

The State of Lean Manufacturing

Findings from the Lean Questionnaire



Collaborating to cross the chasm for Lean adoption by the broad mainstream

An initiative of Industry Reimagined 2030

www.IndustryReimagined2030.org



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Table of Contents

Section 1: Introduction.....	3
Section 2: Summary of Key Statistics and Findings	5
Section 3: Respondent Profile (285 respondents).....	6
Section 4: Improvement Gains from Lean	7
Section 5: Factors Correlating to the Overall Value of Lean	9
Section 6: The First Phase of Adoption (4-6 months).....	12
Section 7: Ways Lean Evolves over Time.....	13
Section 8: What would improve the adoption of Lean	14
Section 9: Industry 4.0 Application to Augment Lean	17
Appendix A: Acknowledgements.....	18
Appendix B: Industry Reimagined 2030	19

The Lean Questionnaire will indefinitely remain open for participation and periodic supplements will be issued.

There is a schedule of webinars to debrief and discuss the findings in this report.

Register at www.industryreimagined2030.org/lean

Thank you to those participating in the original research of the Lean Questionnaire. It was developed in collaboration with thought leaders in lean management and continuous improvement. It is our intention that this briefing be transformational not merely informational ... that it stimulate new conversations in your company.

Doug Berger
Industry Reimagined 2030

Section 1: Introduction

What will it take to have tens of thousands of additional manufacturers adopt Lean?

Lean Manufacturing principles, tools and practices are effective in continuously raising the level of company competitiveness, productivity and employee engagement. Yet after 30 years (in the United States), Lean has been systematically deployed in only 10-15% of manufacturers.

Lean has not yet crossed the chasm to broad adoption by the mainstream manufacturer.

Making Lean more relevant and friendly

Lean was formalized in 1991 by Womack, Jones, and Roos of MIT in their book "The Machine That Changed the World" after having immersed themselves in the Toyota production system. The Lean principles, tools, practices are timeless. That era of manufacturing no longer exists; it is not future shock. Executives are living with the today's shock of a fast-paced, rapidly changing and disruptive business climate. A company which is not continuously raising the bar, is losing competitive ground.

The challenge is adapting the timeless principles of Lean to today's and tomorrow's business climate. This means making Lean very relevant and friendly to today's mainstream manufacturing executive, staff and organization.

Relevant:

- Having Lean deliver important results early and on a frequent rhythm
- Provide a rapid ROI on financial investment and a rapid ROI on time investment
- Agility in responding to customer and supply chain disruptions
- Plays well with Industry 4.0 technology

Friendly:

- Easy to understand, learn and do in small pieces
- Quick to set-up and get going
- Seen to make life better

The Lean Questionnaire

Reimagine Lean, a collaborative effort of Lean expert practitioners and thought leaders is committed to spur a 2-3x step-change in the adoption of Lean Manufacturing. We recognized that we needed to move from anecdotal experiences with Lean to facts and data-driven insights. While focused on U.S. manufacturing, we wanted to make the questionnaire and this report generally available. Data, insights and analysis from the Lean Questionnaire are intended to answer the following:

- ➔ Where can we support individual company experiences with a broader base of facts?
- ➔ What are the measurable and the qualitative benefits from Lean?
- ➔ What distinguishes those companies that reap the highest gains from those with moderate gains?
- ➔ How can we make Lean more relevant to decision makers and staff?
- ➔ How can we improve the implementation process to reflect the urgency of today's business climate?

Our audience: (1) Companies deploying Lean but not reaping the greater potential of gains; (2) Companies familiar with Lean yet have not begun adoption; (3) Service providers, consultants and educators aspiring to cross-the-chasm and reach a broader, mainstream population.

Participation in the Lean Questionnaire will remain open, and we will issue updates as additional demographic statistics become available. [Click for Questionnaire](#)

Reimagine Lean Collaborative

Starting with the end in mind, the Reimagine Lean collaboration is evolving an approach that has Lean be holistically adopted by an additional tens of thousands of mainstream manufacturing organizations and contribute to the revitalization of manufacturing competitiveness. We are starting from the basis that the tools, practices, principles of Lean are effective. However the world of the 2020s is fast paced, rapidly changing and disruptive. To cross the chasm for broad mainstream adoption, we must continue to evolve Lean.

In addition to the Lean Questionnaire, Reimagine Lean is comprised of three action workstreams.

1. **Lean Messaging:** The aim is to adapt the way the Lean community introduces itself to the mainstream manufacturer and speaks to their pressing interests and concerns.
2. **Lean Deployment:** The aim is to structure the implementation of Lean to be highly responsive to the pressures on today's manufacturing organizations and personnel.
3. **Lean Learning Communities:** The aim is to encourage companies in a local area to grow and learn by sharing experience, ideas and advice.

Reimagine Lean is an initiative of the non-profit, Industry Reimagined 2030 (see Appendix B)

Section 2: Summary of Key Statistics and Findings

Section 3: Demographics

We received 289 responses with 79% from U.S. We had a distribution of company sizes, years of adoption, and role of respondents. We used the demographics for a more in-depth analysis of patterns. For example, there were no noticeable differences in answers between countries. It is the patterns that were the focus of this analysis.

Section 4: Improvement Gains from Lean

The questionnaire categorized overall gains as transformative, strategic, significant, visible, marginal or none. In ten (10) operational areas further details assessed gains as very high, high or moderate. We allowed for empty responses where Lean was not a focus. In addition 45% of respondents tracked measurable gains over time.

- The top tier of companies realizing strategic gains (30%) averaging 80% improvement
- The middle tier of significant gains (29%) averaging 40% improvement
- The lower tier of Visible gains (38%) averaging 20% improvement

Note: For statistical validity, where we had less than 10 data points, we did not report that information. We filtered out data that were outliers and distorted statistics

Section 5: Factors Correlating with High Value from Lean

Lean, when led by executives, was most likely to achieve very high gains. However, many organizations did achieve high to very high value, while indicating that executive support was still needed. Duration and Maturity Level were also correlated with high value. Companies reported high results early and continuing over 5, 10 or more years. This supports the insight that Lean builds the organization capability for continuous improvement through employee engagement and there is no end-of-the-road to that improvement.

Section 6: Lessons from the 1st Phase of Adoption

We performed Sentiment Analysis of the gains from Lean over the first 4-6 months of an initiative. Executives favored an early focus on improving priority areas of waste over employee engagement tactics or only training. Many reported significant gains when focused on a single operations area.

Section 7: Ways Lean evolves over time

We performed Sentiment Analysis of the shift in early stage Lean tactics to later stage tactics.

Section 8: What would Improve the Adoption of Lean *(in addition to above factors)*

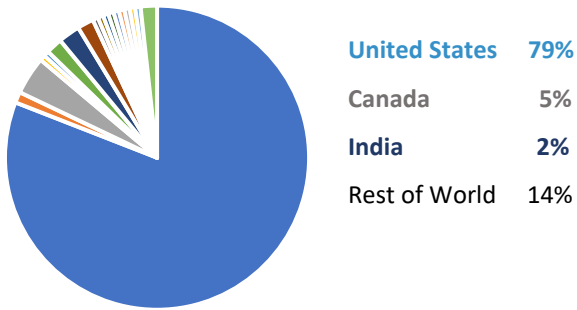
The structured use of change management principles was not widely incorporated into the implementation of Lean and this was reflected in comments. Also direction (goal) setting was not a strong suit in the tactics of Lean adoption. One impediment to adoption is the use of Japanese terms when speaking to people who are not fluent in Lean. "Stop speaking 'Lean-ish'".

Section 9: Digital (Industry 4.0) Tools

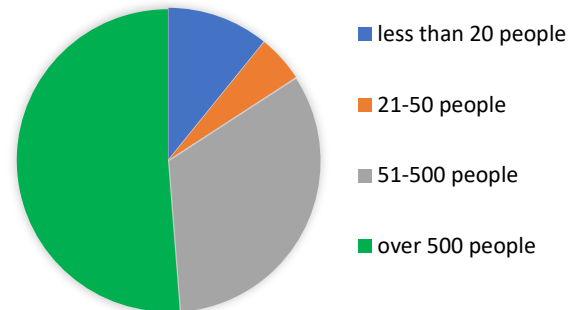
Twenty Percent (20%) of respondents were using Digital tools (Industry 4.0). Digitizing data collection, analysis and display is a large opportunity to advance company productivity and employee engagement and to remove non-value added activities. Lean brought attention to the Hidden Factory. Industry 4.0 is bringing attention to the Invisible Factory.

Section 3: Respondent Profile (285 respondents)

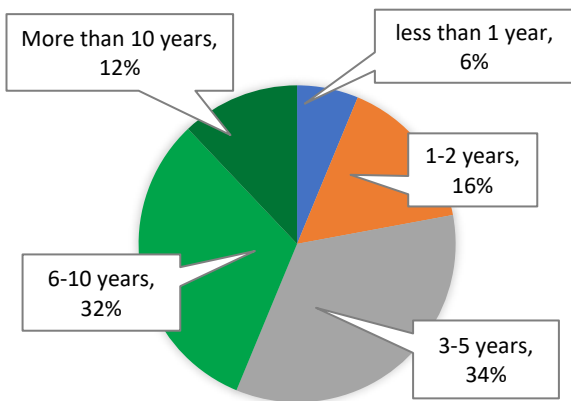
Countries



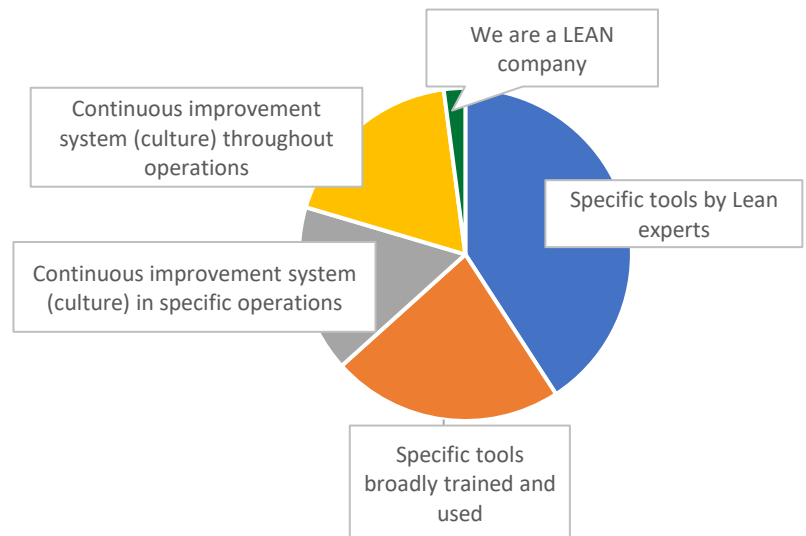
Company Size



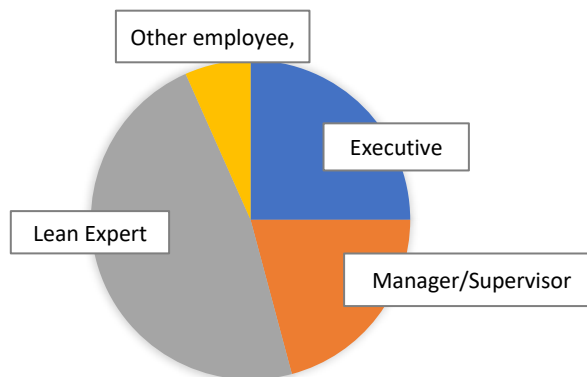
Years of Lean Adoption



Level of Adoption



Organization Roles

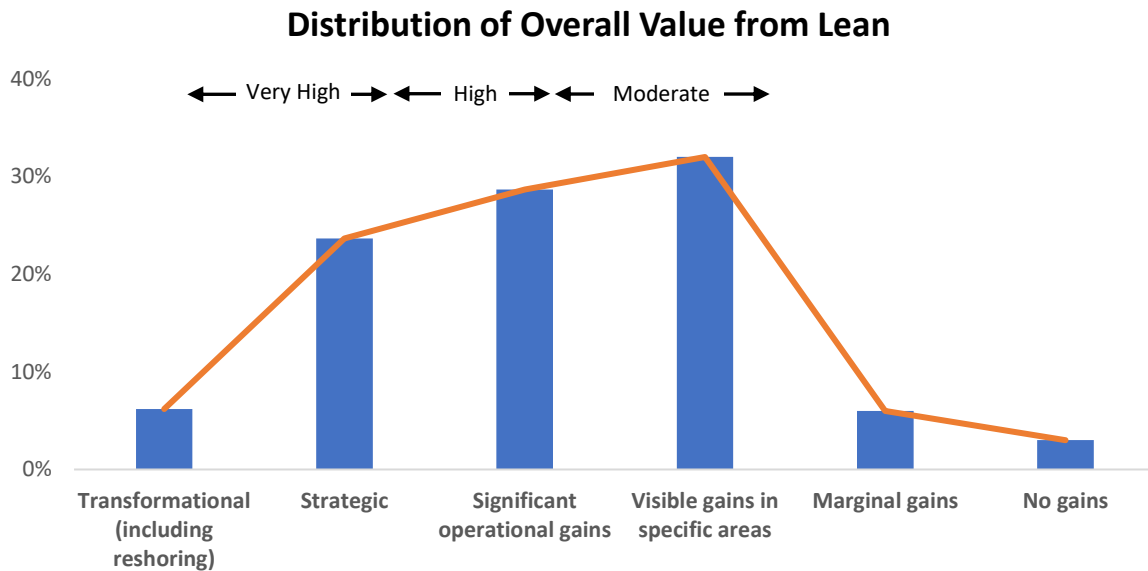


Section 4: Improvement Gains from Lean

We categorized the overall value of Lean to the organization:

1. A transformational impact providing new growth
2. Essential to achieving strategic goals
3. Delivering significant operational gains
4. Delivering gains in specific areas
5. Marginal gains

Note: Companies with more than 1 year experience



KEY TAKEAWAYS

Lean provided Very High value for **30%** of respondents.

Lean provided High value for **29%**

Lean provided Moderate value for **32%**

Lean provided Marginal or No gains for **9%** of respondents

Later in the report we report how various factors influenced the overall gains.

We further categorized both measurable and qualitative and improvements from Lean in 10 operations areas

Quality

Delivery

Cost structure

Order to cash cycle time

Throughput and capacity

Production cycle time

Planned/unplanned downtime

Inventory levels

Employee engagement

Employee turnover

We paired qualitative (Very High – High – Moderate) with measurable gains into 3-tiers. Responses were recorded against the 10 operational areas.

- Tier 1:** Very High gains exceeding 50%
- Tier 2:** High gains between 31-50%
- Tier 3:** Moderate gains between 11-30%

KEY TAKEAWAY

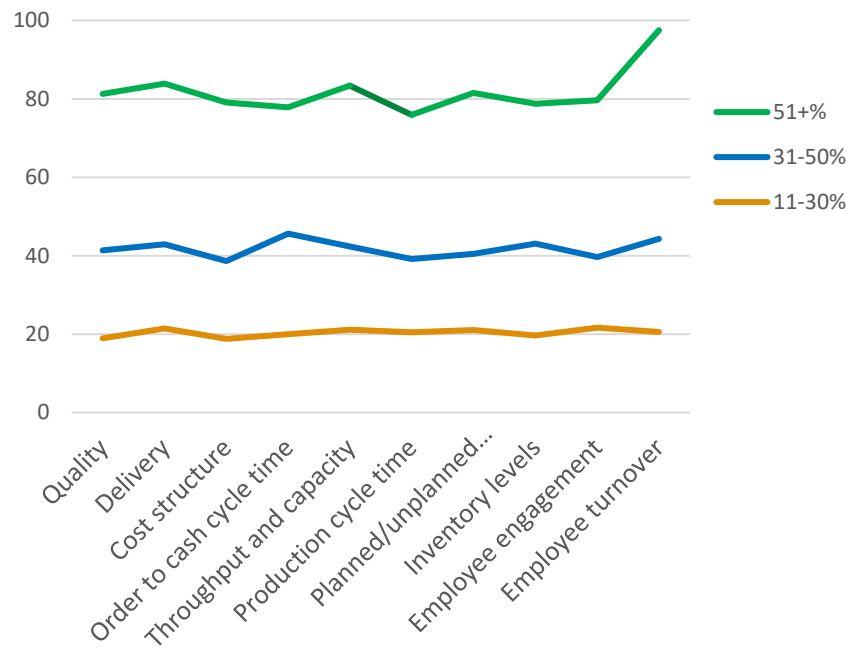
45% of respondents reported measurable gains.

Of those responses:

- 26% were **Very High** gains averaging **80%**
- 38% were **High** averaging **40%**
- 36% were **Moderate** averaging **20%**

These correlate with the Overall Value %

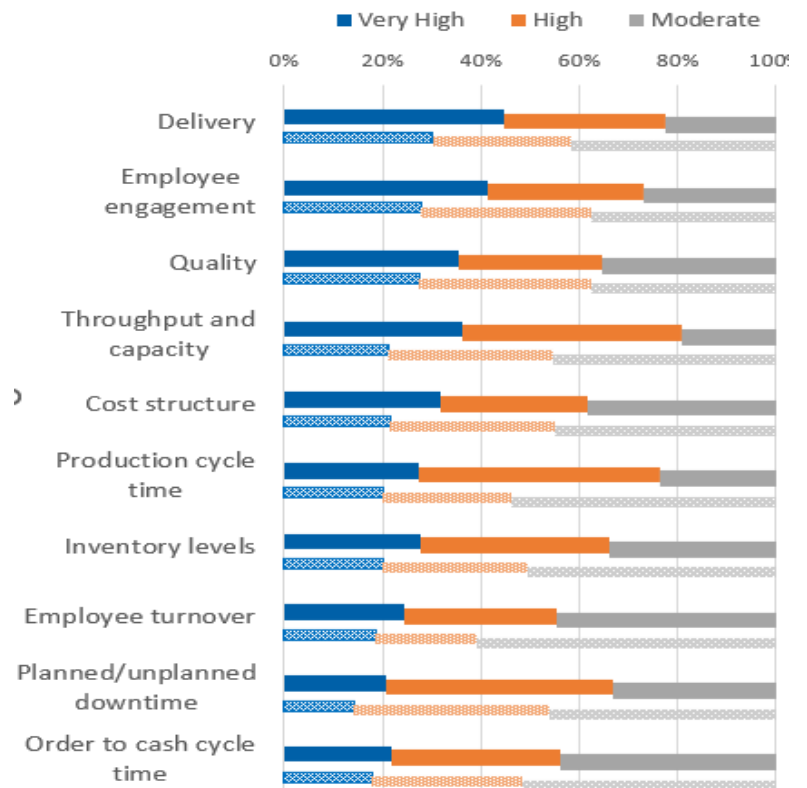
Average Measurable Improvement (3 tiers)



The researchers were curious how executives viewed gains relative to other respondents

First row (solid) ... ratings by executive
 Second row (pattern) ... ratings by all others

Comparing Executive ratings to All Other



KEY TAKEAWAY

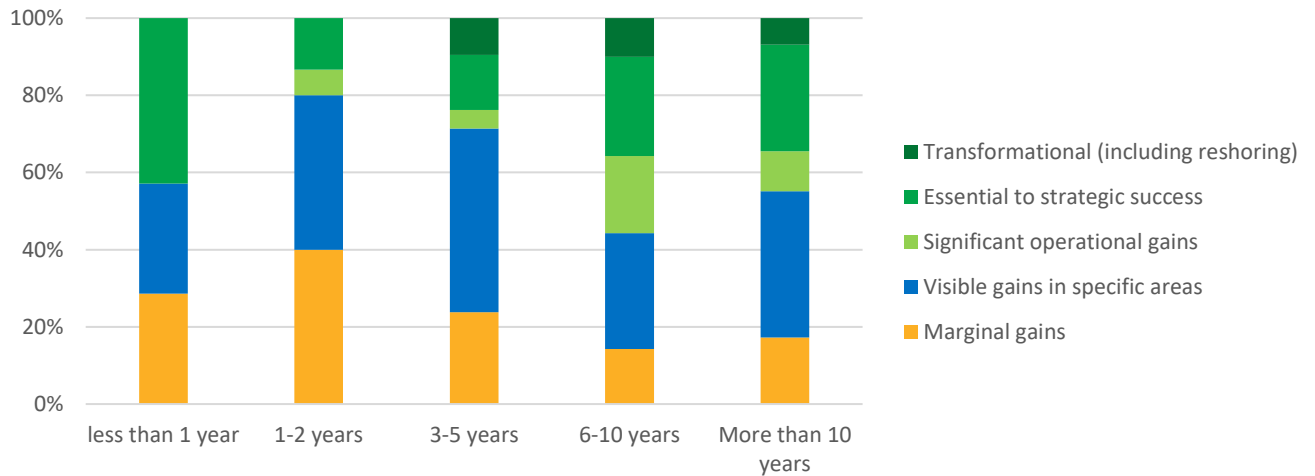
Executives consistently rated improvements higher than managers, experts and other employees.

Section 5: Factors Correlating to the Overall Value of Lean

We analyzed the relationship of various factors to the overall value of Lean.

- Years of Adoption
- Who led the Lean initiative
- Level of adoption
- Success of the first 3-6 months

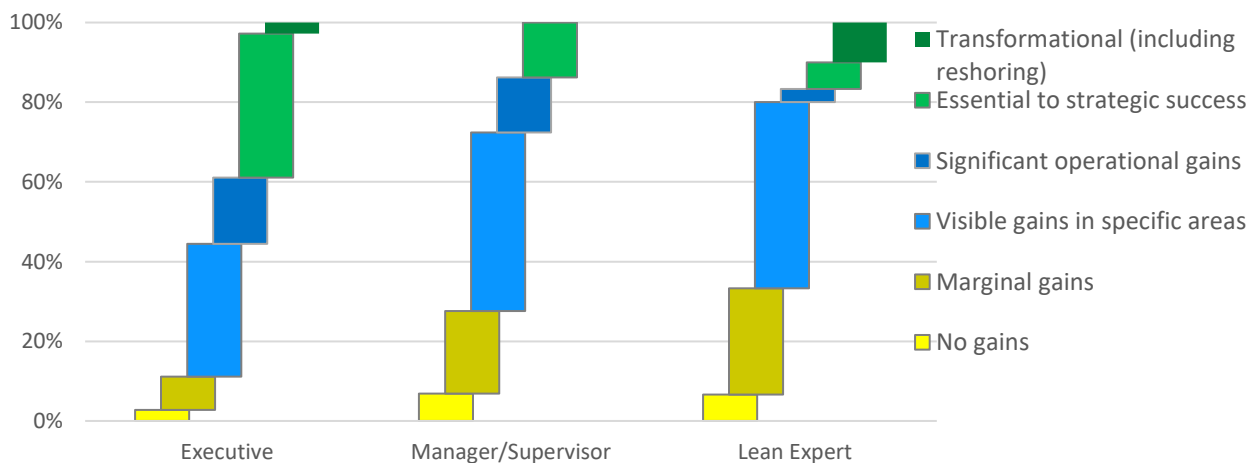
Value increases with Years of Adoption



KEY TAKEAWAY

Visible and significant gains are available early. Achieving marked increases in the transformational and strategic contribution from Lean comes with implementing Lean as a holistic system. This confirms most people's experience.

Value of Lean correlates to Leadership



KEY TAKEAWAY

When an executive leads Lean, it more likely to generate higher gains. This confirms most people's experience.

Success of first 6 months

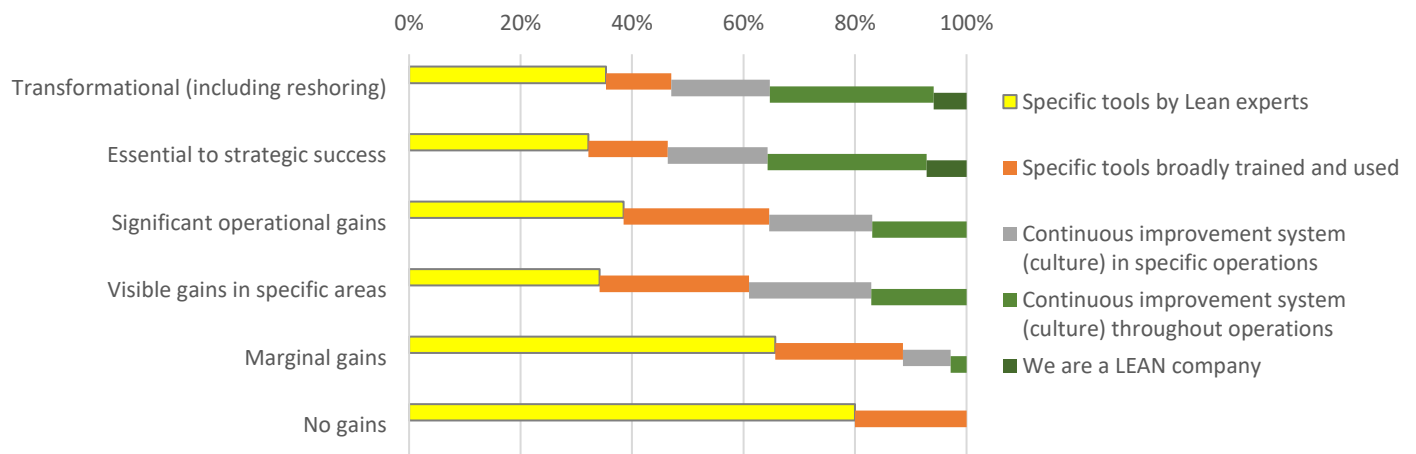
We did not sufficient data to identify any correlation between the success of the first 6 months and the longer term value from Lean.

Maturity Level of Adoption

We established 5 tiers for the maturity level of adoption that reflect organization practices. Lean implemented as:

1. Specific tools facilitated by Lean experts
2. Specific tools broadly used by all levels of the organization
3. A continuous improvement system (culture) in specific operations
4. A continuous improvement system (culture) throughout manufacturing / supply chain
5. A company-wide system (culture)

Value increases with Maturity Level of Adoption

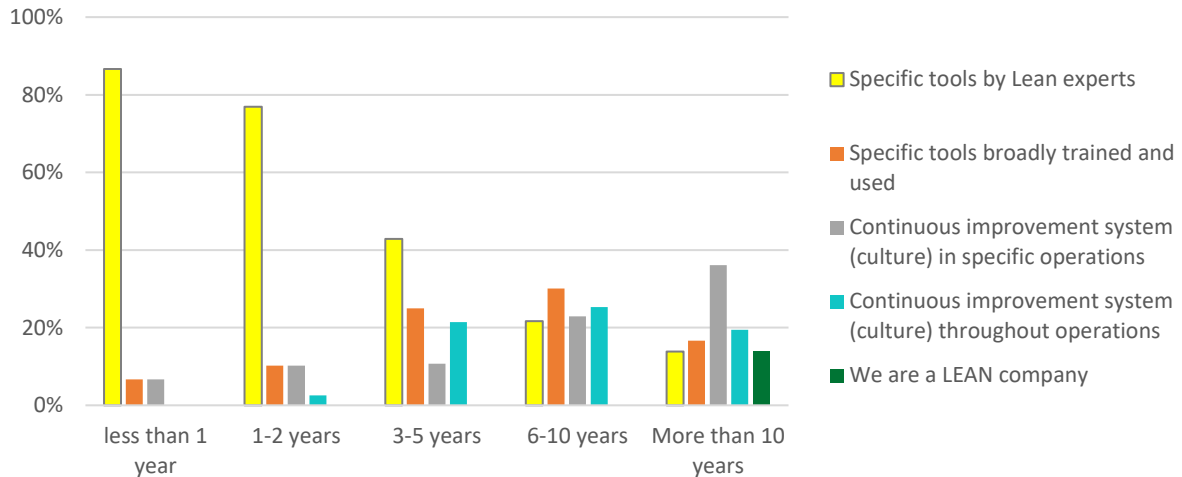


KEY TAKEAWAY

Transformational, strategic and significant gains were more likely when Lean was implemented as a continuous improvement culture.

Subjective comments throughout the questionnaire reinforced the view that it is culture not tools that determine overall value. Where Lean is the domain of specialized experts (e.g. Black Belts) the gains are smaller.

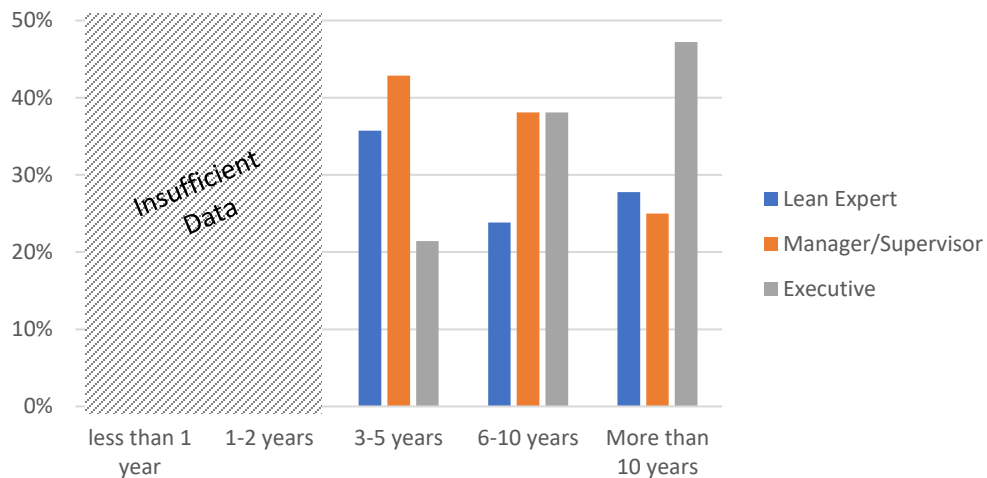
Maturity Level Evolves Over Time



KEY TAKEAWAY

This is a snapshot of company maturity with Lean for different lengths of adoption. We are inferring (??) that this also represents the evolution of an individual company's maturity over time since we haven't tracked that history. With that untested inference in mind, the journey begins with Lean experts and over time becomes more broadly inclusive of employee engagement.

Evolution of Leadership Over Time



KEY TAKEAWAY

Over time executives assume more responsibility from managers for leading the Lean journey. This is consistent with the Maturity Level also increasing over time. Again we are cautious in extrapolating from a snapshot of multiple companies to the evolution of an individual company's leadership.

Intuitively it makes sense that companies on the journey for a long duration would have executive leadership. We don't know the extent of companies that terminated their Lean journey due to the lack of executive leadership.

Section 6: The First Phase of Adoption (4-6 months)

What Executive respondents said about the first phase

48% reported operational gains

- “Significant improvements in safety, quality, delivery and cost
- “Immediate success in satisfying customers
- “Reduced cycle time
- “Reduction in production downtime
- “Hundreds of small improvements
- “Reduced work-in-process
- “Small at first than gradually increased
- “Improved small batch sizes
- “Took about a year but new layout flow
- “Eliminated non-value added work
- “Huge with a few struggles”

35% reported cultural gains

- “First indication that culture trumped tools
- “Change in awareness on waste
- “Increased employee engagement
- “Cleaner work environment
- “Alignment
- “Teamwork and collaboration

17% gains were not reported

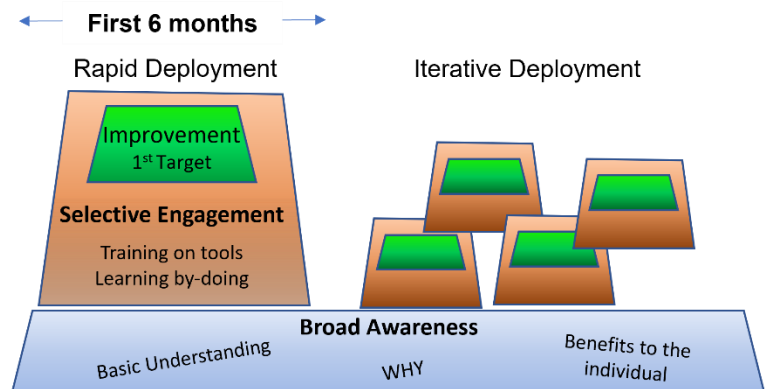
- “Some people just checking the box
- “Improvements have been slow
- “Minor results

Lessons for getting started

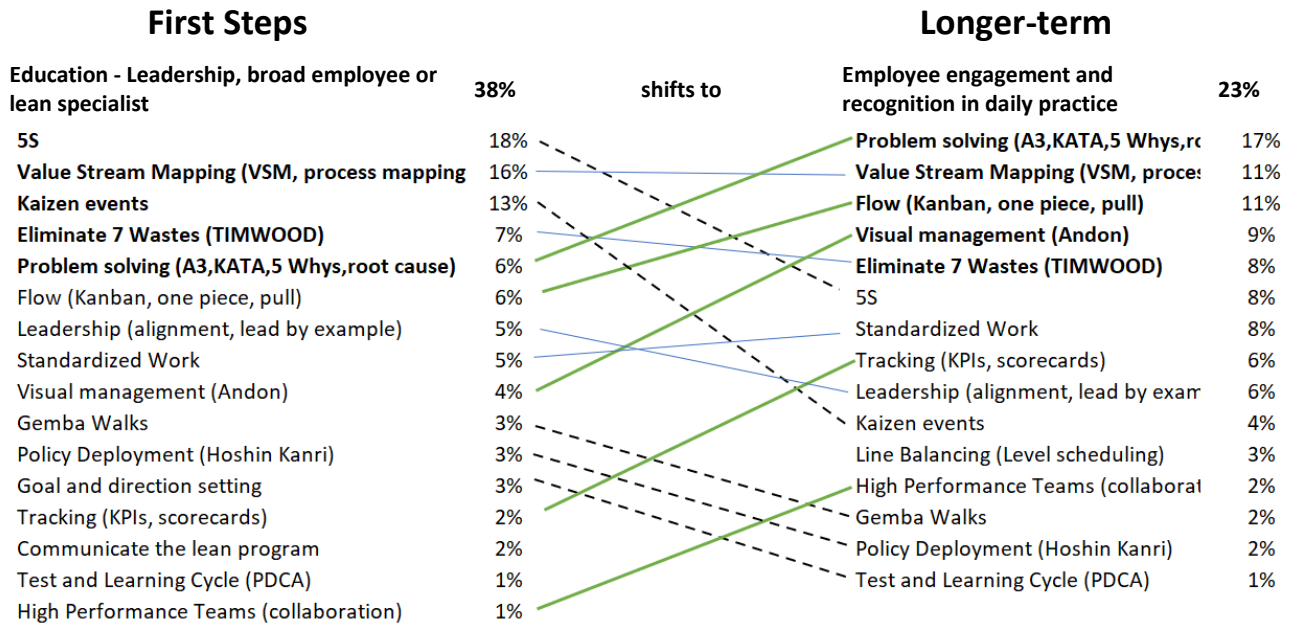
- “Focus on the benefits not the tools.
- “Inch wide, mile deep: solve specific, important problems and then broaden
- “Don’t train on tools not immediately put to use
- “Engagement is learning-by-doing
- “Avoid jargon ... “use terms that work for culture”
- “Use Lean to Jump on problems and engage people as they happen
- “Let the employees learn and develop what they need instead of ‘fed’ by experts
- “Balance continuous improvement in daily life with periodic Kaizen events and projects

KEY TAKEAWAY

1. Start with simple, broad orientation to WHY, WHAT, WIIFM
2. Identify specific improvement targets and areas of operation – select ones highly relevant to executives
3. Mile-deep learn-by-doing engagement
 - Important areas of waste or constraints
 - Recognize and track gains
4. Iterate to the next mile-deep engagement



Section 7: Ways Lean Evolves over Time



KEY TAKEAWAY

Respondents described the first steps and tactics their organization used and separately then described the tactics currently being used. Each response described the prevalent 1-3 tactics at either point in time. These findings should be considered as indicative not conclusive.

Companies should prepare to start with a select number of Lean tools and practices, choosing those most relevant to the target improvements. Over time these will become naturally embedded in the company's way of operating. Targeting new areas of improvement or raising the bar on existing efforts will shift the emphasis to new tools and practices.

It is the culture not the tools. Avoid broad training in the variety of tools which complicates rather than simplifies understanding Lean.

Section 8: What would improve the adoption of Lean

(How we talk about Lean. How we implement Lean)

The question asked: *Are there ways that LEAN is perceived that are limiting its broader adoption in your organization?*

The Top Issues Raised Limiting Lean adoption

#1 Lack of understanding: What Lean is? The WHY? The benefits?	25%
#2 Lack of consistent leadership and management support	22%
#3 Lean is perceived as extra work	17%
#4 Lean is perceived as job elimination	9%
#5 Visible results take too long	5%
#6 Lean is just for the manufacturing floor	12%

KEY TAKEAWAY

The issues raised are not unique to Lean. The source of issues is almost always lack of understanding or a misunderstanding. Most human-centered issues can be resolved in a context of continuous improvement and engagement; issues are surfaced, openly discussed and resolved in a timely manner. This is the daily practice of change management ... It is also core to the principles and practices of Lean.

The Context: These issues relate to more to Change Management than to the specifics of Lean.

The question asked: *How could lean become more broadly adopted in your organization?*

The Top Recommendations

**Phrasing comes from respondents*

Developing executive engagement and support Respondents suggested:

- “Explain the benefits that executives will see in “what’s-in-it-for-me” (WIIFM) terms not in general Lean terms
- “Select problems / outcomes that will engage executives
- “Start with a few new practices for executives which demonstrate support and reinforce the value of Lean (e.g. Gemba walks, attend a Kaizen event debrief)
- “Over communicating WHY we are doing this; explaining the benefits to the various functions and levels of the organization

KEY TAKEAWAY

Any change management will have some executive’s being highly supportive, some with a wait-and-see, some just resisting. Aim to build support over time by addressing an individual’s interests and concerns

When asking for an executive’s support be specific about what new practices you want from them

Directly address limiting factors that will hold-back adoption. Respondents suggested:

- “We are not adding work ... We are eliminating time wasting activities and yes there is some getting started activity
- “We are not eliminating workers ... We are eliminating non-value added work. Employees will be reassigned to value-added or improvement activities.
- “We are not cutting cost ... We are cutting waste
- “Lean takes too long to see results ... show how Lean can focus on significant short-term wins.
- “People resist being changed ... response: “See for yourselves that it is a better way of working”
- “Integrate into business reviews so part of a manager’s life
- “Existing employees familiarize new hires

KEY TAKEAWAY

The source of issues is almost always lack of understanding or a misunderstanding. Most human-centered issues can be resolved in a context of continuous improvement and engagement; issues are surfaced, openly discussed and resolved in a timely manner. This is the daily practice of change management ... It is also core to the principles and practices of Lean.

Structure implementation with a rhythm of continuous improvement.

Use Lean to make life better – to get it right the first time – to fix problems at the source.

Expanding Lean beyond the shop floor

Responses:

- **13%** are implementing Lean broadly throughout the company
- **65%** are implementing in multiple organizational areas

The top areas for Lean outside the manufacturing facility are:

- Customer Service
- Finance and Accounting
- Supply Chain
- Engineering
- Warehousing, Shipping and Logistics

KEY TAKEAWAY

The Lean principles of employee engagement, continuous improvement, eliminating non-value added activities have broad applicability to all organization functions.

Recommendations that did not receive much attention ... rarely mentioned

Employee Recognition

Employee contribution is a cornerstone of Lean. Employee recognition is the open acknowledgment and expressed appreciation for employees' contributions to their organization.

Customer Value Recognition

Customer value in Lean Manufacturing is the process of delivering maximum services and products to customers with minimum cost and effort. The emphasis on results was improvements in operational performance. Respondents did not emphasize the improvements in customer service, quality, on-time delivery.

Policy Deployment (Hoshin-Kanri):

Ensuring that a company's strategic goals drive progress and action at every level within that company. This eliminates the waste that comes from inconsistent direction and poor communication. It aligns the strategy and goals of the company with the plans of middle management and the improvements made by all employees.

Tracking Progress

Only 45% of respondents reported their gains in KPIs. Tracking is the companion to Hoshin-Kanri. When you are aiming to achieve a goal or an improvement, the more that you monitor and record your progress, the greater the likelihood that you will succeed. Tracking is essential to recognizing and building upon what is working and making course adjustments.

Lean Accounting

Traditional accounting uses standard costing, which can lead to inaccurate information for decision makers who put Lean tools and techniques into place. Rather than using a traditional approach, Lean accounting uses a method that categorizes costs by value stream rather than by department.

Section 9: Industry 4.0 Application to Augment Lean

20% reported the use of Industry 4.0 (Digital Tools)

KEY TAKEAWAY

What distinguishes Industry 4.0 is the automatic collection, storage, analysis and display of information.

Many respondents considered PowerPoint, Excel, Dropbox, and their equivalents to be Industry 4.0. While useful, these apps are not considered Industry 4.0.

We should expect that over the next several years Lean tools will become more integrated into Industry 4.0 information and technology platforms.

Industry 4.0
Bar code / QR code scanning
Connected worker
Continuous improvement collaboration
Digital dashboards
Digital Work Instructions
Digital Twin
Equipment monitoring
MEM/MOM systems
Predictive Maintenance
Robotic Process Automation (RPA)
Vision AI

To assist you with research and adoption of Industry 4.0 tools we are providing the names of those companies mentioned in the responses. This is not a comprehensive list or

Specific Digital Products	Description
Dozuki	Digital work instructions
Ignition	No code platform for collecting and graphically displaying data
IntellaQuest	Operations and plant management
iObeya	Dashboards, CI tracking
Kainexus	Dashboards, CI tracking
Minitab	Statistical software
Nintex	Process mapping and improvement tracking
OpCenter	Siemens workflow and production management
Trello	Project / Continuous Improvement management
Tulip	Workflow, standardized instruction, equipment status
UI Path	Robotic Process Automation

Appendix A: Acknowledgements

Organizations and individuals distributing the Lean Questionnaire

GBMP
Lean Six Sigma Institute
Lean Frontiers
OpExChange
Reshoring Initiative
SME
TWI International
Value Stream Solutions
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Contributors to the Reimagine Lean collaborative

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Lean Frontiers
ProgresssivEdge
Shingo Institute
Steve Ebbing
The Ebbing Group
TWI International
Value Stream Solutions
Mark Warren

Appendix B: Industry Reimagined 2030

With thousands of organizations, companies and government actors participating in the ecosystem to revitalize U.S. manufacturing, an honest appraisal would conclude that we have yet to move-the-dial on a comparative level of domestic manufacturing; on manufacturing as a desirable, well-paying career; on education providing the skilled workforce at the scale the U.S. needs; on reducing the environmental footprint.

The non-profit Industry Reimagined 2030 was founded to bring about a sea-change in U.S. industry from a prevailing worldview of 'inevitable decline' to one of 'vibrant opportunity,' We are at an inflection point. A future of vibrant opportunity while possible is not assured. Our action initiatives are:

- **Advocates for transformation:** We have most of the Lego-block pieces to bring about a vibrant future. Transformation is providing what is missing. We are missing a common set of true north objectives; we are missing acting at the needed scale; we are missing unprecedented collaboration throughout the ecosystem of stakeholders corporate, non-profit and government stakeholders.
- **Reimagine Lean:** We are conceiving of an approach that has Lean become holistically adopted by an additional tens or thousands of mainstream manufacturing organizations and contributing to the revitalization of manufacturing competitiveness.
- **Industry 4.0 Ecosystem for SMEs:** Small, medium manufacturers urgently need a better understanding of technological capabilities. Industry 4.0 is creating new and exciting pathways for companies to raise their capabilities and performance. What is missing is reducing the barriers to matching manufacturing needs with available, cost-effective, relevant Industry 4.0 solutions.
- **Reimagine Dialogues:** These are a structured conversation to provide executives with foresight into the disruptive future and to consider how the company needs to adapt. Vibrant opportunities await those companies acting with foresight and preparedness. Distress awaits those companies caught reacting.
- **Holistic SME assessments in collaboration NCATC community colleges:** Manufacturing needs skilled people. People want well-paying, desirable careers. SME assessments are a bridge to introduce students at community colleges to the world of manufacturing. They are fast-track trained to conduct holistic assessments as local manufacturing facilities.

Watch a 13 minute video introduction to Industry Reimagined 2030. [Click](#) Further information is available at IndustryReimagined2030.org