

Designing the Value Stream

Addressing every step of getting a new product, service, or process to market in the development process — including engineering, production, and delivery — enhances business outcomes..

Part five of a series exploring each of the Lean Product and Process Guiding Principles.

Dear Reader,

Thank you for downloading part five of our ebook series, where we explore practical applications of lean product and process development (LPPD) principles and practices. In this issue, we examine how LPPD tools and methods enable you to develop a successful new value stream instead of an isolated product. Our contributors share how taking this value-stream approach to product and process development created significantly more value for their customers and a lasting competitive advantage.



For this edition, our guest contributor is LEI Senior Advisor John Shook, and our Coach's Corner features LEI Senior Coach Katrina Appell, PhD. Our video shares fascinating stories about creating successful value streams from the people leading lean development transformations at TechnipFMC and Pella Corporation.

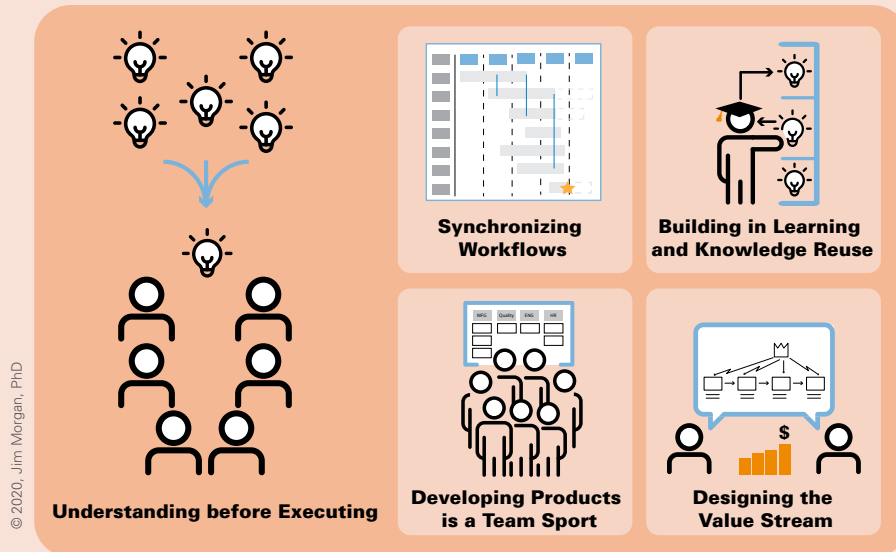
Sincerely,

A handwritten signature in black ink, appearing to read "Jim". The signature is stylized with a large loop at the end.

Jim Morgan, PhD
Senior Advisor, LPPD
Lean Enterprise Institute



Putting People First



Lean Product and Process Development (LPPD) Guiding Principles

- 1. Putting People First:** Organizing your development system and using lean practices to support people to reach their full potential and perform their best sets up your organization to develop great products and services your customers will love.
- 2. Understanding before Executing:** Taking the time to understand your customers and their context while exploring and experimenting to develop knowledge helps you discover better solutions that meet your customers' needs.
- 3. Developing Products Is a Team Sport:** Leveraging a deliberate process and supporting practices to engage team members across the enterprise from initial ideas to delivery ensures that you maximize value creation.
- 4. Synchronizing Workflows:** Organizing and managing the work concurrently to maximize the utility of incomplete yet stable data enables you to achieve flow across the enterprise and reduce time to market.
- 5. Building in Learning and Knowledge reuse:** Creating a development system that encourages rapid learning, reuses existing knowledge, and captures new knowledge to make it easier to use in the future helps you build a long-term competitive advantage.
- 6. Designing the Value Stream:** Making trade-offs and decisions throughout the development cycle through a lens of what best supports the success of the future delivery value stream will improve its operational performance.

The LPPD Guiding Principles provide a holistic framework for effective and efficient product and service development, enabling you to achieve your development goals.



In this 12-minute video overview, you'll hear practitioners briefly describe how the LPPD Guiding Principles helped them improve their product, process, and service development.

Watch the video read the transcript by clicking on the image or at lean.org/LPPD-guiding-principles.



How Designing Value Streams, Not Just Products, Creates Competitive Advantage



By Jim Morgan

As most of us know, a value stream involves all the actions required to deliver value (the product) to your customer. In their seminal work *Learning to See*, which introduced many of us to the concept of a value stream, Mike Rother and John Shook explain: “Taking a value-stream perspective means working on the big picture, not just working on individual processes, and improving the whole, not just optimizing the parts.” By leveraging a value-stream perspective in product development, we can design every one of those steps, not just isolated product attributes — and in so doing, deliver game-changing value to our customers.

Our friend and colleague Al Ward was among the first to talk about this profound insight when he said, “the aim of product development is to create profitable value streams.” Unfortunately for all students of LPPD, Al died in a tragic plane crash in 2004. But he left us with plenty to think about and work on. And as I was to learn, creating a new value stream is a challenging task. It’s more than just moving people from manufacturing or supply chain “upstream” in the development process. It requires a cohesive team and an enabling system to work toward a shared vision of value creation in every step from beginning to end.

I first had the opportunity to put this perspective into practice with an incredibly talented group of people at Ford

Motor Company. We brought engineering, manufacturing, and supply chain together into an aligned team focused on the vehicle body value stream and dramatically improved program outcomes (value creation) and the work experience for team members.

“Taking a value-stream perspective means working on the big picture ...”

— John Shook

Later, when I worked at Rivian, we added logistics to our team with significant benefits to both in-process material movement and last-mile product delivery. Since then, our team at LEI has applied this powerful perspective to clinical processes in healthcare, consumer products, energy technology, and many other environments. Most recently, we have been using this thinking to create environmentally sustainable products and processes with encouraging results. But more about that in a later *Design Brief*.

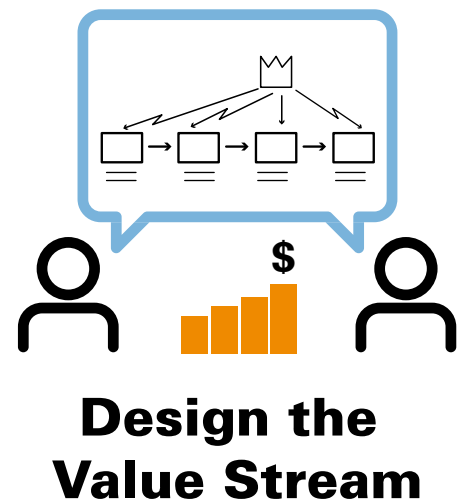
Many of the principles and practices we have shared in other *Design Brief* issues contribute directly to the ability to radically change your development focus from an isolated product to a value stream. For example, deeply understanding your customer and context, treating development as a team sport, and synchronizing workflows enable you to work in this profoundly different way. But it all starts with that value-stream mindset and a commitment to designing each value-creating step required to deliver maximum value to your customer. ■

How Designing Value Streams, Not Just Products, Creates Competitive Advantage

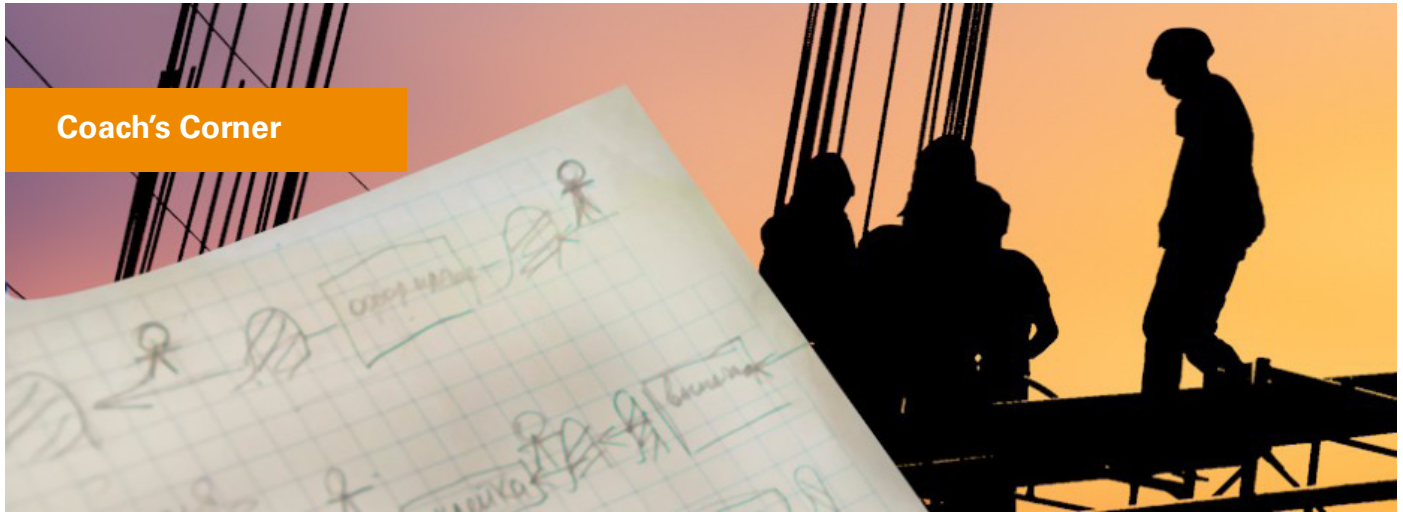


In this month's video, two of our partner companies share their experience creating profitable new value streams.

1. A team from TechnipFMC, an energy technology company, explains how they made a path-breaking product even better by expanding their design horizon to include improving the overall value stream.
2. Pella Corporation's Continuous Improvement Manager Jaime Ogbourne, shares how LPPD-enabled improvements in engineering increased development throughput to the point that it eventually overwhelmed manufacturing. Then he describes how changing to a value-stream approach to their LPPD work in the form of Operational Readiness Levels (ORLs) helped them resolve that problem.



Watch the video or read the transcript by clicking on the image or at lean.org/design-value-stream.



Coach's Corner: Designing the Entire Value Stream from Concept to Product End of Life



By Katrina Appell, PhD

QUESTION: When you talk about the value stream, are you including the product's environmental impacts throughout its life cycle?

Thank you for your question. While most people think of value streams starting and ending on the manufacturing floor, often the biggest opportunities to increase the total value proposition occur through the decisions made in development that impact the entire product life cycle. And yes, that value proposition can include the environmental impacts of designing, making, using, and disposing of the product at the end of its life (reusing, remanufacturing, recycling, or discarding). The systems-thinking approach of lean product and process development (LPPD) is an excellent framework for incorporating environmental considerations into your development process.

There are many benefits to designing to reduce environmental impacts:

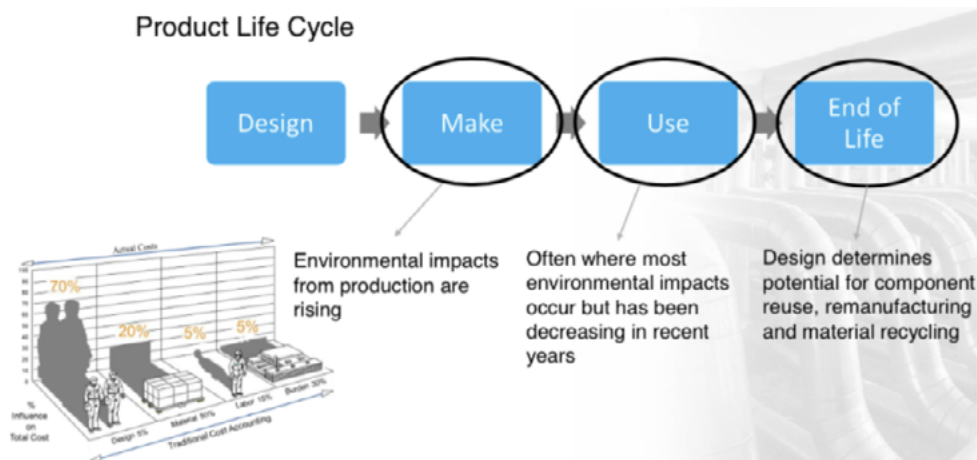
- **Shrink your carbon footprint.** According to the latest report of the Intergovernmental Panel on Climate Change, greenhouse gas emissions must be reduced at least 40% from 2010 levels by 2050 to reduce the worst consequences of climate change.

- **Reduce your production costs.** Improving material and energy utilization are opportunities that lower cost and carbon emissions in the make/production phase.
- **Increase sales.** Environmental impacts are influencing some of your customers' purchasing decisions. Most customers concerned about products' ecological implications focus on their use phase, where approximately two-thirds of emissions are released. However, their attention could shift to the making/production phase, where about one-third of emissions are released, and end-of-life phases in the future.

Enabling people to make better decisions

Product development is a complex process that continues to get more complex with rapid technology development, increasing competition, and customers' growing demand for niche products, including products with lower environmental impact. Often environmental impacts are designed into the product when decisions are made for other reasons without considering the environmental impact. Many LPPD practices are countermeasures to complexity, making it easier for people to make better decisions for the business and the environment through understanding and executing together.

Why an LPPD Value Stream Includes the Environmental Impact of a Product's Entire Life Cycle



Using LPPD guiding principles to design for the environment

Considering the environment when following the LPPD guiding principle of “design the value stream” starts with the LPPD guiding principle “understand before you execute.” Too often, development teams conduct life-cycle analysis to understand a product’s environmental impact after the design is complete. When done this way, the information doesn’t inform the design or, if it does, it leads to an expensive and time-consuming redesign of the product. Instead, developers can use predictive life-cycle analysis to understand before executing to inform the design and set sustainability targets.

Another LPPD guiding principle, “it’s a team sport,” is helpful to keep design team members focused on designing for the environment throughout the project. For example, a concept paper can effectively build cross-functional team alignment on sustainability targets and other product targets. Still, the shared understanding doesn’t stop there.

To effectively execute the development project and design lower environmental impacts into the product, the team needs to understand the interdependencies of their work and the ecological impact of those decisions. Design teams can ensure this alignment using the LPPD guiding principle “synchronize work flows” by creating and using a decision flow or visual schedule and then executing while understanding together through obeya.

The LPPD guiding principle of “build in learning and knowledge reuse” can help people make better environmental decisions. For example, enabling better decision-making can be built into the process by limiting options for material selection to materials with lower environmental impacts. You can also include sustainability principles into design guides enabling designers to consider them during the design process.

These LPPD guiding principles work together, creating a system that enables people to make better decisions in complex environments aligning to the LPPD guiding principle of “people first.” Making it easier for your team members to make better decisions for the business and the environment can create more meaningful work and be part of enabling people to reach their full potential.

Designing your production value stream for the environment

When people think about the environmental impact of the products they use, most think about the implications of their use and their disposal at the end of life. As design improvements continue to reduce emissions during the use phase, the importance of reducing the emissions during production becomes more evident. One-third of emissions come from making products. Designing your value stream to have a lower environmental impact in production could reduce your costs, lower your carbon footprint, and influence future purchasing decisions as consumers become more environmentally conscious. ■

Profitable Operational Value Stream



Create Profitable Value Streams



By John Shook

“The aim of lean product development is the creation of profitable value streams.”

This statement, as simple and straightforward and even obvious as it is, is revolutionary.

We owe the insight to Allen Ward. Al, who passed away tragically in a plane crash in 2004, gave us numerous concepts foundational to lean product and process development (including even the moniker “lean product and process development”). Of them, it’s the principle that product development should aim to create profitable value streams that, more than any other, turns conventional product development entirely on its head. It’s a principle that requires organizations and the people in them to think and work differently.

Building Successful Value Streams

Engineering can do engineering alone. But it can’t do product development alone. Not if we take Al’s definition seriously: Development that creates profitable value streams must seamlessly connect and align each part of the value stream, from idea to delivery. That product development should require enterprise-wide collaboration is a concept

that is neither new nor obscure. It requires no great genius to understand that it is nuts to toss product (or service) designs “over the wall” to an operational organization that is incapable of handling it. The resulting disconnects and turf wars cause unhappy customers, shareholders, and employees. And, ultimately, loss of customers, shareholders, and employees.

Value Stream

All of the actions, both value-creating and nonvalue-creating, required to bring a product from concept to launch (also known as the development value stream) and from order to delivery (also known as the operational value stream). These include actions to process information from the customer and transform the product on its way to the customer.

Yet, organizations still work in the old, siloed way. Even modest-sized organizations that develop low-complexity products still toss development work over the wall to the next silo. And then they measure and reward performance in a piecemeal fashion, all but guaranteeing the whole will be less than the sum of the parts. The result is that broken value streams and failed products (and services) are, if not the norm, the inevitable result unless we exercise superhuman

efforts to pull things together at the last minute. Which good, overworked people often do.

The alternative to pulling rabbits out of hats by merely working harder lies in how development work is conducted and managed. AI prodded companies to give up “scientific management” (cast as a top-down or an engineer-led process) in favor of “management by science,” in which each individual is the scientist conducting science on his or her own work.

AI provocatively argued that “development exists to create operational value streams.” Still, it’s crucial to note that the value-stream concept applies to all organizations, not just those who make products. AI was speaking in a specific context: for-profit commercial enterprise. But tweak the words just a bit, replace “profitable” with “successful,” and the concept can be applied to any thing or activity that is designed or developed. For example, your local fire department need not be profitable (let’s hope profitability is not their aim!). Still, they have objectives to be met (and with prudent stewardship of resources) that require cross-functional alignment and execution. In fact, LPPD principles and practices are being applied to design clinical pathways at one (at least) major academic medical center – Michigan Medicine – where profitability is far from the primary objective. From a lean thinking perspective, any enterprise should have a defined value-driven purpose to which all products, processes, and value streams are directed – purpose, not “profit” necessarily, is the ultimate aim.

Transforming the Enterprise

As enterprises have struggled to adopt lean strategies and practices over the years, we’ve learned that product/service development may be the most leverageable activity for organizations to focus their efforts to transform. Transformations that begin in operations tend to stay in operations. Transformations that start in a corporate bureaucracy die in corporate bureaucracy. Transformational change that originates in any single silo struggles to propagate across the organization. Product development – back to AI’s definition – crosses organizational boundaries.

As an example, Proctor & Gamble Chief Research, Development & Innovation Officer Kathy Fish recognized

Why It’s Essential to Integrate Value-Stream Development with Product / Service Design

The primary goal of LPPD is to create new value for customers, but equally important is to design profitable value streams for the enterprise. While product development drives top-line growth by providing new products and services customers need, as the “shadow chart” above shows, it also determines 70% of the ongoing costs of the entire business – from engineering and manufacturing to marketing and distribution – dramatically impacting the bottom line. So, to meet both goals, organizations must concurrently design each value-creating step within each function to deliver on the new product’s or service’s total value proposition.

By designing-in quality upfront, an organization can more effectively and efficiently design-in those critical product attributes valued by customers. And by leveraging a value-stream perspective in product development, it can design-out product and process costs. And in so doing, they’ll deliver exceptional value to their customers and a profitable value stream for their business.

Applying lean-thinking upfront by designing the product or service and the value stream together, LPPD strives to design out the waste during development versus using kaizen to drive it out later.

that P&G had a healthy culture and was great at execution, but fear of failure while working inside comfortable silos prevented the company from innovating as rapidly and consistently as needed.¹ So, Kathy came up with a new value proposition: Provide irresistibly superior customer experiences that required the organization to stop working in silos.

Kathy decided to introduce P&G to lean innovation, with experimentation happening all the time, necessitating a crucial change in mindset: fall in love with the problem, not the solution. Unable to simply tell the business unit leaders what to do, Kathy did what she could do within her control while reaching out broadly to the organization to encourage leaders to join voluntarily. She embraced lean

management concepts and practices such as focusing on the problem, asking questions that chipped away at the culture of fear, encouraging experimentation, leading through influence, breaking down silos, and embracing innovation in product development as a full team activity.

AI's concepts echo throughout the Harvard researchers' analysis of lean innovation at P&G¹.

Moving from Disruption to Normal

The role of product development in enabling constructive yet disruptive change with stability was an essential underpinning of the most famous lean transformation: the New United Motor Manufacturing, Inc. (NUMMI) in Fremont, California. The famous part of that transformation story takes place on the factory floor, where the worst-performing workforce and factory in the entire GM/UAW system became the best — and equal to the Toyota benchmark — in only one year. Factory operational and management practices led to a dramatic turnaround in performance and culture. The same workers who had sabotaged quality and failed even to come to work one day out of five embraced a radically different way of working together as a team to produce Toyota-level quality and almost Toyota levels of productivity.

But, unseen to drive-by observers was teamwork at higher organizational levels that laid the groundwork for stable, trusting work relationships and gave the factory a product that was easy to build productively and with high levels of quality. Compared to products built when GM ran the plant, the NUMMI-produced Chevrolet Nova, a rebadged Toyota Corolla, practically snapped together. Needed parts were always where they were needed when line workers required them. Equipment worked as designed. Previously, GM Fremont had to produce 116 body styles with dozens of powertrain combinations and an unlimited options list. NUMMI produced one body style with six option packages when it shipped its first products in 1985.

As it turned out, that Chevy Nova didn't sell well. The value stream wasn't profitable. Customers simply didn't buy the

product. Ouch. Traditionally, GM would've shuttered the program. Instead, Toyota began introducing a series of new products to the plant, steadily increasing the complexity NUMMI was tasked to handle as it gained capability.

Flash forward from Fremont, California, circa 1985, to Normal, Illinois, today. There, Rivian Automotive (full disclosure, I have a relationship with the company) is gearing up to ship its first vehicles to customers later this month, an electric pickup truck that is, in many respects, the most capable vehicle ever offered. The pickup can accelerate from 0 to 60 in 3.0 seconds (faster than a new Ferrari Portofino), crawl over rocks with an 11-inch ground clearance (more than a new Jeep Wrangler), handle on the track like a quattro-equipped Audi, all with the ride comfort of a Lexus luxury sedan, except even quieter. Incredible. Following a recent test drive on the track and off-road, I can personally attest to the remarkable performance of the vehicle — but a remarkable product does not necessarily equate to a profitable value stream.

Proof of success for Rivian, as for each of the many new auto companies, will come not just from amazing product design. For the companies to be successful, their value streams must be successful (profitable). That means that the value stream's product and processes are developed concurrently to address customer needs; components are developed and sourced in partnership with capable suppliers and delivered as needed; and sales and service operations enhance the overall customer experience. We can all observe together whether Rivian — or any other startup in the auto and other industries — leverages management by science and creates successful, profitable value streams.

Innovating at the Value-Stream Level

“The aim of product development is the creation of profitable (successful) value streams.” Is Rivian's? Time will tell. Is yours? You can tell. But don't wait to learn about it from your next P&L statement. Instead, take a look at your development process with a total value-stream perspective. ■

¹ Truelove, Emily, Hill, Linda A., and Tedards, Emily. July 2020. “Proctor & Gamble: Navigating Industry Disruption by Disrupting from Within.” Cambridge, MA: Harvard Business Review

Faculty Highlight



Katrina Appell, PhD

Senior Coach
Lean Product and Process Development
Lean Enterprise Institute

President
Katrina Appell Consulting

With over 15 years of coaching, facilitating, training, and team development experience, Katrina is passionate about supporting organizations in lean transformation. She has coached lean principles and practices at many companies in various industries, including Caterpillar, Michigan Medicine, Pella Windows & Doors, TechnipFMC, US Synthetic, and Whirlpool. At LEI, Katrina codeveloped and is an instructor of LEI's Designing the Future Remotely: A Lean Product & Process Development Immersive Learning Experience.

In addition to coaching, Katrina has collaborated with Dan Cooper, PhD, to research how LPPD can enable reducing greenhouse gas emissions and other ecological concerns across a product's entire lifecycle.

Katrina holds a master's and a doctoral degree in industrial and operations engineering from the University of Michigan at Ann Arbor and a Bachelor of Science in General Engineering from the University of Illinois at Urbana-Champaign.



John Drogosz, PhD

Senior Coach and Chief Engineer
Lean Product and Process Development
Lean Enterprise Institute

Vice President
Liker Lean Advisors

John has over 25 years of experience applying lean principles and practices in manufacturing, product development, and services. As a coach, he has led lean transformations in numerous companies and industries, including Northrop Grumman, Johnson Controls, Harley-Davidson, Embraer, and Caterpillar.

As LEI's chief engineer, lean product and process development, John leads the development of learning experiences that enhance design professionals' lean development knowledge and capabilities while advancing the discipline's body of knowledge. He codeveloped and is an instructor of LEI's Designing the Future Remotely: A Lean Product & Process Development Immersive Learning Experience.

Additionally, John teaches classes in lean product and process development for the College of Engineering at the University of Michigan. He has contributed to several books and articles, including *The Toyota Product Development System* (2006) and *The Toyota Way to Continuous Improvement* (2011).



Eric Ethington

Senior Coach and Chief Engineer
Lean Product and Process Development
Lean Enterprise Institute

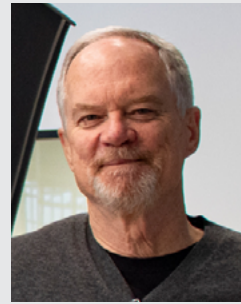
President
Lean Shift Consulting

Eric is a recognized expert in process development and problem-solving methodologies with over 30 years of industry experience in frontline-through-executive leadership roles at Delphi and Textron and 12 years of consulting practice. His experience in applying lean includes most types of industries and functional areas, including organizations as varied as Medtronic, Michigan Medicine, Coca-Cola Enterprises, and Goodwill.

As LEI's chief engineer, process and product development, Eric leads the development of learning experiences that enhance design professionals' lean development knowledge and capabilities while advancing the discipline's body of knowledge.

Eric holds a Bachelor of Science in Industrial Engineering from General Motors Institute (now Kettering University), a Master of Business Administration from the University of Michigan-Flint, and a six-sigma black belt in design.

Additionally, he is the coauthor of *The Power of Process*, a Story of Innovative Lean Process Development (2022).



Jim Morgan, PhD

Senior Advisor
Lean Enterprise Institute

President, EMC Network

Jim is recognized globally for his expertise in product and process development. His know-how comes from a unique combination of industry experience as a senior executive and rigorous scholarship. His most recent industry role was as the chief operating officer for Rivian, an electric vehicle manufacturer, during a critical transition period. Before that, he was global director of Body and SBU Engineering and Tooling Operations during Ford's historic, product-led revitalization under then-CEO Alan Mulally. Before joining Ford, Jim served as vice president of operations at TDM, a tier-one global automotive supplier, during a period of rapid growth.

In addition to his nearly 40 years of industry experience, Jim has authored or coauthored two books — the award-winning *The Toyota Product Development System* (2006) and *Designing the Future* (2018) — three book chapters, and numerous articles.

LEI's Co-Learning Partner Program is for leaders looking to transform their enterprise and contribute to the lean thinking and practice body of knowledge. You and your team will closely partner with LEI Coaches in a journey of discovery that will take your organization to the next level.

Become a [Co-Learning Partner](#)

Partner with the Lean Enterprise Institute (LEI) to accelerate your lean journey and jointly conduct experiments on the best way to advance your lean transformation. As one of a select group of companies, you'll work closely with LEI thought leaders, such as John Shook, Jim Morgan, and other top-flight LEI Coaches and subject-matter experts.

Within the partnership, LEI Coaches will guide you as you design and evaluate the experiments that will help you discover the best lean approach to address a business problem or achieve breakthrough performance. We don't come in with a cookie-cutter solution. Instead, LEI Coaches bring their decades of lean thinking, practice, and coaching to bear on the business issues you need to address and guide you through discovering — for your organization and in the specific situation — how to resolve it.

By offering targeted, immersive experiences that demonstrate the value of addressing all five dimensions of the Lean Transformation Framework, LEI Coaches ensure you and your team gain an in-depth understanding through crucial guided practice.

Join a Learning Group

LEI's most advanced partners — those who have reached the highest levels of lean thinking and practice — are invited to participate in an LEI facilitated learning group. Open only to those who have and are willing to share advanced lean thinking and practices, this learning opportunity allows organizations and their teams to learn from one another. While participants in the learning groups collectively direct the learning, LEI Coaches facilitate the meetings three to four times per year and share related learning materials.

The meetings are held on-site at a learning group company or in virtual gatherings. The learning groups are organized around a specific LT&P discipline, industry, business function, and the like.

The longest-running Learning Group is focused on Lean Product and Process Development (LPPD), bringing together partner companies interested in transforming their product, process, and service development systems. Much of this Learning Group's learning was captured in Jim Morgan's and Jeff Liker's *Designing the Future*, which LEI co-published with McGraw Hill in 2019. Who knows, maybe your lean transformation story will become part of an upcoming book published by LEI.

Companies we've partnered with



Herman Miller





About The Lean Enterprise Institute

The Lean Enterprise Institute, Inc., was founded in 1997 by management expert James P. Womack, PhD, as a nonprofit research, education, publishing, and conferencing company. As part of its mission to advance lean thinking around the world, LEI supports the Lean Global Network (leanglobal.org), the Lean Education Academic Network (teachinglean.org), and the Healthcare Value Network (healthcarevalueleaders.org).

Continue Your Learning

The Lean Enterprise Institute (LEI) offers a wide range of learning resources, all with the practical knowledge you need to sustain a lean transformation:

Learning Materials

Our plain-language books, workbooks, leadership guides, and training materials reflect the essence of lean thinking — doing. They draw on years of research and real-world experiences from lean transformations in manufacturing and service organizations to provide tools that you can put to work immediately.

Education

Faculty members with extensive implementation experience teach you actual applications with the case studies, worksheets, formulas, and methodologies you need for implementation. Select from courses that address technical topics, culture change, coaching, senior management's roles, and much more.

Events

Every March, the Lean Summit explores the latest lean concepts and case studies, presented by executives and implementers. Other events focus on an issue or industry, such as starting a lean transformation or implementing lean in healthcare. Check lean.org for details and to get first notice of these limited-attendance events.

lean.org

A quick and secure sign-up delivers these online learning resources:

- Thought-leading content delivered monthly to your inbox.
- First notice about LEI events, webinars, and new learning materials.