LNS research

RESEARCH SPOTLIGHT

"Getting Real" In Industrial Transformation

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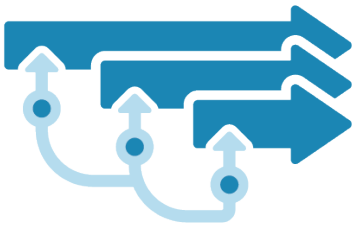
Executive Summary

One-half of industrial enterprises report they have embarked on an Industrial Transformation journey. And the leaders in this journey have found very real benefits in the form of increased revenues, lowered Cost of Goods Sold (COGS), and increased operating margins. These successes have put pressure on the rest of manufacturers to stop "playing" at Industrial Transformation (IX) and to "get real": to build a value creation engine in the form of an IX Program.

This Research Spotlight is a primer on how IX Programs have morphed over the last few years, the processes that are critical to program success, and the seven "clusters" of best practices we have derived by surveying the market extensively and advising manufacturers carefully.

To derive our findings, LNS Research conducted a global survey in the winter of 2021. This study builds on and looks for insights across a similar survey executed in December 2018/January 2019 and leverages results from more focused surveys through that time span (for example, our Analytics that Matter Survey).



INDUSTRIAL TRANSFORMATION (IX) IS A PROACTIVE and coordinated approach to leverage digital technologies to create step-change improvement in industrial operations. Industrial Transformation is a critical and often the largest subset of a Digital Transformation program that includes initiatives outside of the industrial space, such as redefining customer relationships.

Click to lean about the INDUSTRIAL TRANSFORMATION FRAMEWORK

The survey results are clear: Industrial Transformation Leaders (IX Leaders) are defining, executing, and benefiting from their IX Programs differently. Among numerous other differences, IX Leaders are:

- 72% more likely to have grown revenues by more than 10% and 57% more likely to have reduced Cost of Goods Sold (COGS) by more than 10% as a result of their IX Program.
- 140% more likely to have converted their Continuous Improvement teams into IX teams.
- 375% more likely to be on their fourth+ IX Program head as the success profile is increasingly oriented towards domain expertise.
- FIVE times more likely to be actively engaging Operations personnel (not just OT) in their programs.
- 450% more likely to have a three-year IX budget of over $100 million (depending on company size).
- Making investments in dramatically more types of Digital and IIoT technologies.

The survey data clearly shows that Industrial Transformation (IX) is working and that the time is now to "get real" and aggressively pursue such a Program.

Defining Industrial Transformation and IX Leaders:

Industrial Transformation (IX) has become a very real phenomenon across industrial operations. It goes by many names: Industrie 4.0; Connected, Digital, or Smart Manufacturing. Industrial Transformation is the proactive and coordinated approach in leveraging digital technologies to create step-change improvement across the value chain. Industrial Transformation is an important, often the largest, subset of a Digital Transformation Program that includes initiatives outside of the industrial space, such as readdressing customer relationships. IX is differentiated from, or an acceleration of, such Continuous Improvement programs such as Lean or World Class Manufacturing (WCM) by its focus on step-change. And, it is particularly challenging as solutions must be deployed across a manufacturing network that is diversified by manufacturing models, culture, Operational Technology (OT) deployed, and digital maturity.

More than two-thirds of companies surveyed have implemented, are currently implementing, or plan to implement an Industrial Transformation (IX) Program. And despite what you might have read, only 7% of those programs are "stuck" in pilot purgatory. In fact, 57% of companies report their programs meet or exceed their expectations. The average program includes 12 distinct initiatives (Quality 4.0, Connected Worker, Digital Twins) and is foreseen as a three-year journey.

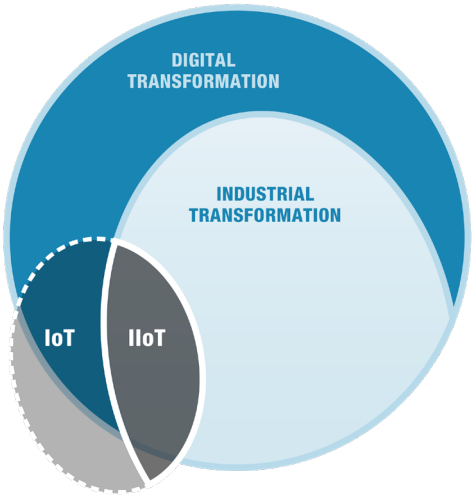


FIGURE 1 - Industrial Transformation (IX) as a subset of Digital Transformation

The worldwide COVID pandemic is not slowing IX down. Seventy-eight percent of companies are maintaining or accelerating their programs in the face of the economic turmoil created by the pandemic. Moreover, IX Leaders are three times more likely to be increasing the IX budget because of COVID and the associated burdens on manufacturing compared to Followers.

How do we define IX Leaders and Followers? In our 2019 research, we asked our survey takers to self-evaluate the perception of their transformation programs. We found the IX Leaders to be the 28% of companies that when asked about their company programs' impact said:

"We have made progress and the corporation is seeing value."
or
"We are a real success both in terms of business benefit and speed of the program's impact."

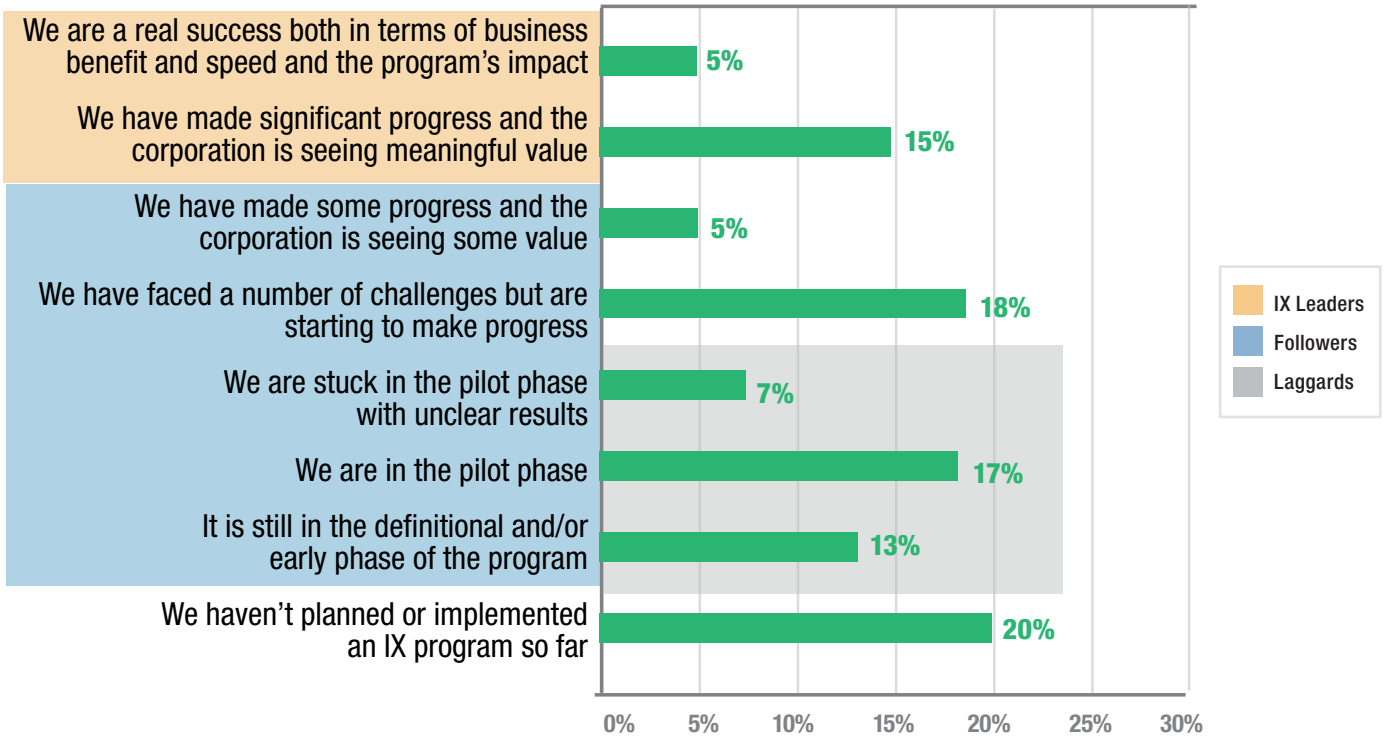


FIGURE 2 - Methodology: Comparing To Leaders

However, our more recent surveys have shown that the IX Leaders have increased from 28% to more than 40% of the market. To keep up with the industrial community's progress and to raise the bar for the IX Leaders, LNS Research has updated the definition in this 2021 edition of the IX Readiness research. Figure 2 on the previous page displays the latest version of the question and identifies Leaders, Followers (including Laggards), and Laggards. As you can see, IX Leaders now make up only 20% of the dataset. We will be contrasting how IX Leaders are doing generally to "Followers" and occasionally to "Laggards" throughout this report.

It should not be unexpected that "Corporate" leads in defining the IX Program 53% of the time with Business Units responsible for another 38% of the programs. We did see those numbers flip when asking about executing the program: business units were then in the lead role in 52% of the cases. Plants were seldom the focus in either defining or executing the IX Program despite being the site of industrial operations.

Return on Investment (ROI) should be fundamental to the strategy, tactics, and outcomes of an IX Program. As detailed in a recent LNS eBook, IX is delivering for manufacturers. ROI is being realized widely across IX Leaders. In fact, 80%+ of IX Leaders were able to reduce COGS and/or improve operating margins and/or grow revenues by at least 3% as a result of their IX Program.

IX Leaders are	72%	more likely to	Increase	Revenue	by	10%	as a result of their IX program
	57%		Reduce	COGS		10%	
	43%		Increase	Operating Margin		5%	

FIGURE 3 - Financial Effects of IX Leaders

In the two-plus years between our surveys, it is clear that IX is evolving for more and more companies. IX Leaders built a real value creation engine in IX and are embedding transformation into the core fabric of their company. In 2019, we identified four organizational disconnects in IX that led us to conclude that many programs were being established without a real commitment to their success and were headed to stagnation or outright failure. We call these programs "Zombie Programs" because they are the walking dead. The good news is that increasingly Followers are rearchitecting their programs to more closely align to the learnings of IX Leaders. Still, poorly organized, planned, and executed IX Programs abound. Let's look at the state of IX in 2021, then the processes of IX Leaders to identify best practices in IX.

How are Instant Oatmeal and Zombies related to IX?

Companies talking the talk but not walking the walk of IX.

At the 2020 LNS Research *The IX Event,* a large building products manufacturer Transformation Leader talked about the reality of generation one IX programs. He labeled them the "Instant Oatmeal" view of Transformation. He saw those programs executing poorly:

Step 1: Decide to do a digital transformation because everyone else is doing it.

Step 2: Appoint a Chief Digital Officer from a technology company.

Step 3: Find new operational issues that can be solved with flashy technology.

Step 4: Hope it generates enough buzz to seem like progress.

Step 5: Declare success.

Step 6: Try to justify why technological success did not equate to profitability.

He was proud to say they had moved beyond Instant Oatmeal at his company. At LNS Research, we call these programs "Zombie Programs" because of all the disconnects and lack of commitment to Transformation.

State of IX in 2021:

The days of playing with cool technology and proclaiming success are increasingly over. IX Programs must deliver for their corporations. We have raised the bar on IX Leaders and if Followers and Laggards want to realize the same level of benefit, they need to raise the bar as well.

The single biggest indicator of IX "getting real" is the turnover in IX Program heads. Sixty-nine percent of IX Leaders have had at least two program heads and are 375% more likely to be on at least their fourth. Turnover shows how difficult IX can be and that to become IX Leaders, corporations must have the right program head and the right strategy for success. IX Leaders have found that deep understanding of operations and technology is critical to success. Moreover, IX Leaders are THREE times more likely than Laggards to have a program head with a deep understanding of:

- OT generally
- Company's strategy and business objectives

Clearly, the success profile is increasingly oriented toward domain expertise.

Further, IX Leaders have learned to build expertise internally around a wide range of technologies. It is not good enough to find a technology partner, but internal competency must be built. IX Leaders were generally TWICE as likely to have built deep expertise around 13 of 13 technologies (Data Lakes, Cloud, AI/ML, etc.) when compared to Followers.

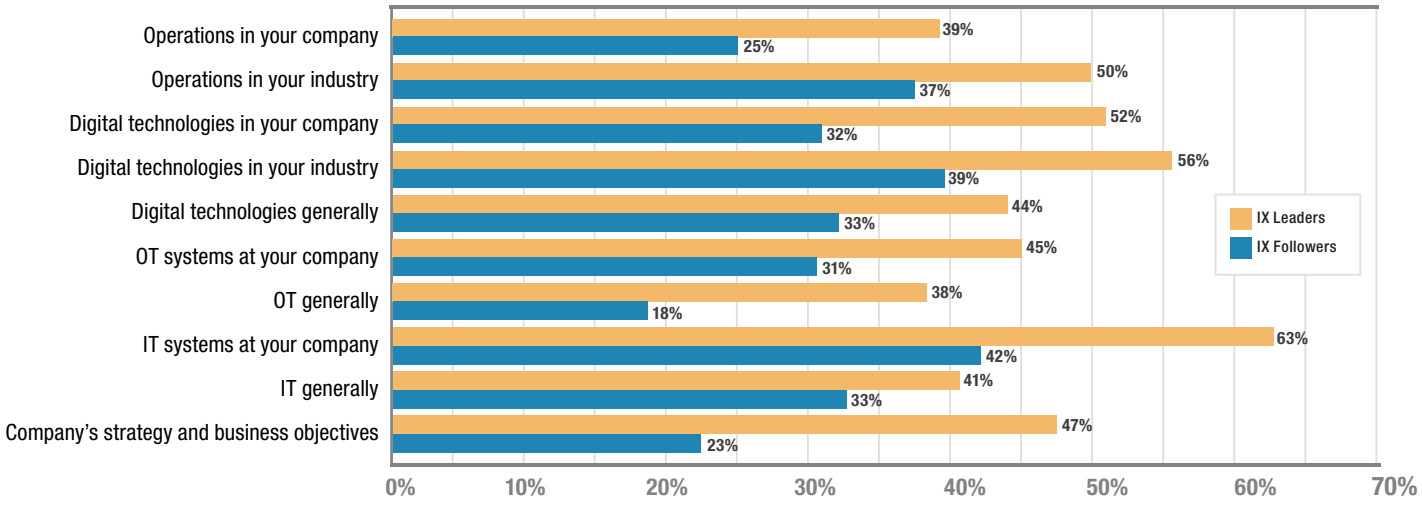


FIGURE 4 - IX Leadership's Deep Understanding of Organizational Elements

Who heads the IX Program is also changing. IX is still a "C" suite-led program, but which "C" level executive is changing. CEOs are less likely, and CIOs are more likely to be the ultimate program head. Some of this may simply be a branding change rather than a program change as more and more IT departments are renaming themselves to Digital Transformation (DT) departments. But LNS Research views it as evidence of the maturation of the programs within IX Leaders' companies (we will be detailing the Four Stages of the IX Journey later this year). Ultimately, IX must transition from a program to a core part of a company's operating fabric. The program must become a component of the company's culture. The CIO is responsible for all other enterprise-wide technologies so it makes sense that eventually IX technologies and the technical stream of the IX Program will fall under the CIO's purview. LNS Research would argue strongly that operations/manufacturing must have a focal point, a "lead," on the IX team, even if the program head is the CIO. We would also suggest an inclusive team becomes even more important when IT leads IX.

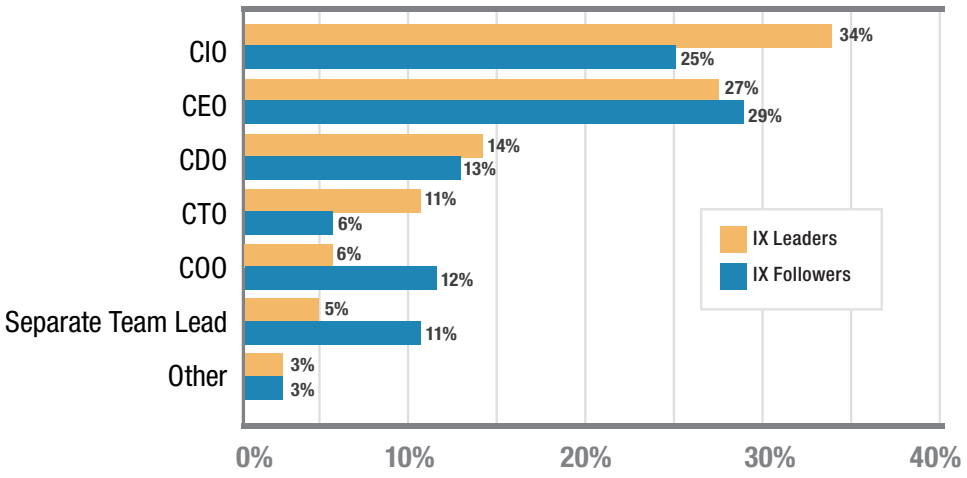


FIGURE 5 - Positions Leading IX Programs

Additionally, the money and resources IX Leaders are putting into transformation are growing. Budgets for IX are still small overall as the primary focus of the IX Program is only around pilots and proof of concepts rather than wide-scale rollouts. But IX Leaders are budgeting more for IX and are 450% more likely to have a three-year budget of $100MM or more. The data also shows that overall, budgets are up across the board (Leaders and Followers) and for all sizes of companies when we compare 2019 to 2021.

Another sign of the maturation of IX Programs can be seen in the challenges being reported. Increasingly, people, process, and security issues are becoming paramount. Even the technology challenges reflect the changing dynamic of transformation as technology challenges no longer dominate the discussion nor top the list.

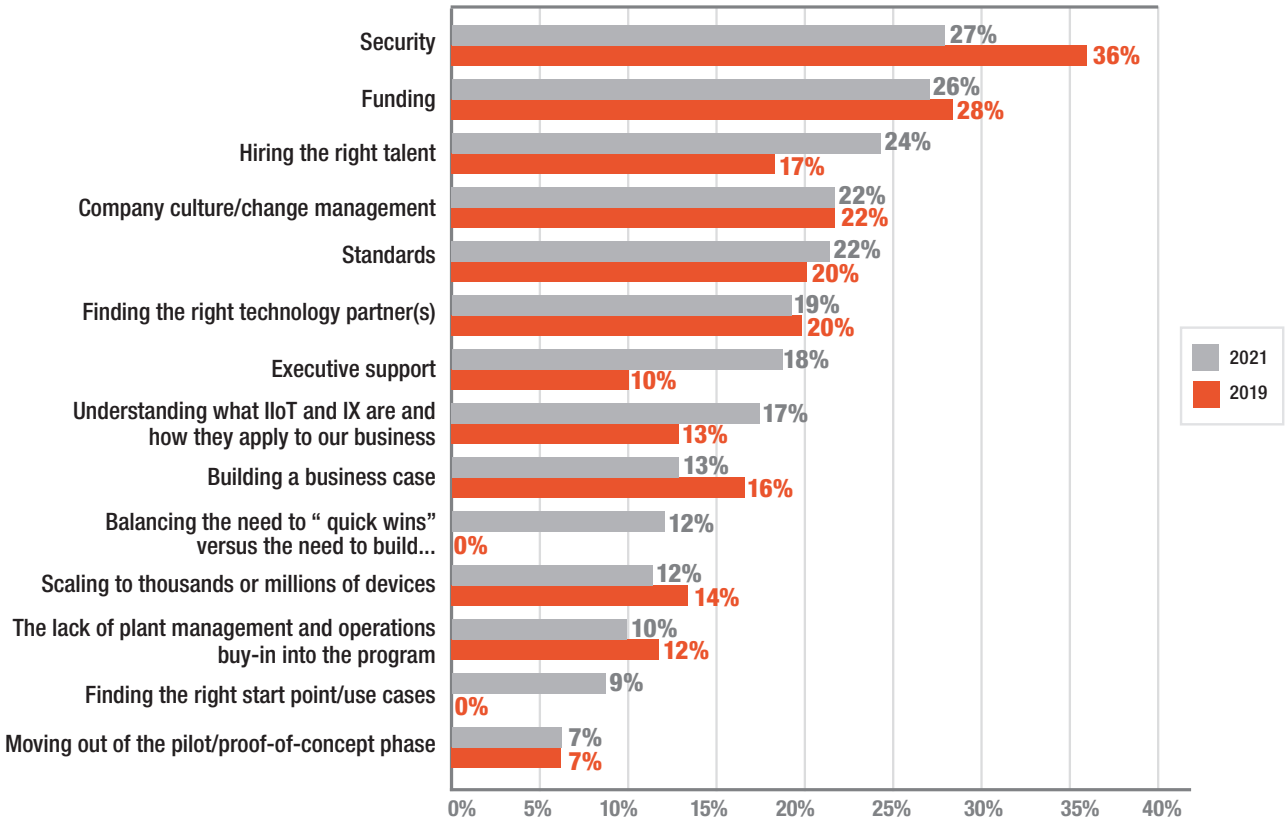


FIGURE 6 - Common Organizational Challenges to IX

Processes of IX Leaders

Let's look now at the processes IX Leaders are using to build our view of the best practices associated with IX. Here we want to highlight four processes that are core to success in IX.

Follow the LNS Research IX Transformation Framework

We have created the LNS Research Industrial Transformation (IX) Framework to help companies pursue step-change improvements. The LNS Research IX Framework has five swim lanes or steps that cascade and lead the enterprise from highest-level goals and objectives to changes in a specific plant in a particular geography. Ideally, an organization will start at the beginning and progress through the five steps sequentially, but certainly, companies should step in wherever it makes the most sense and backtrack to the greatest extent possible.

Industrial Transformation (IX) should be tightly integrated and aligned with the overall corporate strategy. Senior leadership should be re-imagining business processes and service delivery to seek dramatic improvement in industrial operations and to disrupt marketplaces. Meanwhile, the highest levels of the corporation should also be deciding how deeply to engage customers and suppliers in the IX Program. The business objectives for the IX Program should set the vision about how the company should pursue new initiatives — APM 4.0, factory of the future, connected frontline worker — to achieve the step-change goals set.

One of the most common problems we see in IX Programs is that companies often start with Solution Selection. That is not an advantageous path: successful IX programs are 61% less likely to use "evaluating and testing" technology as one of the fundamental organizing principles.

A critical finding of our research is that IX Leaders are executing each and every phase of the IX Framework better than Followers. They are operating more effectively across the whole lifecycle of transformation.

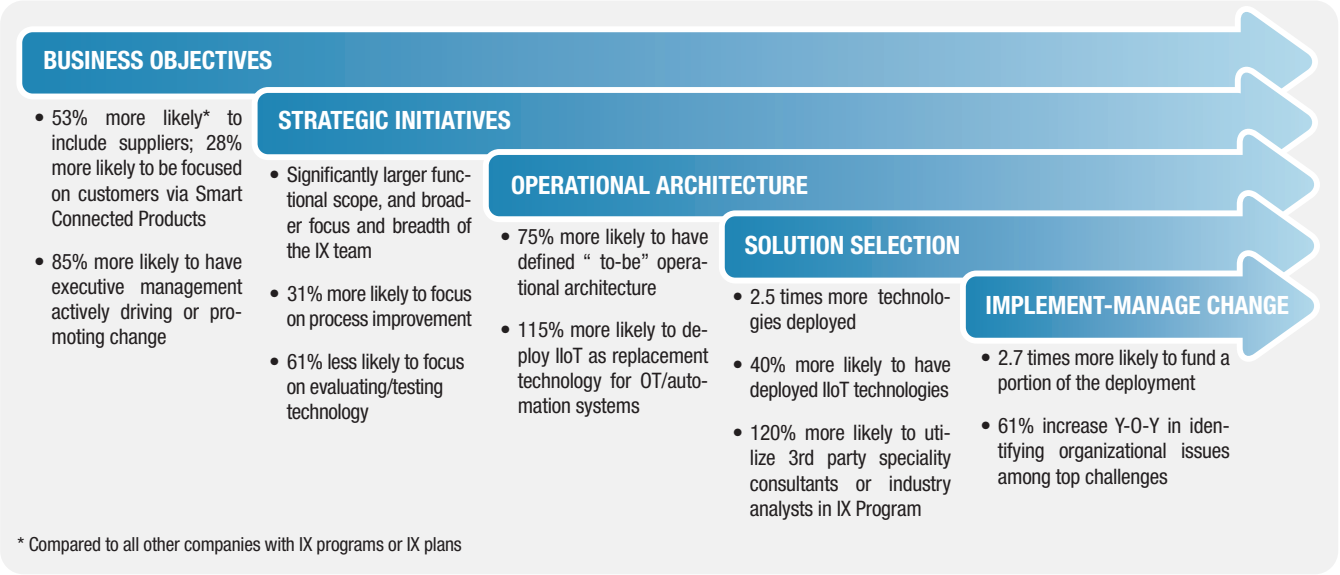


FIGURE 7 - Phases of the IX Framework

Value Focus and Use Case Prioritization

We noted in our definition of IX that the coordination/rollout to the plants makes IX more difficult. One thing Zombie programs do is to focus on easy engagements: those plants with the most technical appetite. Typically, these are the best plants with technically engaged plant management. So, the "easy program focus" is to execute to the path of least resistance and focus on making the best plants even better. In fact, this strategy has a name: Lighthouse. At LNS Research, we are not big fans of the Lighthouse strategy for more advanced IX Programs. This leads to diminishing returns and fewer deployment resources over time.

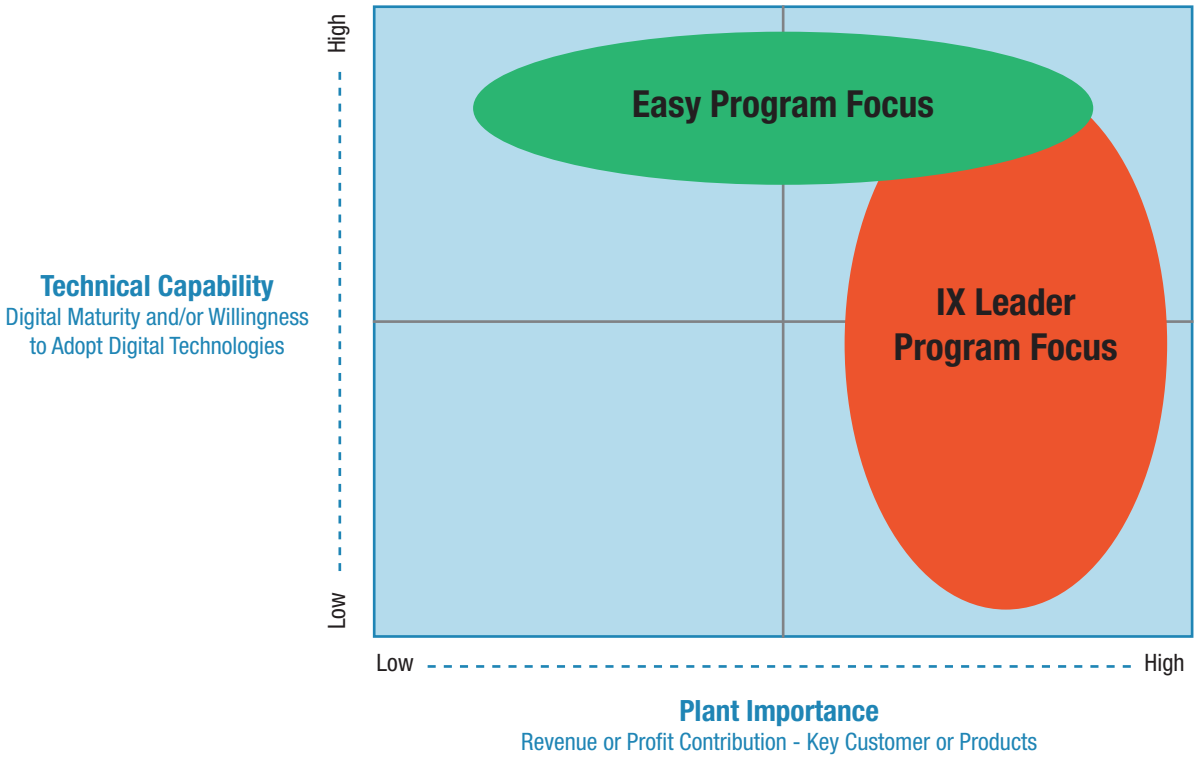


FIGURE 8 - Plant Importance vs. Technology Capability

Alternatively, we would encourage two other processes. First, in terms of prioritization of use cases across specific plants, we would suggest not going to where it is "easy" because of plant buy-in but to where it is "valuable". Early use cases should focus on the intersection of "easy" and "valuable" but over time the program must look across maturity levels of plants to focus on maximizing return in the form of revenue increases or COGS reductions independent of the plant's current technical capabilities.

Second, LNS Research advocates a blended view of use case prioritization. We are regularly asked about which use cases are the "low-hanging fruit" and offer the "best bang for the buck." We have researched that question and delivered definitive answers in previous Research Spotlights. Increasingly, we are telling manufacturers that is the wrong question. Manufacturers need to be thinking about all the hard work behind real transformation instead of focusing exclusively on the low-hanging fruit. More specifically, manufacturers must build a data infrastructure from sensor/machine to data lake, including data connectivity, transport, and contextualization. Quick wins are critical to gain program momentum but may not always build the transformative capabilities needed for step-change improvement. Therefore, LNS Research recommends the blended use case approach we commonly see being executed by IX Leaders.

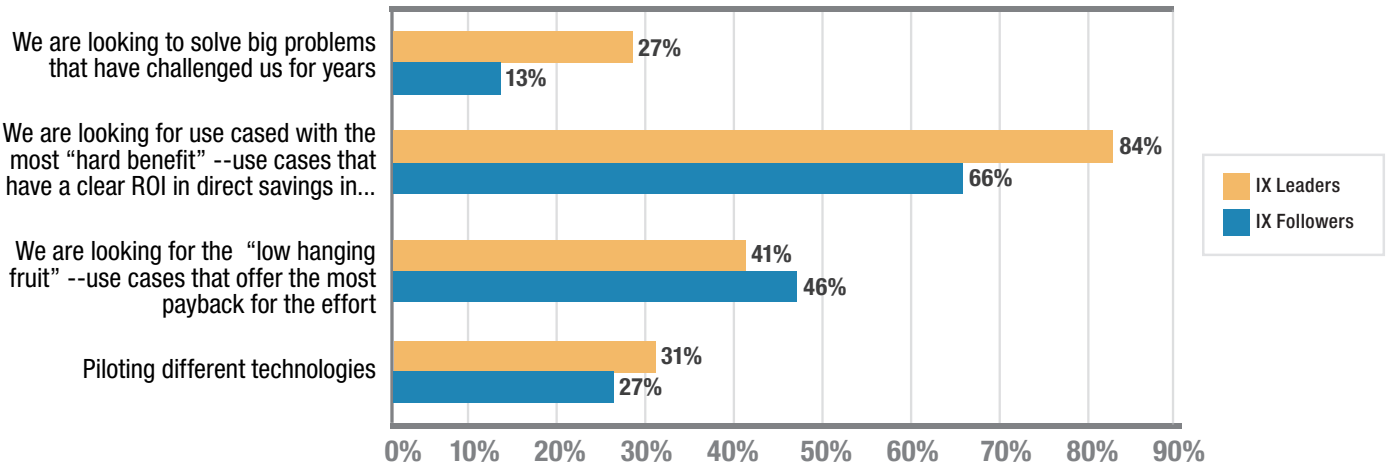


FIGURE 9 - Strategy for Selecting Use Cases/Initiatives to Target in IX Programs

Center of Excellence (CoE)

Further, we would suggest that every manufacturer should look at a Center of Excellence (CoE) rather than a Lighthouse structure for their program as the program matures. A CoE is a virtual consolidation of the key IT, OT, Operations, and IX resources into one team to support the deployment of digital solutions across the manufacturing network. The CoE should have responsibility for listening to requirements, problems, and potential solutions. The CoE should be thought of as doers, teachers, disseminators, embracing the Yokoten philosophy of Lean. The CoE team is responsible for governing and supporting the rollout of data, technologies, and most importantly, operational processes. The CoE's responsibility goes beyond technical systems to production systems, including manual business or manufacturing processes.

The CoE model differentiates from the Lighthouse model in a number of ways but maybe the most important is implementation support (budget and resources). The Lighthouse strategy depends on the Lighthouse plant's personnel to continue the rollout to other plants over time. Instead, as one successful Chief Digital Officer said: "come with budget and resources to get a plant's attention." Ninety-eight percent of IX Leaders are supporting implementation and are 56% more likely than Followers to be doing so. Additionally, IX Leaders are more than TWICE as likely as Followers to be responsible for the "full value chain-wide rollout of digital technologies." The programs of IX Leaders are increasingly coming with a significant share of the rollout budget as well.

Lighthouse Strategy	IX CENTER of EXCELLENCE (CoE)
Smaller IX Program Team	Larger IX Program Team
Technology (IT) focused	Operational problems focused
Aims at making the most advanced plants even better	Aims at a wide range of plants with varying technology maturity
Leverage LH plant personnel in subsequent rollouts	IX Program Team brings resources and budget to support plant rollouts
Focus: demonstrating potential of technology (pilots)	**Focus:** supporting operations (scale)
30% less likely than Followers to include a Lighthouse plant as a part of the team's responsibility	25% more likely than Followers to build an Industrial Transformation Center of Excellence
LNS BOTTOMLINE	
Effective way to start an IX Program	Key to building long term success

FIGURE 10
Lighthouse Strategy vs. Center of Excellence (CoE)

Agile Infused with Lean

The methodology being deployed in Industrial Transformation (IX) differentiates from the traditional Waterfall/Stage Gate strategy traditionally deployed by most IT organizations. The research data shows that IX Leaders are now THREE times as likely as Followers to implement an Agile methodology in their transformation program. These agile software development programs are essential because they enable much quicker and more efficient technology deployment and change management processes.

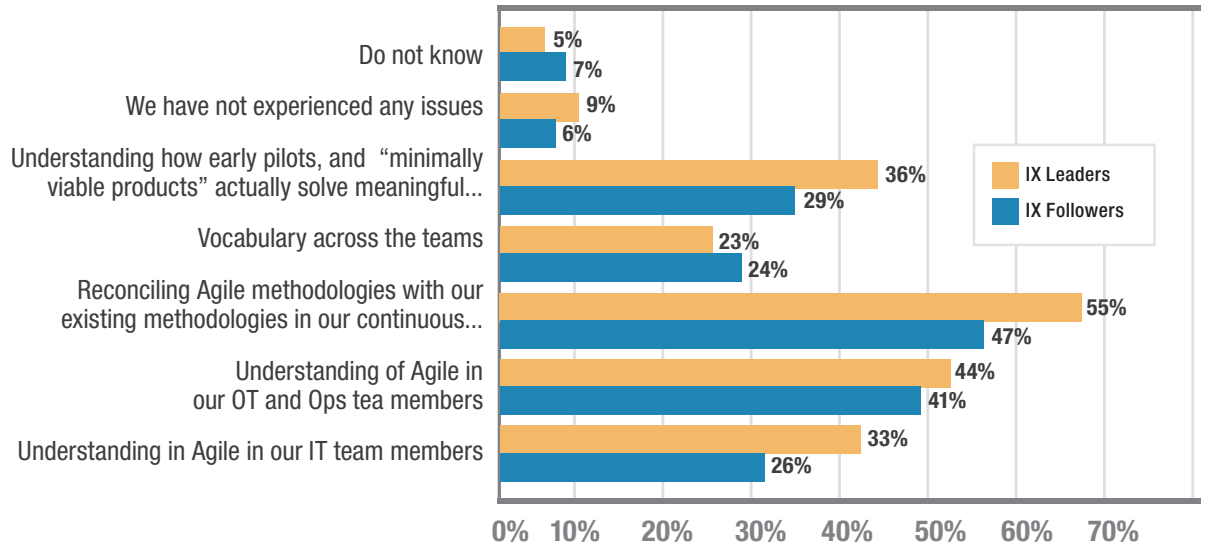


FIGURE 11 - Challenges to Deploying an Agile Methodology in IX

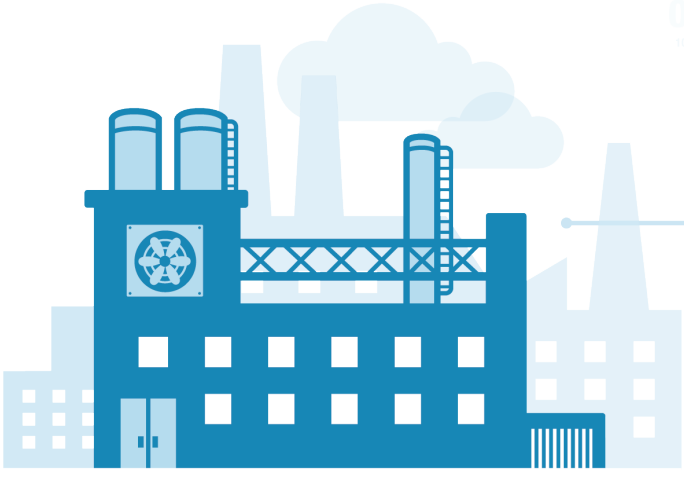
There are numerous challenges with deploying an Agile methodology in IX. One "theme" that runs through the challenges surveyed revolves around the alignment of operations and OT with Agile. Practices like "fail fast" and "minimally viable product" conflict with the low-risk nature of manufacturing and operations. Further, Agile methodologies may conflict with Continuous Improvement methodologies like Lean or World Class Manufacturing already entrenched in manufacturing. LNS Research would recommend manufacturers think about fusing the two sets of methodologies together rather than following either one slavishly.

Two meanings of Agile in manufacturing and transformation:

Google "Agile" and you will see two meanings applicable to the world of IX.

1. **Agile Methodology** is an iterative approach to the project management process, mainly used for software development, where demands and solutions evolve though the collaborative effort of self-organizing and cross-functional teams and their customers."

2. **Agile Organizations** are enterprises that move quickly and easily and "...are characterized by rapid learning and fast decisions cycles which are enabled by technology, and a common purpose that co-creates value for all stakeholders." Interestingly, one common characteristic of IX Leaders is they are using an Agile methodology often to become a more Agile organization.



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7 Sets Of Best Practices

LNS Research has identified seven "clusters" of best practices in Industrial Transformation. We use the phrase "clusters" to reflect the fact that each best practice has a People, Process, and Technology dimension to it. Let's define the Seven Best Practices and drill into the Process dimension of each (subsequent research with drill into the People and Technology dimensions).

1. The Power of More™

The single most powerful finding of all the LNS Research work on IX Programs is that Leaders are doing more in every direction. IX Leaders are:

- Deploying 170% more technologies,
- Executing a more expansive functional scope and strategy,
- Encompassing greater breadth on their IX Program teams,
- Reaching out to both customers and suppliers,
- Getting data from more sources and making it available to more roles across the corporation,
- Jointly funding more initiatives/solutions.

Followers are always planning to close some of the gaps sometime in the future.

From a Process perspective, it is critical that IX Leaders develop a strategy assuming success rather than a "dip your toe in the water" program. To be blunt, IX Leaders must be "all in" on IX or the program will stagnate. The plant funding model means that the IX Program needs to develop a range of solutions for plants of all levels of maturity. The need for deep domain expertise means the program needs to engage large swatches of company personnel. Executing the program according to the LNS Research Transformation Framework supports an "all in" perspective by aligning the IX Program to the corporate strategy.

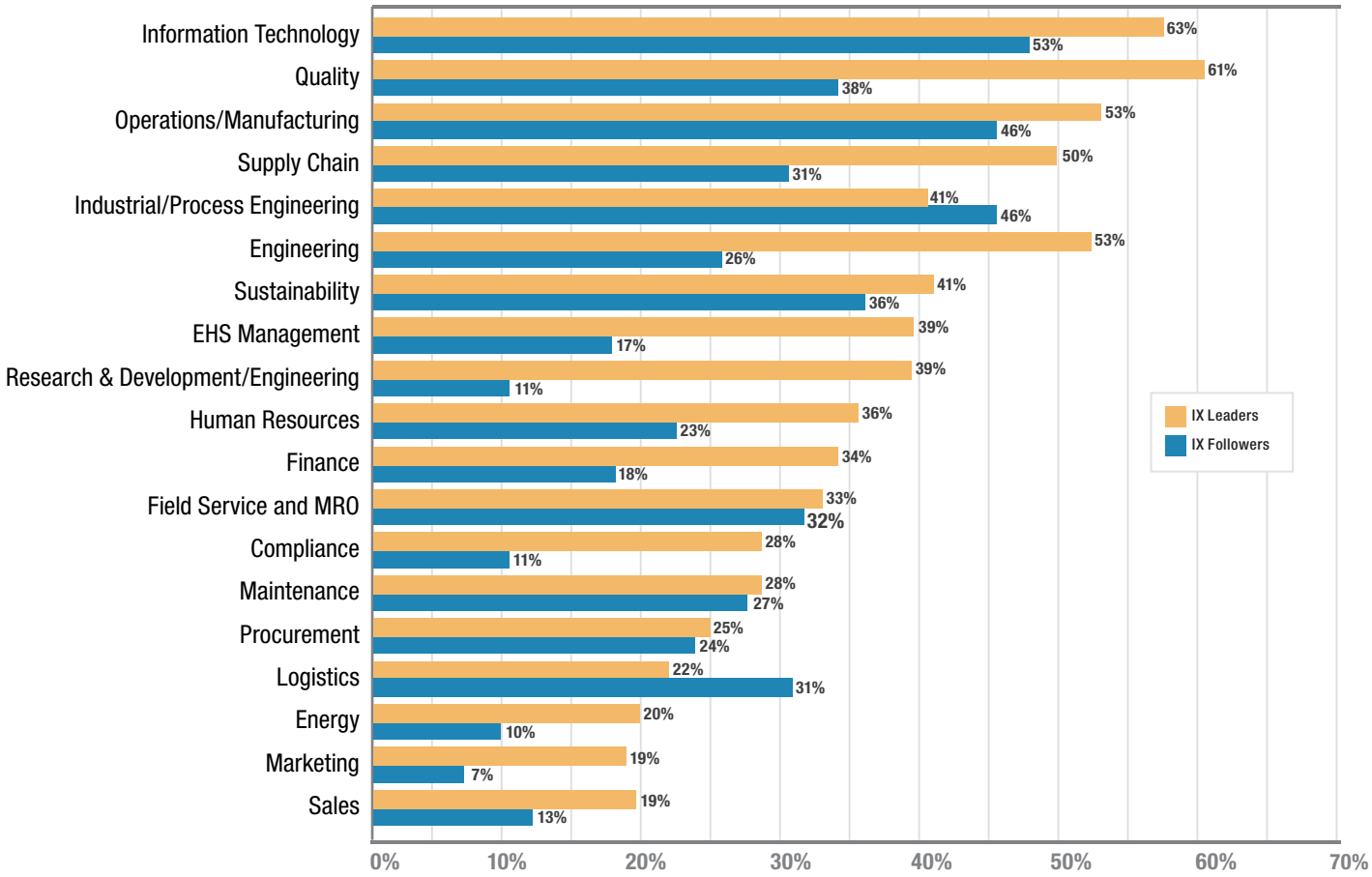

FIGURE 12 - Functional Leaders on IX Program Team

2. Top Down

Industrial Transformation (IX) is a high-profile project across industrial enterprises globally. IX Programs require engagement from large portions of company personnel, rearchitecting of business processes, and convergence of a number of business functions and existing programs. In other words, transformation is hard and is not for the faint of heart. Therefore, executive engagement is critical to get the program going, funded, and a high profile internally.

LNS Research views it as especially critical that the head of operations be seen as deeply committed to digitalization. IT system after IT system has failed to rollout across manufacturing—even with a demonstrable ROI—because there was not direct and active encouragement from manufacturing management. The hierarchical nature of manufacturing lends itself to adoption WHEN manufacturing leadership is, and is seen as, committed.

IX Leaders are leveraging written IX Plans with "Big But Achievable Goals" and regular communications around the progress of the program against a wide array of metrics as tools to ensure the corporation understands the executive commitment to IX.

> LNS Research would **not advise a company to start IX without real executive commitment** to the success of the program.
>
> **– Tom Comstock**
> *Principal Analyst*

3. Morph to Bottom-Up (Engage Business/Operations)

Top-Down commitment is necessary but not sufficient for success. Subject matter expertise from the plants, plant management, and specialized contractors is correlated to success. Further, given the funding model, plant engagement early and often appears to be critical to successful rollouts over time. The program must morph from Top-Down to also be Bottom-Up with significant engagement from across business and operations. Remember, IX should not be something you are doing TO plant personnel. It should be something you are doing WITH plant personnel.

IX Programs must be inclusive in their team-building, structured to listen to problems and potential solutions from all levels of the corporation. An IX Program acting as a CoE (listening and providing resources and budget support) with super users across a range of plants is a process model highly correlated to success.

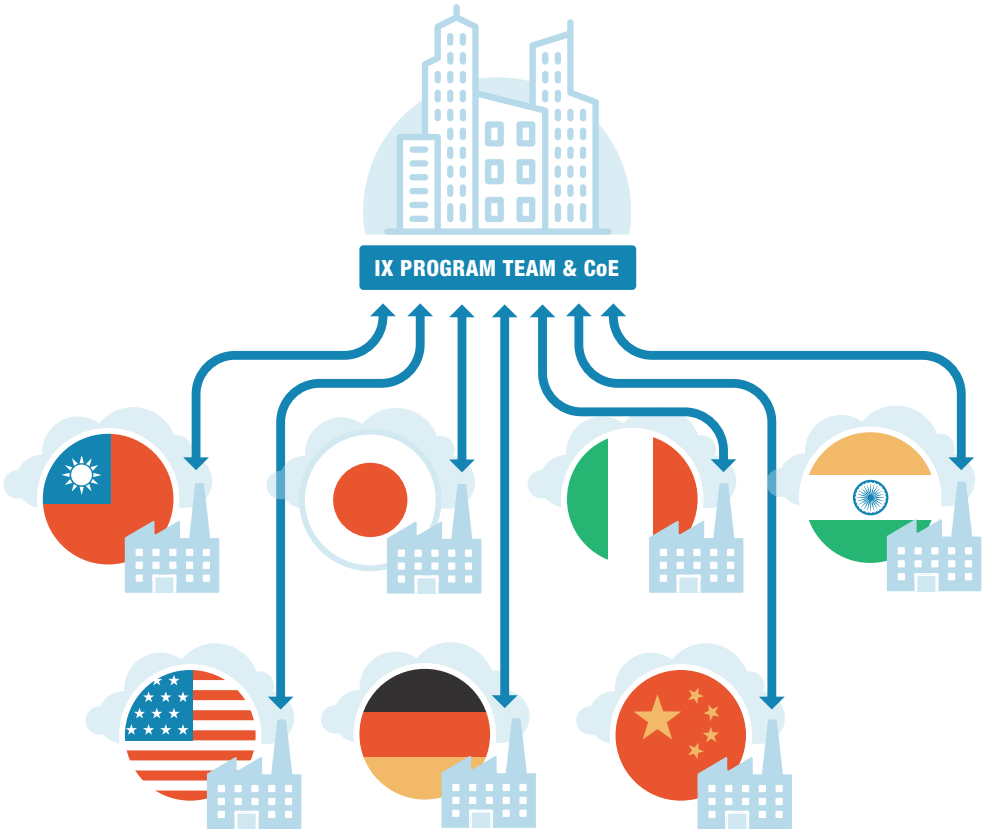

FIGURE 13 -IX Program Team and Centers of Excellence (CoE)

4. Bring along the whole manufacturing network

Even the most advanced companies have a range of maturity across their manufacturing plants from technically advanced to still paper-based. It is easy for IX Programs to focus on the most advanced plants which most often have management that is supportive of technological innovation. It is not uncommon to see IX programs chase the diminishing returns in making the best plants even better. This is one of the core reasons that the Lighthouse implementation strategy typically stalls.

Industrial Transformation (IX) Leaders know they have to seek to improve operations in all high-value operations (those that are contributing the most to profits or losses) independent of their technical capability today. IX Leaders phase use cases strategically. They leverage early successes with the "technologically willing" to engage the rest of the organization. Actively promoting program progress and cajoling the reluctant becomes a key task for IX Leaders.

5. IT/OT Convergence

IT/OT Convergence is all over the automation and IT media. It means everything from replacing closed, proprietary process control systems with new software running on standardized computers to an integrated team organizationally. IX Leaders are integrating teams faster and are using written Operational Architectures as "vision stories" for that convergence.

From a Process perspective, we saw that IX Leaders are implementing an Agile methodology and are blending it with the Continuous Improvement (Lean, Six Sigma, World Class Manufacturing) program methodologies already in place. LNS Research fully expects to see a few manufacturers become exemplars promoting their own hybrid methodology over time.

6. Balance short and long term

Quick wins are highly critical to getting an IX Program off the ground. The challenge is that for long-term success, the program must also tackle data connectivity, transport, and contextualization challenges which are difficult and have limited direct payoff. On the people side, companies must start with a program to kick-start work but morph it into a culture to institutionalize success.

IX Leaders have found a balance between short-term and long-term imperatives. IX Leaders are blending technologies and use cases for short- and long-term benefit. In fact, as the program matures, there is typically an increasing focus on big problems and solutions.

7. Data is the currency of IX

We all know that data is at the core of Industrial Transformation (IX). Collecting it, understanding it, delivering it, and making decisions based on it are fundamental to transformation. Manufacturing operations are good at managing materials, labor, equipment, and tooling but typically not mature in managing data.

LNS Research sees the need for the deployment of Data Operations practices, created in the IT world, into operations as increasing rapidly. Wikipedia notes that, "DataOps is the orchestration of people, processes, and technology to deliver trusted, business-ready data to data citizens, operations, and applications throughout the data lifecycle...With properly governed data, businesses can comply with complex regulations, data privacy and ensure artificial intelligence (AI) model accuracy by monitoring data quality." But data is not naturally "properly governed" so it is incumbent upon IT, OT, IX, and Operations personnel to develop the governance processes associated with operational data to drive transformation forward.

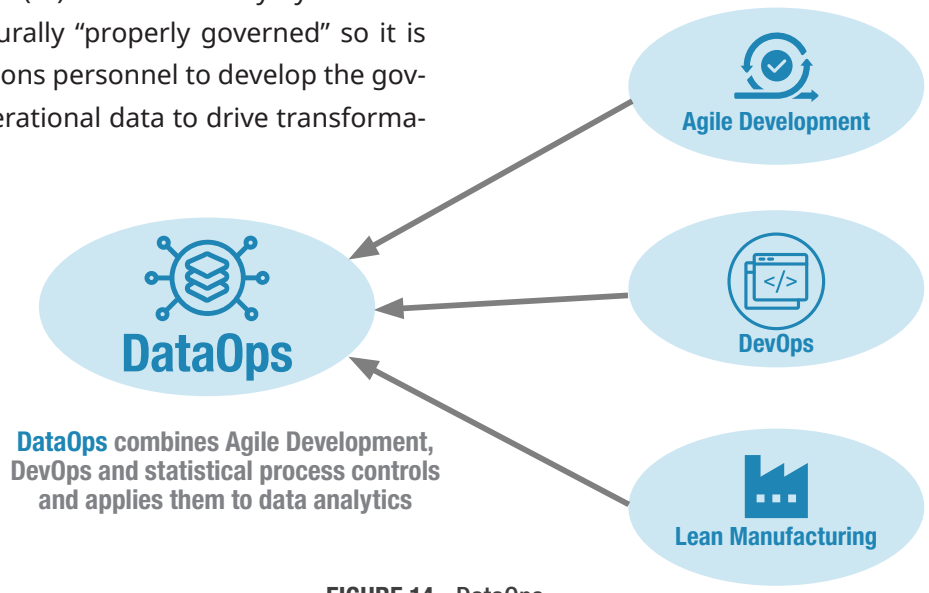

FIGURE 14 - DataOps

Best Practices and Associated Process Recommendations

All in all, the chart below describes the best practices we found in the data and engagements with manufacturers and a drill down into the Process dimension of those best practices. (Subsequent LNS Research Spotlights will drill down into the People and Technology dimensions.)

LNS RESEARCH IX BEST PRACTICE	PROCESS AND STRATEGY
The Power of More™	Be all in: Develop a wide strategy assuming success rather than a "dip your toes in the water" program
Top Down	Written IX Plan and regular communication on progress against specific metrics Big But Achievable Goals™
Morph to Bottom Up	IX Program acting as a CoE (providing resources and budget support) with super users across a range of plants
Balance short & long term	Balanced Use Case Selection Process™ Compress organizational silos, do not just reautomate existing silos
Bring along the manufacturing network	Phase use cases strategically: leverage early successes with technology leaders to engage the rest of the organization Compress organizational silos, do not just reautomate existing silos
IT/OT Integration	Agile fused with CI (Lean)
Data is the currency of IX	Build/deploy a Data Ops process across operations Make the users of the data responsible for getting the data

FIGURE 15 - LNS Research's IX Best Practices

Recommendations: The Time is Now

The research is compelling. Companies all over the globe are seeking to go beyond Continuous Improvement to find step-change improvements in business. While the numbers are small so far, it is clear that many industrials are finding those step-change improvements in the form of incremental revenue opportunities and cost savings. Industrial Transformation is working.

For manufacturers to succeed in IX, they need to "get real" by adopting an ever-increasing number of best practices. IX is no longer a mystery that requires process innovation. IX now simply requires the application of identified best practices to your specific environment and culture.

LNS Research will continue to research the activity of Industrial enterprises globally. We will be drilling more into the Technologies and People dimensions of our Seven Best Practices and detailing the associated IX Maturity Model in the near future. Stay tuned.

IX NOW SIMPLY REQUIRES the application of identified best practices to your specific ENVIRONMENT & CULTURE.

Appendix: Demographics

The 2021 edition of the IX Readiness survey was taken by more than 300 business and IT decision-makers, including managers, directors, VPs, C-suite executives across several functions in manufacturing companies. We sought responses from across the discrete, batch, process, and infrastructure industries. Half of the companies were from Europe and the other half were from North America and the Asia/Pacific regions. We translated the survey to French, German, and Simplified Chinese to accommodate survey takers from Europe and Asia. The survey includes more than a hundred questions on a company's IX program's objectives and challenges, budget, scope, key metrics, organizational culture, and technology resources.

Other surveys (2018/2019 IX Readiness, 2020 Analytics that Matter, etc.) used for comparison purposes had generally similar demographics with some having slightly higher North American participation.

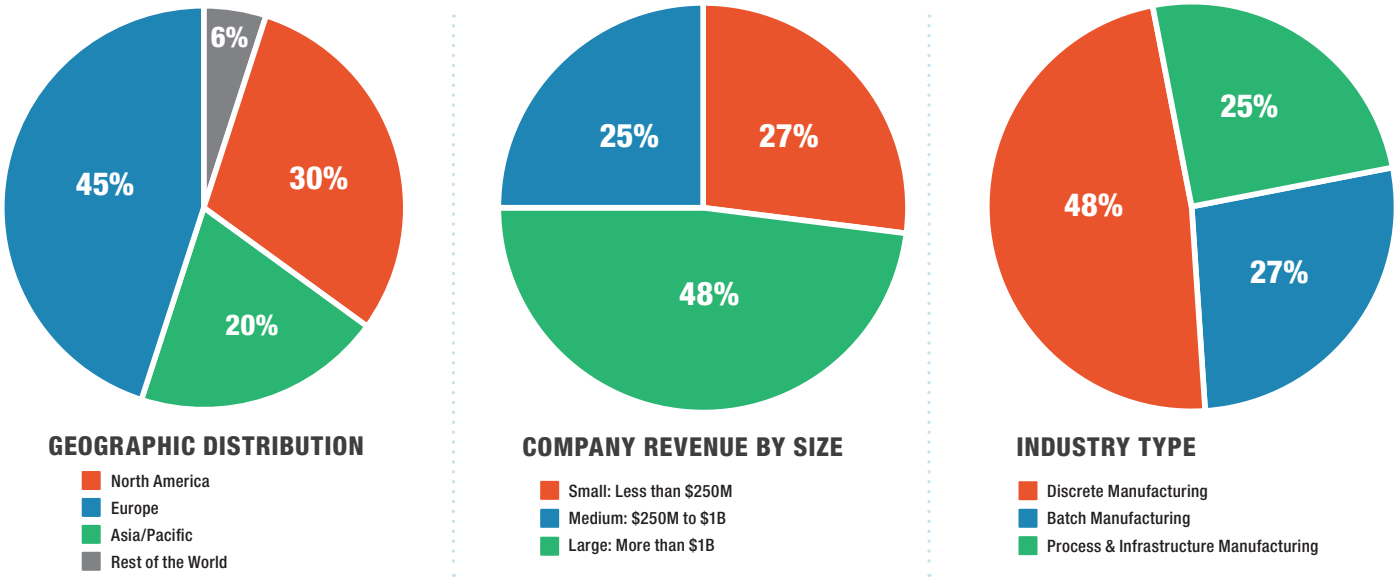

FIGURE 16 - Survey Demographics

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