Lean and Information Technology Toolkit

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Executive Summary

Environmental agencies across the United States are finding better, faster, and more efficient ways to address environmental management challenges. Lean and information technology (IT) are two important ways that environmental agencies are transforming how they protect human health and the environment. **Lean** is an improvement approach and set of methods that eliminate non-value added activity or "waste." New IT approaches can help agencies to streamline, modernize, and expand the services they provide to customers. This **Lean and IT Toolkit** explores how Lean and IT can be used to accomplish the following:

- Efficiently design new products and services to better meet customer needs (Lean Startup)

- Improve the efficiency and effectiveness of existing processes (Lean process improvement)

- Reduce the costs and risks of developing new IT products (Agile development)

This Toolkit provides how-to guidance, resources, and tips for making improvements in each of these applications of Lean and IT (product conceptualization, process improvement, and IT product development), as well as describes how agencies can collaborate effectively on improvement projects.

Lean and IT Project Results

- **Wisconsin Department of Natural Resources** used Lean thinking and process mapping to streamline the permit application process for the Water Program, cutting the time for general and individual permit reviews by about 50%. The agency then developed an e-permitting system to further enhance permit response time and provide better information to regulated entities.

- **Massachusetts Department of Environmental Protection** is developing an enterprise-wide data management system to support permitting, compliance, and enforcement operations. MassDEP used Lean thinking to document current practices, identify opportunities to streamline, and simplify processes in anticipation of constructing an e-permitting module. This process resulted in categorizing over 300 permits into eight permit "families" to support the e-permitting system.

- **EPA Region 1** employed Lean and IT strategies to reduce the time to complete lab-purchasing orders by 60%, eliminate 40% of the steps in the process, institute an automatic reordering process when supplies are low, and develop a new electronic form and record-keeping system. The agency is also instituting a SharePoint workflow tracking system to support the new process.

- **EPA Region 7** improved the quality and timeliness of the concentrated animal feeding operation (CAFO) inspection process through Lean and IT improvements. This included reducing the time to complete CAFO inspections by 25% when sampling was required and by 40% when no sampling was needed, enabling online coordination of electronic draft reports with a new SharePoint site, and developing a spreadsheet to track key performance indicators and timelines for inspections.

This Toolkit contains case studies of each of these projects.

Benefits of Lean and IT for Environmental Agencies

Environmental agencies have used Lean to speed process times, eliminate backlogs, improve product quality, provide more value to customers, and free staff time to work on other activities. IT solutions amplify these gains by automating streamlined processes, incorporating automated error checks to improve quality, enhancing the ability to share data across organizations, and providing better information for decision-makers. Lean Startup and Agile methods also allow agencies to design and develop new products and IT solutions to meet customer needs while minimizing the risks and costs of product development.

Lean Startup: Design or Redesign Products or Services

Lean Startup, first conceptualized by Eric Ries, is the use of Lean concepts to determine what products or services to develop to meet customer needs in conditions of high uncertainty. The Lean Startup approach minimizes the time and costs of product development through the following, iterative process:

- Identify ways to deliver value to customers through new or redesigned products or services

- Develop minimum viable products – components of a new approach that can be tested in the real world

- Learn from how customers engage with the minimum viable products, and adapt plans for the product or service based on user data

Environmental agencies could consider using the Lean Startup approach when there is a need for new or fundamentally redesigned products or services to meet customer needs and when there is little known about what would be most useful to customers.

Lean Process Improvement: Reduce Waste to Optimize Existing Processes

For existing processes, Lean and IT can work together to increase efficiency and enhance effectiveness. Key principles for combining Lean and IT to support process-improvement projects include the following:

- **Involve IT personnel in all stages of process-improvement projects**, at least on a consulting basis, to help plan projects, identify IT strategies that could address process problems, and, where applicable, develop and implement IT changes in the context of other process changes.

- **Use creativity before capital to solve problems;** maximize improvements you can make to your process with simple, cheap changes, and then consider whether to invest more resources to deliver additional performance benefits.

- **Streamline processes before automating them**; otherwise, there is the possibility of locking in or exacerbating errors and inefficiency in the process.

> **Tips for Multi-Agency Collaboration on Lean and IT Improvement Projects**
>
> - Coordinate with agencies early on
>
> - Limit the size of Lean project teams
>
> - Establish lines of accountability at different agencies
>
> - Be flexible and consider agency differences when designing solutions and planning implementation

- **Closely coordinate implementation of IT and other changes**, tracking the status of action items, identifying and addressing issues early on, evaluating process performance, and recalibrating efforts when necessary.

This Toolkit outlines how-to steps, tips, and resources for planning and executing Lean and IT process-improvement projects based on these key principles.

Agile Development: Use an Iterative Process to Develop IT Solutions More Efficiently

Unlike traditional, linear "waterfall" methods for software development, Agile uses a streamlined, iterative process for developing IT solutions to meet customer needs. Agile development relies on the following:

- Short, team-based "sprints" of activity to develop components of technology

- Frequent collection of customer feedback on technology components during the development process (rather than waiting until the full product is developed)

- Adapting the technology requirements and plans based on feedback

By iterating development and collecting user feedback early on, Agile teams are better able to focus their efforts on what matters most for the users. Agile offers a powerful new way for environmental agencies to develop IT solutions using less time and resources. Agile is often used in Lean Startup to help develop minimum viable products when there is less certainty around what IT product is needed.

Lean and IT Going Forward

This Toolkit complements a series of Lean resources available from EPA and other agencies, including EPA's Lean in Government Starter Kit. Taken together, these documents can help environmental agencies in their efforts to operate more efficiently and effectively to protect human health and the environment. The practice of using Lean methods with technology solutions to improve agency programs and processes is relatively new. We envision this Toolkit to be a living document that can be updated over time to reflect best practices, resources, and examples that emerge as environmental agencies use these techniques to achieve the next level of improved environmental performance, customer service, and efficiency.

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Chapter 1: Introduction

Background and Purpose of This Toolkit

This Toolkit was developed as part of **E-Enterprise for the Environment** initiative (see box) to help environmental agencies integrate Lean with new information technology (IT) approaches that streamline, modernize, and expand the services they provide to customers. **Lean** is an improvement approach and set of methods that can dramatically enhance the speed, quality, and transparency of processes by eliminating non-value added activity or "waste," thereby focusing efforts on high-value outcomes.

This Toolkit provides best practices, guidance, and resources that can help your agency integrate IT improvements while improving the efficiency and effectiveness of programs and processes. It is designed to help your agency understand how to accomplish the following:

- Use appropriate Lean tools to find better ways to deliver value to customers and make efficient IT investments.

- Streamline the development of IT solutions.

- Identify and plan Lean and IT improvements to address problems in your processes.

- Implement process-improvement approaches effectively.

E-Enterprise for the Environment (E-Enterprise)

Launched in 2014, E-Enterprise is a new model for collaborative leadership among environmental co-regulators and affected parties to achieve positive environmental, human health, and economic outcomes. The E-Enterprise Initiative is streamlining and modernizing the implementation of our environmental programs.

With E-Enterprise, environmental agencies have the opportunity to learn from each other, apply Lean and IT at an agency and cross-agency level, and access shared technology resources.

Lean is not the only approach for quality and productivity improvements, but many environmental agencies have found success with it. The Toolkit highlights the following methods:

- **Lean Startup:** A rapid, efficient approach to determining what new products or services to develop that meet customer needs

- **Lean Process Improvement:** Structured methods for eliminating non-value added activity, including delays, errors, and other inefficiencies, from work processes, thereby delivering more value to customers

- **Agile or Lean Software Development**: Techniques and tools that allow IT staff to work in an iterative, streamlined fashion to develop a technology solution for an identified customer need

These three Lean approaches are appropriate for solving different kinds of problems, as shown in Figure 1. For those with high

uncertainty and/or before a process is in place, Lean Startup can be used. For existing processes that need to be improved, agencies can use traditional Lean thinking and methods to reduce wastes and provide more value to customers. When an IT need is more certain, Agile helps integrate Lean thinking into the IT development process. This high-level conceptualization provides guidance when each of these methodologies may be used, but in practice, these methods are often combined with each other.

Figure 1: Toolkit Framework

This Toolkit is intended to complement existing resources describing the use of Lean by environmental agencies, including EPA's Lean in Government Starter Kit. This Toolkit expands upon those resources by providing how-to guidance and resources for how environmental agencies can combine Lean with IT, as well as collaborate effectively, to improve agency programs and processes. This Toolkit assumes basic familiarity with Lean concepts, but additional information and resources on Lean can be found in Appendices A and B.

Benefits of Lean and IT for Environmental Agencies

Integrating IT strategies with Lean improvements accelerates and expands their impact. When applied to streamlined processes, IT is even more effective at helping agencies optimize performance and share information internally and with stakeholders and the public. The use of Lean techniques can improve enterprise technology development and operation by increasing the speed and quality of development and by providing resource efficiency at the agency level. Lean includes talking to customers, listening to concerns, and delivering products and services to meet customer needs identified for business processes. Lean does this through collaborative, team-based activities that have the following characteristics:

> *"The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency."*
> – Bill Gates

- Focus prioritization and action in tight periods

- Rely on data about how processes actually work

- Emphasize high-impact, simple solutions over expensive, time-consuming process changes

IT capabilities such as mobile data collection, shared files, and auto-error checking in forms, among others, can enhance and further streamline business processes. Through techniques such as Agile development, Lean can also increase the efficiency of and collaboration on IT development while mitigating overall risk and maximizing the efficiency of resources. Techniques like Lean Startup help mitigate uncertainty in complex IT projects and provide a method for quickly starting on key aspects of a project without diving head first into full product development.

Many environmental agencies have used Lean successfully to produce significant results for IT projects. These Lean projects have helped agencies to speed process times, free staff time,

Benefits of Lean and IT

Agencies using Lean and IT can expect to see one or more of these benefits:
- Eliminate or dramatically reduce backlogs
- Reduce lead times by more than 50 percent
- Decrease the complexity of processes and eliminate unneeded process steps
- Improve the quality and consistency of work products and activities
- Allocate more staff time to "mission critical" work
- Improve staff morale
- Enhance process transparency to internal and external audiences

eliminate unnecessary process steps, and improve quality of products, as well as improved IT services. Agencies like the Government Services Administration (GSA) are starting to build guidelines for technology development using Lean principles as well. Appendix C of this Toolkit contains case studies describing the experiences, results, and lessons learned from Lean and IT projects at the following agencies:

- Massachusetts Department of Environmental Protection

- Wisconsin Department of Natural Resources

- EPA Region 1

- EPA Region 7

Toolkit Organization

This Toolkit is appropriate for both Lean practitioners who are looking for guidance on how to use Lean to improve processes that may have an IT component and agency personnel who have identified a need for a technology solution to address a particular problem. For the latter, Lean tools can provide a roadmap to ensure the most efficient and effective deployment of technology solutions. The remainder of this toolkit is organized around the following questions:

- **Chapter 2: What is Lean Startup**?
    o This chapter introduces Lean Startup and potential applications for designing new products, including IT projects, at environmental agencies.

- **Chapters 3, 4 and 5: How do I plan for, conduct, and implement Lean and IT solutions to solve problems in my process?**
    o These chapters provide specific guidance for each phase of the process-improvement projects from planning, conducting Lean projects, implementing process changes, and follow-up. A particular emphasis is placed on when and how to coordinate and integrate IT solutions within Lean methods such as "kaizen" rapid process improvement events.

- **Chapter 6: What is Agile?**
    o This chapter provides an overview of Agile methodology and its application for IT development. This chapter is particularly valuable for IT departments and staff seeking faster, cheaper, and less risky ways to develop IT solutions.

- **Chapter 7: What are the best practices for collaborating on Lean and IT improvement projects with multiple agencies?**
    o The information in this chapter highlights key lessons learned and tips based on experience gathered from Lean and IT improvement projects involving multiple agencies.

- **Appendix A (Background on Lean): What is Lean?**
    o Appendix A contains more information on Lean and key Lean methods.

- **Appendix B (Resources): How can I learn more?**
    o Appendix B contains a compilation of resources for learning more about Lean government, E-Enterprise, Lean Startup, and Agile development.

- **Appendix C (Case Studies): How have environmental agencies used Lean and IT solutions to improve their processes?**
    o Appendix C contains case studies of EPA and state Lean and IT process-improvement projects. The case studies describe the project activities and the results they achieved.

- **Appendix D (Lean Charter Template)**
    o Appendix D contains a Lean charter template that may be used to clarify and promote understanding of the scope, goals, and expectations for Lean process-improvement projects.

- **Appendix E (Lean Implementation Plan Template)**
    o Appendix E contains a template and an example of a Lean project implementation plan that may be used to identify and track action items from process-improvement projects.

Chapter 2: Lean Startup

In this chapter, we discuss a powerful new application of Lean called Lean Startup, which can allow agencies to determine what new products or services (including IT solutions) to develop to meet customer needs while minimizing the costs and risks of new product development. Lean Startup can complement strategies for improving existing processes with Lean and IT (chapters 3-5) and/or developing defined IT solutions (chapter 6).

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IN THIS CHAPTER

1. What Is Lean Startup?
2. How Does Lean Startup Differ from Lean Process-Improvement Methods?
3. What Is a "Minimum Viable Product"?
4. Why Is Lean Startup useful for Projects with Highly Uncertain Outcomes?

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What Is Lean Startup?

Lean Startup is a methodology developed by Eric Ries that guides new projects through the discovery and creation process quickly while taking advantage of innovation that is often lost in project management.[1] It pulls from Lean methodology and includes an emphasis to "work smarter not harder," while increasing the overall speed at which products are developed.

Lean Startup focuses on a cultural shift in management techniques from a linear to a cyclical approach. Within environmental agencies, the idea of a "startup" can be applied to situations where processes need a major overhaul, or new technologies or products are needed. Using this framework can help agencies break out of typical product-development lifecycles that rely on drawn-out requirements-gathering processes.

The principles of Lean Startup, adapted from Eric Ries, include the following:

- **Entrepreneurs are everywhere:** Creativity allows for innovation, and product and IT development should capitalize on this opportunity.

- **Entrepreneurship is management:** Managing your process with an eye towards innovation will help you build a better final product.

- **Validated Learning:** Running "experiments" through your product-development lifecycle helps clarify and confirm the value you are serving to your customers.

- **Innovation Accounting:** Success requires measuring progress and milestones to help prioritize work throughout the product-development lifecycle.

- **Build-Measure-Lean:** The goal of the project lifecycle is to turn ideas into products, measure customer's response to the product, and then determine if a strategic change in direction is necessary. Teams should accelerate this feedback loop to ensure your work is always high-value.

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[1] Eric Ries, *Lean Startup.* http://www.theleanstartup.com/

Identify Potential Product/Service Value:
- What problem are we trying to solve?
- What value are we bringing to the table?
- What are our most critical assumptions and hypotheses, and which of these are most uncertain?

Ideas about Value

Learn

Build

Evaluate User Feedback:
- Did the user recognize the problem and value?
- What did we learn is truly important to the users?
- What might they adopt or at least not resist?
- Did user feedback suggest the need to pivot and rethink the overall product or project assumptions?

User Data

Measure

MVPs First, Then Product Releases

Build Minimum Viable Products (MVPs):
- MVPs are simple and not fully developed products – an initial MVP could be just paper and a person talking to customers
- Goal is to interact with customers around something REAL
- The MVP is structured to allow for continuous learning and feedback on use and satisfaction

Source: Adapted from information in *The Lean Startup* by Eric Ries.

Figure 2: The Lean Startup Cycle

The build-measure-learn cycle depicted in Figure 2 is central to the Lean Startup methodology. It starts with the identification of a potential product or service that serves a value for your customer. For example, this could be interest from your user base in an electronic permitting system. To move forward in building your system, the Lean Startup method asks that you take a step back and identify the ***Minimum Viable Product (MVP)*** that a user would find valuable and move it through the cycle, interacting as often as possible with your users. This interaction provides ***validated learning***[2] and requires the use of identified, measurable outcomes so that you can incorporate the information you learn into your next cycle.

The Lean Startup cycle is designed for moving through quickly and in multiple stages; frequently a single iteration of the cycle may not provide a huge amount of forward progress. Taken together, the cycles allow you to incorporate the information gathered from your users into each stage and identify when you may need to "pivot" or adjust your assumptions so that you are not creating a product no one will use. Key questions to consider through the entire cycle include the following:

1. What are we trying to learn next?

2. What do we need to measure in order to learn that?

3. What do we have to build to be able to measure that?

This cycle is designed to mitigate the risks at each stage by allowing you to validate your assumptions early and often, rather than at the very end of the development cycle.

How Does Lean Startup Differ from Lean Process-Improvement Methods?

Lean Startup is used when the level of uncertainty is very high within IT projects or product-design initiatives, while traditional Lean process-improvement methods (techniques like kaizen events and value stream mapping) work well for optimizing existing processes and/or when there is clarity about IT development needs. For large, complex projects it may be useful to use both; moving from Lean Startup to more traditional Lean tools as you move from high-level product or IT solution conceptualization down into more specific steps like production and system maintenance. For mature systems that are already developed but need a major overhaul to modernize the technology, a cycle of Lean Startup will help jump start the discovery and identification of necessary "disruptions" for evaluation. Use the Key Questions below to explore whether Lean Startup could be helpful to meet your improvement needs.

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[2] Validated Learning is a term coined by Lean Startup practitioners that references a rigorous method for demonstrating progress when one is embedded in a process with extreme uncertainty (http://theleanstartup.com/principles). It also refers to a process in which one learns by trying out an initial idea and then measuring it to validate the effect (http://www.startuplessonslearned.com/2009/04/validated-learning-about-customers.html).

Key Questions to Identify When You Might Use Lean Startup

- **_Is there uncertainty about the existing program or process design?_**

  In situations where there is uncertainty that our underlying assumptions are correct, the use of MVPs provide opportunities to validate learning on specific components (e.g., parts of an IT solution) and inform next steps.

- **_How mature is my program? Are we starting from scratch or creating such a disruptive change that it may feel like we are starting from scratch?_**

  While traditional Lean methods can be used to clarify and streamline a process, in situations where the changes needed are enough to be considered "disruptive," the use of Lean Startup, especially MVPs, will allow you to break down the required changes into more easily manageable steps while validating your assumptions at each stage.

  MVPs will also allow you to validate the associated impacts of changes during each iteration and provide an avenue for quickly adjusting expectations if you find they are incorrect.

- **_Where am I in my product or service development cycle?_**

  Lean Startup works best when applied early in a designing or redesigning a product or process. It is tailored to uncertain/dynamic environments with tools and approaches that help solidify key process aspects of a product development using small tests. The cycles can happen before you turn to other Lean process improvement tools to optimize the overall process design and workflow end-to-end.

What Is a "Minimum Viable Product"?

Is Minimum Viable Product (MVP) just a new word for pilot? Sometimes it is, but often the terms mean different things. At best, pilots are the launch pad that transitions project managers from talk to action. The pilot blazes the way for a program to scale up, even if there is a lag. However, sometimes pilots are "where good ideas go to die," or at least to hold until other conditions are finally right. Pilots generally test multiple, integrated components of a process or system at one time.

MVPs, on the other hand, are typically smaller than pilots at the start, test only one or a few components, and are iterated on a faster schedule to the extent possible. When implementing Lean Startup, your project team will typically be testing multiple MVPs in concurrent, overlapping periods as part of a strategy to determine what product to develop through build-measure-learn cycles.

Why Is Lean Startup Useful for Projects with Highly Uncertain Outcomes?

At its core, Lean Startup is about managing risk. It is based on the finding that the highest risk for many projects is not failure to deliver or develop the right product on time, and on budget, but delivering the WRONG product or process without time or resources to recover to the right track. This is the worst possible outcome, and it can be avoided.

When uncertainty and complexity are high, this type of failure is a major risk, and many of our traditional product/project management tools amplify this risk. For example, large federal IT projects require a huge investment in up front detailed "requirements" definition and documentation as well as detailed milestones and development approaches. These documents may all have to be developed and committed to despite fundamental known or unknown uncertainties about key causal relationships and stakeholder behaviors.

Lean Startup seeks to invert the process/product development process by seeking out and making explicit key hypotheses and uncertainties and then apply some of the scientific method, within practical limits, to test these hypotheses, reduce these uncertainties and thereby reduce project risk. After your

> *"Progress in manufacturing is measured by the production of high quality goods. The unit of progress for Lean Startups is validated learning – a rigorous method for demonstrating progress when one is embedded in the soil of extreme uncertainty."*
> – Eric Ries, author of *Lean Startup*

project team has reduced the risk in project approach and provided early value to customers with Lean Startup, you can then shift to other implementation methods, such as Lean process-improvement or Agile software development, which we discuss in later chapters of this Toolkit.

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Chapter 3: How to Plan for Process Streamlining and Process Modernization Projects

In the last chapter, we discussed how Lean concepts apply to designing (or entirely rethinking) products and services. With this and the next two chapters, we look at how to use Lean and IT to increase the efficiency and enhance the effectiveness of existing processes. We provide "how to" guidance on how to effectively integrate IT in the different phases of typical Lean projects: planning (chapter 4), process-improvement events or activities (chapter 5), and follow-up (chapter 6).

The five steps in this chapter (see box) may be implemented concurrently to plan for effective process-improvement projects. For additional guidance on how to successfully implement Lean projects, see EPA's Lean in Government Starter Kit.

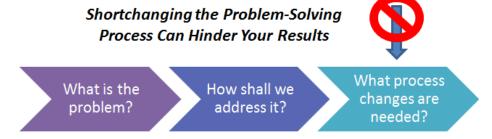| IN THIS CHAPTER |
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1. Understand the Problem

Before changing a process, it is important to have a clear sense of why you want to make changes. For example, your agency may want to issue permits or complete inspection reports more quickly, eliminate backlogs, reduce errors, or address other concerns that managers, staff, customers, or stakeholders may have. Clarifying the problem(s) you would like to solve will help ensure that you choose and implement the most appropriate solutions. Understanding the problem can have several components:

- **Identify Key Issues:** It is useful to have a high-level understanding of key issues to address. Common improvements from Lean projects include reducing process time (allowing staff to do more or focus on other activities); improving the quality, consistency, and completeness of products; simplifying processes; and improving staff morale and communications.

- **Define the Process:** Most problems are related to processes, not people. To focus your efforts, be clear on what process you are trying to improve. A program generally has many individual work processes. What is the product or service that your agency delivers in the process? Who is the customer of the product/service? (Note: Think about who is directly using the product.)

- **Identify Measureable Goals**: Projects should have specific, measurable goals and objectives. For example, your team might seek to reduce permit application review time by 50%. Your team can also use these goals and objectives as a reference point to monitor progress as the project unfolds. For more guidance on metrics, see EPA's Lean Government Metrics Guide.

The amount of time you need to spend understanding the problem before addressing it will vary considerably depending on the problem. If you spot a problem that has an easy solution, it is fine to go ahead and fix it (e.g., archiving older document files, if there has been a proliferation of drafts). By contrast, if you have a more involved problem, you may want to engage a team in the problem-solving effort.

If You Have a Solution in Mind, Do You Need to Go Through a Problem-Solving Process?
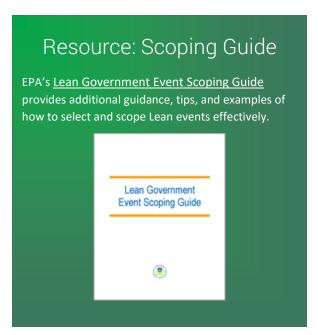
- It can be very tempting to short-change the problem-solving process, but do not do it! If you jump to a solution, you may risk missing easy fixes, not working on the right issues, or reinforcing wasteful aspects of the process you could have eliminated.
- It is great that you are thinking ahead and have a solution in mind. However, it is likely that other people have ideas for how to fix the problem, too.
- To be most effective, focus on understanding the problem and figuring out how to address it, and then bring your ideas to the table when you and others discuss how to improve it.

Shortchanging the Problem-Solving Process Can Hinder Your Results

What is the problem? → How shall we address it? → What process changes are needed?

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2. Develop a Manageable Scope for Lean and IT Process-Improvement Efforts

Once you have that problem in mind, you will need to determine the scope of your project. Setting the scope of the project refers to determining what segment of a work process—involving specific activities and steps—that you will focus on. Common problems with scoping Lean events/projects include the following:

- ***Unclear scope*** – where the project team wastes time with disagreements over the goals and scope of the project

- ***Too large scope*** – where teams have difficulty making progress during a Lean event or project because there is too much to accomplish (This is a common problem for agencies new to Lean.)

Resource: Scoping Guide

EPA's Lean Government Event Scoping Guide provides additional guidance, tips, and examples of how to select and scope Lean events effectively.

Lean Government Event Scoping Guide

- **Too narrow scope** – where teams spend time and resources improving small areas of a process without understanding bigger picture impacts; changes could disrupt other parts of the process not included in the scope

If you are implementing your project as one or more Lean events, the Lean event team leader and facilitator should work together with the project team to clarify the project scope and determine how much is appropriate to tackle in a Lean event (or multiple events). Your team will also want to scope any follow-on IT projects to match the size and scale of the needs identified in the Lean event(s).

One of the most effective ways to clarify and get buy-in on the goals and scope of your project is by developing a charter. The purpose of a charter is to help a team to plan, communicate, and build consensus for a Lean project. Information in a typical charter includes:
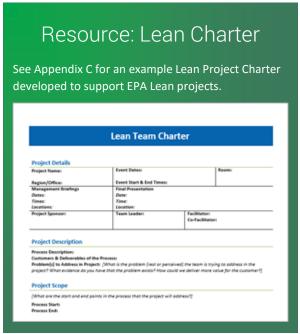
- Project participants, including project sponsor, facilitator, team leader, team members, and on-call support

- Event/meeting schedule and logistical information, including dates, times, meeting room(s), management briefing times, and final presentation time

- Descriptions of the project, its scope, and any boundary conditions (what is out of bounds)

- Goals and objectives, including any quantitative improvement targets to performance metrics

- Work to be accomplished before the Lean event (e.g., background research)

- Schedule for follow-up activities, such as management follow-up meetings

- Signatures of approval from leadership and the facilitator

By working together to develop a charter, you can help ensure that project team members have a clear, common understanding of the problem, the goals of the project, and how you plan to approach it. You will adapt your approach over time with implementation, but developing a well-defined charter at the outset will make it easier to succeed.

Resource: Lean Leadership Guide

EPA's Lean Leadership Guide outlines eight steps leaders can take to support Lean projects.

Resource: Lean Charter

See Appendix C for an example Lean Project Charter developed to support EPA Lean projects.

3. Assemble a Project Team with the Right Mix of Leadership, Facilitation, and IT Support

As part of developing a project charter and planning a project, you will want to assemble a project team. There are three important considerations, as follows.

- **Leadership:** Nothing is more important to the success of a process-improvement project than leadership support and engagement. Leaders (project sponsors or champions) have important roles to play throughout all stages of projects. These roles include helping scope the project and develop the charter, motivating the team and participating in the project kick-off, attending management briefings during the event (or the full event), participating in the event report-out presentation, keeping the team accountable for process improvements, and addressing barriers to implementation success. Projects perceived as difficult or controversial may only be possible with early leadership engagement and buy-in (see Case Studies in Appendix C for examples).

- **Facilitation:** Trained Lean facilitators support Lean events, making sure teams design and execute events effectively. Facilitators play key roles in helping the team scope projects and develop a charter (see previous step), training participants on Lean techniques during events (as needed), managing the discussions so that the team makes sufficient progress, and pushing the team to make process changes and develop a clear implementation plan. Agencies may use outside consultants as Lean facilitators or train internal staff on Lean facilitation techniques.

- **Team Membership:** Lean project teams are typically 8-12 people and should primarily be composed of *people who directly work on the process*—these people have the best knowledge of how it really works and where improvements could be useful. You should also involve one or two *customers or stakeholders* to add outside perspectives (e.g., regulated entities or partner agencies) and to ensure your solutions will work for all those involved in the process. You may want to include *IT representatives* that could help the project be successful (see below).

> **Connecticut Underground Storage Tank (UST) Mobile Field Inspections Project Teams**
>
> The Connecticut UST inspection program used Lean and IT to streamline its field inspection process and develop a tablet-based mobile tool. When creating its project team the agency found that:
> - IT staff engagement early in the process ensured the appropriate technology was incorporated.
> - Program staff was equally important to the full development cycle as they held practical knowledge of the process and how the final IT solution would work in the field.
> - Pulling program staff away from their day-to-day work can put a strain on resources but is essential to ensuring their input from real-world use is reflected in the final product.

IT Staff Involvement in Lean Process-Improvement Projects

Most process-improvement projects at environmental agencies will have some connection to IT. IT staff can play a critical role in Lean projects by providing a systems perspective on issues associated with information flows

and technology, as well as informing the project team of technical considerations and improvement opportunities. The level of IT staff involvement will likely fall into one of three categories, as follows.

- **IT Department Participation in Project:** IT is integral to many agency processes, even if the process is not owned by the IT Department. If your team has identified problems related to existing IT (e.g., duplicative databases) or envisions ways IT might enhance process performance (e.g., automating a streamlined process), your team should include an IT representative.

- **On-Call IT Department Support:** If your team has started a process-improvement project but has not identified IT-related problems or solutions to focus on, you may want to designate someone from the IT Department to be available for assistance on-call during the event (as opposed to a full Lean event participant). Your team may find that IT support would be useful to make immediate changes, discuss potential changes, and/or develop an implementation plan for future changes.

- **IT Department-Led Project:** In some cases, the process you intend to improve occurs within the IT Department, or with IT staff as the primary people doing the work. When this occurs, your project team is comprised largely of IT staff, and other agency staff and/or other customers of the process are included on the team to bring additional perspectives.

When forming your project team, consult with the IT Department to invite one or more representatives to join the team and/or discuss who could be available to provide on-call support if the team identifies IT needs during or following a Lean event. This early engagement between project leads and IT staff helps your team to develop and implement better solutions as well as anticipate potential issues.

4. Sequence Improvements to Streamline Processes Before Automating Them

Automating processes can be a great way to speed transaction times, reduce errors, increase transparency, and improve customer service – *if* you are automating a well-designed, streamlined process. If you automate a process without first improving it, however, you could lock-in unnecessary steps and inefficiencies, add to process complexity, and waste time and resources automating things that may not be useful to users.

So, when planning your project, first use Lean thinking and methods to remove waste and inefficiency in the process. Then, your team can plan how to approach the automation in the context of other improvements. If you envision automating part or all of your process, keep in mind the following considerations:

- **Simplify, simplify, and simplify.** The more changes that you make to cut out unnecessary steps, and streamline decision-making paths before you automate

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Sequencing Matters

EPA Region 1 is in the process of developing a SharePoint workflow to improve its lab purchasing request process. At the start of the project, the project team had a tool in mind, but realized very quickly that automating the existing paper process would not add any efficiency. Instead, the team developed a detailed process map to highlight places where steps needed to be changed or eliminated, and now is using the updated process to develop an automated system. This is a perfect example of the importance of sequencing your project to streamline a process prior to automating it.

processes, the more you will be able to save on IT development resources and time, and the easier it will be to implement the process in the long run.

- **Recognize that the time frames for Lean and IT changes differ.** You may be able to make rapid changes to the process initially using Lean concepts to eliminate waste, but may need an extended amount of time to fully implement any IT changes.

- **Do not wait until working on the automation to fix errors or raise problems.** It will be much more difficult and time consuming to change the process and any documents/forms associated with it after it has been automated, so try to fix issues early whenever possible.

5. Identify Other IT Impacts That Could Affect the Project

IT solutions do not occur in a vacuum. When an IT solution is identified, such as the need for an electronic permitting system, there is a high likelihood another part of your agency has thought about, implemented, or may be planning a similar solution. These other IT efforts could affect your process-improvement efforts. Learning about these IT changes is especially important in times of reduced resources and centralized IT.

When scoping your project and developing a project charter, talk to an IT representative about other IT activities on the horizon, so you can factor those into planning the project. Examples of changes that could affect or interact with process improvements in your project could include the following:

- Agency or program website or Intranet redesign

- New software, or upgrades to software or operating systems (e.g., increased availability of collaboration software such as SharePoint, new chat program for employees, etc.)

- IT process improvements developed elsewhere that could be transferred or adapted to a new process (e.g., an automated permit application form that could be adapted)

- Shared IT services being developed (e.g., a system for unified management of facility data, so different programs do not have to re-enter basic facility-related data)

- New platforms that may need to be taken into account (e.g., the ongoing shift toward mobile devices

- Requirements to make many types of products or systems accessible to all users with varying abilities to see, hear, and interact with web pages or other tools (e.g., making documents Section 508 compliant which requires alternative, readable formats for users with disabilities); this can require additional upfront planning[3]

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[3] For more information on Section 508 compliance, please see: http://www.section508.gov/

- Changes made at the level of the larger enterprise (e.g., a s*tate government* may make a change which an *agency* must take into account) or changes to systems that EPA manages for the states (e.g., the Safe Drinking Water Information System [SDWIS], the Integrated Compliance Information System for Air [ICIS-Air], and the Central Data Exchange [CDX])

- Regulations or polices that require reporting into a federal system (e.g., a proposed rulemaking for New Source Pollution Standards to the Electronic Reporting Tool) may affect the development of federal and state systems

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Shared IT Services – Standard Work for IT Services

- One of the current trends in IT design is the move towards shared services and service-oriented architecture. While their implementation can be complex, these concepts are really a transfer of the Lean concept of "standard work" to IT services.
- Standard work refers to the best, least wasteful way to perform a given task or operation. Lean practitioners document standard work—often in simple, visual ways—so that people can complete tasks correctly and efficiently every time.
- With shared services, an agency takes its best solutions to a common business problem, such as archiving inbound transactions, and re-uses it as a service over and over.
- This provides not only an economy of scale, but also a powerful way to transfer best practices and optimized processes across an agency. Moreover, these processes can be continuously improved.
- Examples of shared services in use in many agencies, including EPA, include:
    - Substance Registry Services (SRS), a consolidated system to track and reference regulated chemicals and other substance
    - The Facility Registry Service (FRS), a national system for the management of facility identification data
    - Cross-Media Electronic Reporting Rule (CROMERR) identity proofing and signature services, which are EPA-provided tools to assist states in complying with CROMERR regulations
- Your project team should consider whether your process might be a good candidate for shared IT services and/or could benefit from shared services provided through the multi-agency E-Enterprise Initiative. Consult with IT staff to assess the role of shared services at your agency.

These are not the only IT opportunities your project team will want to consider during Lean projects; however, these changes occurring outside your process can create important windows of opportunity for change or suggest different sequencing of improvements in your process.

The steps outlined above are not all that are needed to plan and prepare for effective Lean and IT projects. Your team will also need to coordinate logistics for any Lean events or team meetings, conduct background research, choose a facilitator, and prepare your team to be successful. For more information on how to plan Lean projects effectively, see EPA's Lean in Government Starter Kit.

Resource: E-Enterprise Shared Services

States and EPA are accelerating their use of shared services with E-Enterprise. EPA will be collaboratively designing and hosting shared services to support many information-centric aspects of environmental management processes.

- These services may take the form of applications that states could use to conduct state business and/or may be software services (such as a facility data tool) that could be integrated into state systems.
- The E-Enterprise Initiative plans to develop a shared services catalog and guidance for EPA and state environmental agencies to use.

Chapter 4: How to Improve Processes with Lean and IT

After planning for Lean and IT process-improvement projects, you will bring your team together for a Lean event or other project meetings to analyze a process in depth, brainstorm ways to address problems in the process, design a new, streamlined process, and begin to implement that new process. In this collaborative working environment, teams can consider how to combine Lean thinking and IT strategies to optimize the process and deliver better results.

This chapter outlines several steps for doing this effectively (see box) in Lean events or projects. Your team may need to be flexible with process improvements, adapting these steps as needed to achieve your goals and adjust for unexpected issues.

> **IN THIS CHAPTER**
>
> 1. Develop a Robust, Data-Driven Understanding of the Current Process
>
> 2. Take a "Creativity Before Capital" Approach to Process Improvement
>
> 3. Consider Ways IT Solutions Can Enhance Lean Outcomes
>
> 4. Engage Stakeholders and Customers Early and Often
>
> 5. Develop a Clear Implementation Plan for Future Lean and IT Improvements

1. Develop a Robust, Data-Driven Understanding of the Current Process

> "The IT organization…sits outside the functional silos, possessing a bird's-eye perspective that enables it to see information flow from end to end. IT staff are therefore in a unique position to understand the interdependencies, complexities, redundancies, and inefficiencies of information flow and information systems— understanding the weaknesses of the current state is the first step to improving a process."
>
> – Steven C. Bell and Michael A. Orzen, *Lean IT: Enabling and Sustaining Your Lean Transformation, 2011*

A critical aspect of Lean projects, including kaizen events and value stream mapping events (see Appendix A for definitions of different Lean methods), is when project teams develop an in-depth, shared understanding of how the current process actually works, including key areas of problems and delays. Project teams document this understanding as a map of the current state and add data about the time involved at different steps, including waiting time and processing time. Teams also generally bring in data about how the process is working, such as historical lead times, customer feedback, and/or performance data from similar agencies (as benchmarking).

It is usual for people to start Lean projects with different understandings or incomplete knowledge of how the process works. By mapping the process, team members develop a common, in-depth understanding of the process and identify opportunities to improve the process. In addition, by including customers or stakeholders in Lean events, participants can gain a multi-faceted view of what is working and what is not.

Figure 3: EPA Office of Air and Radiation Lean Project Team Analyzing a Current State Process Map

As mentioned in the previous chapter, if your project team is considering automating the process or working on other areas that will involve IT support, then IT staff should participate in the Lean event. IT staff should participate in the "current state" process-mapping activities of the Lean event, not just the brainstorming about process changes and the development of a "future state" map. IT staff can use the current state process mapping as an opportunity to better understand the needs of the customer in developing a technology solution and the root causes of problems that occur in the current process. Whether or not the problems are IT related, there may be a technology solution that could help address them.

2. Take a "Creativity Before Capital" Approach to Process Improvement

After mapping your current process and getting a good understanding of where changes are needed, your team will then work on mapping the "future state" of the process. This typically involves (1) brainstorming ways to address root causes to problems, (2) prioritizing potential ways to address those problems, (3) mapping a more streamlined process, (4) making initial process changes, and (5) developing an implementation plan for actions to realize that future state (see step 5 below). A good mantra for identifying process changes is "creativity before capital" or "mind before money." The idea is to maximize the gains you can get from easy, cheap solutions before investing significant resources.

Employees and others who interact with the process are great sources of improvement ideas, including changes to the process and the technology that underpins it. It is important not to be blindsided by particular technology solutions and miss opportunities to make progress with simple changes, however. Simple solutions—such as eliminating process steps or review loops, creating checklists and templates, and developing "paths" for common situations (e.g., a streamlined review for simple permit changes vs. more in-depth review for more complex permitting)—can make a big difference.

Project teams often prioritize solutions with impact-difficulty matrices, plotting ideas based on their potential for positive impacts and their level of difficulty to implement. This exercise can be a useful tool for identifying what ideas to implement first. Ideas that are

Figure 4: Impact-Difficulty Matrix

high impact-low difficulty should be implemented first; and low impact-high difficulty ideas should be dropped from further consideration.

Figure 5: Impact-Difficulty Matrix Used by EPA Region 8 to Prioritize Improvement Ideas for a Tribal Underground Storage Tanks Grant Award Process Lean Event

If you're conducting a Lean event, your team may be able to implement many Lean and IT process changes during the event itself (e.g., drafting checklists, templates, or tools for the new process; making database changes; identifying requirements for IT solutions to be developed). Starting these efforts during your Lean event or project meetings will give your team a head start on implementation efforts.

3. Consider Ways IT Solutions Can Enhance Lean Outcomes

While it is important to make simple, easy process changes first, that does not mean that more involved, technology-based solutions should not be considered as well. If targeted to address key problems in the process and tailored to address customer needs, technology improvements can provide transformative changes to agency processes. For example, if a process is paper-based, efficiencies can be gained by making some or all of the process electronic. Consider whether any of the IT strategies in the box below would be relevant to enhancing the performance of your team's process.

Increasingly, IT does not simply serve a supporting function for a process, but can be integral to the overall value proposition of the process. As agency processes become more and more automated and online, process improvements are often powerfully embodied in changes to the software used to support them. The transition to e-everything (reporting, permitting, monitoring, etc.) means that agencies are transforming many of these processes on several levels at once. Thus, an inter-active e-permitting system is not just a web-version of the paper form.

Lean IT and Mistake-Proofing

A Lean concept that can benefit from IT help is "poke-yoke," or "mistake-proofing." For example, a modern computer has no physical way to plug a cable in to a wrong place. One way electronic forms can use this concept is through pull-down lists at data-entry spaces or making some fields mandatory. More sophisticated software offers the chance to build in automated quality controls, such as rejecting finish dates that are before a start date. These mistake-proofing features help avoid looping back to get information corrected, which wastes time. IT staff can help tell you what is possible, easy, and/or will take more resources to develop.

Examples of IT Enhancements to Processes

- Mobile or field data collection and reporting (e.g., field inspectors enter data from inspections into tablets rather than waiting to enter data until after a site visit)

- Electronic, fillable forms, with automatic error checking to reduce errors or incomplete submissions

- Shared, electronic tracking systems for monitoring the status of work in process (e.g., permit review status) and/or the status of implementation items (This can include sharing both within your agency and across agencies for collaborative efforts, such as the ability to easily share and crosscheck data reported from states to EPA.)

- Automated, on-line processes (for reporting, permitting, monitoring, and other functions) that replace hardcopy-based processes

- Easier ways to access information stored in files and/or databases

- Online payment acceptance and processing (related to permitting and other customer services)

As with all potential process-improvement ideas for the process, evaluate the potential benefits of the changes against the difficulty, time, and resources necessary to enact the process changes, using the impact-difficulty matrix discussed in the step above or other means. If the potential IT changes look favorable in this analysis, then build them into the implementation plan developed for the Lean event.

Source: Connecticut Department of Energy and Environmental Protection,
http://www.ct.gov/deep/lib/deep/air/siprac/2013/siprac_lean_update_5-9-13.pdf.

Figure 3: The Connecticut UST inspection streamlining process used both technology and Lean to not only reduce overall time for UST inspections but to increase the compliance rates of permitees.

4. Engage Stakeholders and Customers Early and Often

To make your Lean and IT process-improvement efforts more successful, frequent engagement of those who are involved in or affected by the process is vital. Engaging with customers and stakeholders can create greater buy-in of any changes identified during your process-improvement efforts and can provide you with additional insights based on their experiences. One of the most effective ways to involve customers and stakeholders is by including them in your project team, as we discussed in the previous chapter. However, since project teams are limited in size, you may also want to consider other ways to engage with customers and stakeholders during the lifecycle of your project. If you are engaged in a Lean Startup process, then customer/stakeholder engagement is included in the MVP cycle process to ensure you are validating assumptions frequently with users engaged in your product.

Engagement can take several forms, including in-person meetings, phone calls, written requests for information, or even social media. Identify which mechanism(s) you will use to connect with stakeholders and who will be responsible for collecting, addressing, and responding to feedback. Engagement can be through one-time interactions or with existing groups such as a stakeholder advisory board. Most likely you will want to engage with customers and stakeholders at all phases of the project, including collecting perspectives on customer concerns and needs when planning projects, getting feedback when considering potential changes, and evaluating how the new process is working during implementation.

5. Develop a Clear Implementation Plan for Future Lean and IT Improvements

In the final phase of a Lean event/project, your project team should develop an implementation plan that outlines the actions that need to occur after the Lean event to achieve the desired future state. Your implementation plan should clearly outline the following items:

- **What** actions your team wants to accomplish

- **Who** is responsible for completing each action and who is responsible for overall implementation of the process changes

- **When** each action need to be completed

- **How** you will follow up on the status of those action items, in the form of formal follow-up meetings with management

Many implementation plans include a Gantt chart (see box below and the Implementation Plan Template in Appendix E) that allows managers and team members to track the status of implementation items over time. These charts can show visually whether teams are on track with action items or whether certain items need further attention and follow-up. Your agency or office may also have other systems for project management that could incorporate action tracking from Lean events or projects.

Resource: Implementation Plan Template

The following is an implementation plan template that was developed to support EPA Lean projects.
See Appendix E for the full implementation plan template and example plan.

Lean Implementation Plan: Agency X Property Inventory Process

Project Details	
Project Sponsor	FirstName LastName
Team Leader	FirstName LastName
Facilitator	FirstName LastName
Event Date	September 20-23, 2014

Date Created:	
Last Updated:	

Follow-Up Meetings	
30-Day	10/21/2014
60-Day	11/20/2014
90-Day	12/18/2014
6-Month	3/19/2014
1-Year	9/21/2015

Status Key

	TO BE INITIATED
	ON TARGET
	OFF TRACK
	COMPLETE

ID #	Action	Owner	Start Date	Target Date	Completed	Timeline												Comments
						Sept-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	
1	Modify the IT Tracking System for use in property inventory	J. Doe	10/1/2014	2/1/2015	TBD													On track to be done by due date; new system design awaiting management approval at weekly meeting
2	Purchase new equipment	J. Doe	9/25/2014	11/1/2014	TBD													Behind schedule; budget constraints; researching alternate options to meet need
	Create a checklist																	

It is essential to involve IT staff in the development of your implementation plan if it includes any technology-related improvements. Make sure that your team (including any IT staff on the team) has a clear, common understanding of the needs and expectations for IT improvements, who will implement them, how those IT changes will be coordinated with other process changes in the implementation plan, and the timeline for the IT changes. Since some IT changes may take longer to implement than other process changes, it is helpful to build in explicit points to check in on implementation status and make adjustments to plans as needed. The use of Lean Startup once you identify technology-related improvements can help streamline development and ensure constant communication between process users and IT staff, especially throughout the MVP identification and development process (see Chapter 2 for more information).

For software-development needs arising from the Lean project, your team and/or other IT staff supporting your project may decide that it would be helpful to use Agile methods to incorporate Lean thinking into the software-development process. As described in Chapter 6, Agile is a rapid, iterative approach to software development that maintains a tighter connection to the customer throughout the development process. In this context, the "customer" may be the people on the project team who are or will be using the software.

An implementation plan is only the beginning—most of the real work comes next. The next chapter discusses how your project team can manage the Lean and IT implementation process successfully.

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Chapter 5: How to Effectively Follow Up from Lean and IT Process-Improvement Projects

Implementation, where the rubber meets the road on process-improvement projects, is often when projects have the most difficulties. While effective planning and well-executed Lean events can mitigate challenges (for example, by appropriately scoping projects and clearly defining responsibilities and timelines for follow-up actions), project teams can also take several steps to help ensure success with Lean and IT projects in the implementation phase, as outlined in this chapter.

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IN THIS CHAPTER

1. Track Action Items and Make Project Teams Accountable for Making Progress

2. Closely Coordinate IT Development Efforts with Implementation of the New Process

3. Evaluate Process Performance and the Need to Make Additional Changes

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1. Track Action Items and Make Project Teams Accountable for Making Progress

As described in the last chapter, through a Lean event or other meetings your project team will develop an implementation plan that can serve as a roadmap for improvements to your process. Once you have a plan, your team will need to put these changes into place to realize the full benefits of the Lean project. It can be hard to hit the ground running on process changes, since regular responsibilities often get in the way. Your team will also need to be flexible with implementation to respond and adjust to real-world changes affecting the process, and maintain regular communications to monitor progress. There are several actions your team can take to keep your project on track during implementation, as follows.

- **Assign an implementation manager** (could be the Lean project team leader) to track and manage action items.

- **Hold short, weekly meetings** ("stand-up" meetings work well) to provide status updates and identify issues early on.

- **Keep leadership updated** with the team's progress, and provide formal briefings on implementation status, project results, issues, and future plans at key times, such as 30 days, 60 days, 90 days, six months, and 1 year after a Lean event or after completing an implementation plan.
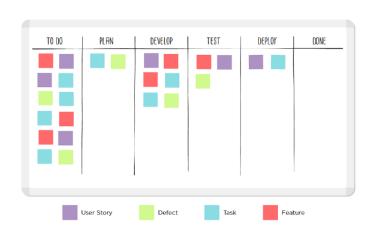

Figure 6: Example Kanban Board

- **Use the implementation plan** or other implementation action tracking tool over time to highlight task status, identify issues, and add actions where needed. A **kanban board** is one type of tool that provides a way to visually track implementation status over time (Figure 6).

These activities are particularly important for longer-term changes, such as many technology-related changes, since there is a greater need to sustain momentum. Having IT staff on your project team will help during the implementation phase, since then they are likely to have more buy-in for the improvements, as well as management support for dedicating time to process improvement. If IT were only involved on an on-call basis during your Lean project, you may have to build a business case for process improvements with IT managers before being able to proceed with information systems and technology changes.

2. Closely Coordinate IT Development Efforts with Implementation of the New Process

As implementation proceeds, it is very likely that the process your team improved with Lean is evolving even while additional IT solutions are developed. The reason for this is that many simple process changes can be made quickly, while changes to technology or systems may require more time to fully implement. As your process changes, it is important to not build IT in vacuum. Rather, closely coordinate your work on IT changes with your work on other process changes. This could include weekly stand-up meetings and monthly

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Finding Time for Process Improvement: Deselection and "Stop Doing" Lists

- Lean and IT projects have the potential to be transformative—dramatically reducing the time needed for agency activities, improving the quality of agency services and products, and providing better information to decision-makers to improve environmental management.

- However, process improvement also takes work to achieve those results and free up staff time.

  - When teams return to their regular jobs after Lean events, it can be difficult to find time to continue to make changes to improve the process.

  - There also are many competing demands for how IT staff spend their time, and process support is just one activity.

- The Lean concept of "deselection" can be a useful tool for managers and staff on project teams to consider as they proceed with implementation.

- What deselection entails is finding time for new, high-priority tasks (such as Lean and IT process improvements) by identifying other, low-priority tasks to take off one's plate.

  - Consider what activities you do that could be considered non-value added from a Lean perspective (e.g., over-processing of documents, unnecessary meeting attendance) and/or that could be removed from your to-do list without significant impacts.

  - Develop a draft "stop doing list" of things that you think you could take off your to-do list, then consult with your manager and/or others as needed to confirm whether you can make the changes to make time for higher-priority work.

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management briefings as discussed above, use of implementation plans and/or other visual tracking tools, and/or other communications. If your IT team is using the Agile methodology (described in Chapter 6), you may also have an Agile development team that engages a member of the process (the customer) in frequent feedback loops about iterations of the software.

With this coordination, you may realize you need to recalibrate your efforts and adjust implementation plans. For example, when working on process changes, your team may realize that the time and resources needed to develop a certain solution far exceeded your initial estimates (e.g., when your team evaluated the impact and difficulty of potential solutions), and this may make the solution less attractive to pursue. Alternatively, there could be agency-wide IT changes or developments that it would make sense to leverage. Your team may also discover new issues or needs to be addressed in the process that you had not anticipated. Implementation plans should be considered living, working documents – adjust them as needed based on the realities of on-the-ground deployment, but also use them to help keep your team on track.

3. Evaluate Process Performance and the Need to Make Additional Changes

Along with tracking action items, your project team should monitor and track the actual performance of the process. Use metrics identified in your charter and any others you identified as important in the Lean event. This will provide the best sense of how your project team's efforts are making a difference for improving the efficiency, quality, and results of your process.

Common metrics used in Lean projects include the following:

- **Process Steps:** the number of discrete steps in a process, which often can be distinguished by handoffs of a document or transfer of information between parties; this is a measure of the complexity of the process

- **Lead Time:** the total time to complete the process, from the customer's perspective, including wait time (e.g., time between permit application submittal and receipt of permit); this time metric is particularly relevant for meeting customer needs and any relevant regulatory timelines

- **Processing Time:** the time in the process spent working on the product, also known as "touch time" (this *excludes* any time that something is waiting to be reviewed/worked on); this time metric is important as it relates to how much time staff spend working on the process (freeing staff time could allow staff to eliminate work backlogs and/or take on more value-added work)

- **Percent Complete and Accurate:** the percentage of time a work product moves through the process without needing any corrections or additional information from the previous steps (i.e., the work product was 100% complete and accurate the first time moving through each process step); this is a measure of the quality of the process
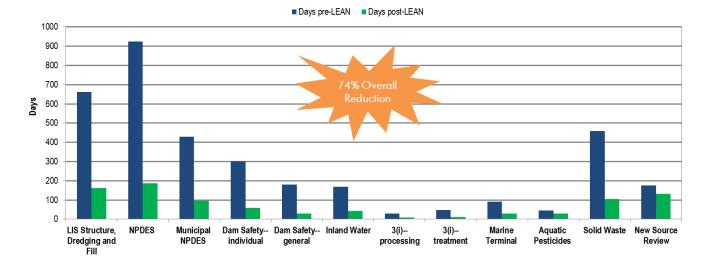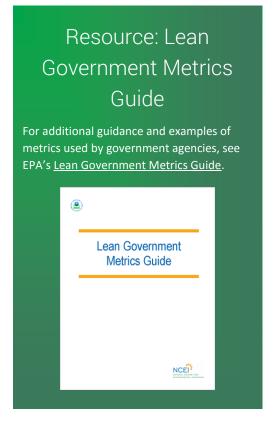
Days pre-LEAN **Days post-LEAN**

Figure 7: Connecticut Department of Energy & Environmental Protection, Average Processing Time for Select Permits, Before and After Lean Projects, 2013

Plan to report on key performance metrics at the report-out presentation of the Lean event, as well as at the management follow-up meetings at 30 days, 60 days, 90 days, six months, and 1 year after the Lean event. It may be useful to track additional metrics related to process performance, such as the time to conduct certain key segments of the process. The key is to focus only on a few measures that you know will provide useful information for decision-makers.

For projects with an IT component, kanban boards provide an easy, quick, and visual tool to track implementation for the project. This type of visual tool should be placed in a location (physical or online) where all team members can easily see it and recognize when steps may be stuck and prevent progress. The information gathered in a kanban board can also feed into overall project tracking metrics.

If you can integrate the data collection for these metrics into your overall data collection and reporting for the process, you are more likely to be effective than if you ask employees to adopt an entirely new system for process data tracking. The IT staff on your project team may be able to help with systems for tracking process performance data over time.

Resource: Lean Government Metrics Guide

For additional guidance and examples of metrics used by government agencies, see EPA's Lean Government Metrics Guide.

Lean Government Metrics Guide

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As you track the performance of your process and your implementation efforts over time, take note of what is working and what problem areas remain. Your team may find that you need to adjust your implementation plans to address unforeseen issues or new challenges, or you may identify further ways to reduce waste and inefficiency in the process. Processes that have gone through Lean and IT changes will very likely go through them again at some time. No solution needs to remain forever, and improvements can always be made to make processes more efficient and provide more value to customers.

Chapter 6: Agile Methodology

In Chapters 3-5, we described steps to guide you through process-improvement projects that include an aspect of IT – both projects when IT could help streamline your process and projects that are inherently related to IT. In situations where an IT solution becomes necessary, the approach you take to development will affect the speed at which you can deliver your final product. This chapter discusses a Lean way to build those IT solutions known as Agile.

What Is Agile?

Agile is an alternative way to approach IT project management that creates a time-limited, iterative, and service-oriented framework for software development. It was developed in the 1970s as a critique of sequential development.[4] It hinges on the idea that customer needs may not always be clear and that short "sprints" of development for specific parts of a tool are more efficient and effective than traditional IT project management.

Typically, IT projects are managed by conducting a large requirements-gathering process that may take weeks or months and then sequestering IT staff to develop a full product (often referred to as "waterfall"). Waterfall management, as shown in Figure 8, has often resulted in large IT projects that are completed long after the initial requirements were gathered, may no longer be relevant, and may even use technology that quickly becomes obsolete. Sometimes, customers get a better understanding of their needs when they see a particular piece of the puzzle, clarifying the requirements later in the process.

Agile, shown in Figure 9, attempts to solve these problems by delivering pieces of technology while frequently checking in with customers to ensure that their needs are built into each step.

In 2001 a group of developers came together to identify what is now called the "Agile Manifesto." It highlights the following principles as key to Agile:[5]

Resource: US Digital Services Playbook

The Digital Services Playbook outlines 13 key "plays" drawn from successful practices from the private sector and government that, if followed together, will help government build effective digital services. It incorporates Lean concepts, including Agile, as part of guidance on how to build effective IT solutions.

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[4] Dr. Winston W. Royce. Managing the Development of Large Software Systems. Available online at: http://www.cs.umd.edu/class/spring2003/cmsc838p/Process/waterfall.pdf

[5] Adapted from the Agile Manifesto: http://www.agilemanifesto.org/principles.html

- The customer needs are satisfied through early and continuous delivery of valuable software.

- Changing requirements are anticipated and welcome.

- Short and frequent delivery timescales for software development are encouraged.

- It is important to stay connected to the business side of the project. Staff from business and IT must work together daily.

- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.

- Simplicity—the art of maximizing the amount of work not done—is essential.

- The best architectures, requirements, and designs emerge from self-organizing teams.

- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.
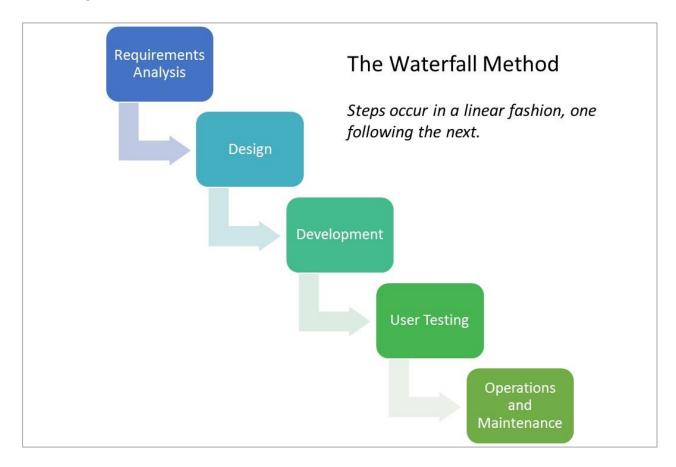
The Agile Development Process

Figure 8: The Waterfall Method

Source: Adapted from an image by Think Interactive, Inc.

Figure 9: Agile Development Process

How Is Agile Helpful for IT Development?

Most IT products are developed using the waterfall method where the requirements gathering, analysis, design, coding, and testing are treated as individual project steps. In an era of diminishing resources this often means that projects run out of money just when they need it the most – during product testing. It also highlights the risk involved with product development, as you do not see the final product until the end of the process, when it is too difficult to switch gears.

The iterative nature of Agile allows you to anticipate that the project may not always go as planned, focus resources where you need them, and learn from any changes or mistakes made during previous iterations. The focus on "user stories" helps model your product and moves the focus from a list of general "requirements" to a picture of how users need to interact with what you are developing and how that matters for the final product. Asking users why they are interested in particular requirements can elicit better responses as humans love to tell stories. The context also allows you to better identify common or related requirements across user groups.

As mentioned earlier, environmental agencies can combine Agile development with Lean Startup and Lean process-improvement tools depending on their specific needs.

> ***Early User Feedback in Developing the Wisconsin E-Permitting System***
>
> During the development of the Wisconsin e-Permitting system (see case study in Appendix C) the agency was worried that collecting early user feedback would cause them to be scrutinized. It turns out that engaging the user base early and often allowed the tool to meet critical needs they were not aware of and built a "hook" into the new tool for users. Early adopters were much more likely to tell others about the tool and how easy it was to use. This cannot be replicated for every user group but is important for key stakeholders.

e-Manifest Development Using Lean Startup and Agile

e-Manifest, the electronic hazardous waste tracking system, is using Lean Startup in conjunction with Agile development to ensure the efficient development of an electronic manifest system. This process is moving EPA's Office of Enforcement and Compliance Assistance from a traditional waterfall approach to a more modular, iterative development approach. Key steps in EPA's approach include:

- Starting with an initial demonstration of functionality that will evolve into a minimum viable product (MVP)
- Building initial modules, addressing uncertainties, and engaging early with users and stakeholders
- Bringing down the cost of current and future development by addressing uncertainty upfront and ensuring that the work being completed brings actual value to stakeholders and users
- Using open source code that are available at a GitHub repository

e-Manifest also utilizes modular contracting strategies that allow for maximum interoperability, while minimizing costs. These strategies are best aligned with iterative processes that allow for continuous improvement and adaptation to the production environment.

- e-Manifest is engaging with multiple teams and services with specialized capabilities to evolve the product from beginning to a mature product.
- Team and services will be brought on at different stages based on the needs of the product - with a preference for reuse and minimizing waste.

Chapter 7: Strategies and Tips for Multi-Agency Collaboration on Lean and IT Improvement Projects

Whether you are implementing Lean Startup to develop new product or service concepts, improving an existing process, or developing a new IT system, it is useful to consider whether it would be helpful to involve other agencies in your project. This chapter discusses when it is useful to include multiple agencies in Lean and IT improvement projects, as well as outlines some strategies and tips for effective collaboration.

IN THIS CHAPTER
1. Benefits of Agency Collaboration to Improve Processes and Programs
2. Collaboration Strategies and Tips

Benefits of Agency Collaboration to Improve Processes and Programs

Collaboration between agencies to improve processes and programs can lead to better outcomes by identifying and addressing systemic implementation barriers, enabling full lifecycle improvement, improving communications between agencies, and increasing the reach of process changes. Agency coordination on a shared process or IT system (e.g., data exchange system) can eliminate or address potential barriers and implementation challenges by working with the full complement of participants who may need to interact with the process. This is relevant to all types of improvement projects, including Lean and IT process improvements, and IT development projects.

Multi-agency collaboration can take many forms. For example, your project team may be considering improvements to an environmental data reporting system that includes state and/or tribal data that must be shared with EPA. Alternatively, your process improvement project may have EPA Headquarters interacting with

---

Questions to Identify When to Collaborate with Other Agencies on Process-Improvement Efforts

Consider coordinating with another agency on improvement projects if you answer "yes" to any of the following questions:

1. Does the improvement project directly affect a process where both agencies are integral to the operations (e.g., an EPA-state joint priority setting process)?

2. Is another agency a stakeholder in your process and/or would that agency be affected by changes to your process?

3. Would your agency and/or another agency benefit from participating in the project in a coordinated manner (e.g., as a learning opportunity)?

4. Would the perspective of another agency facing similar process problems or that has already made improvements to a similar program or process be helpful?

---

a single state or tribe through their programs offices or an EPA Regional Office interacting with its states and/or tribes. This may be in the realm of EPA review of a state program; a program where EPA and states are co-regulators; EPA, states, and tribes coordinating on a data exchange process; or even an EPA, state, or tribal process where there may be value in getting the perspective from the other entity.

Collaboration Strategies and Tips

The tips and lessons for Lean and IT projects described earlier in this Toolkit apply to multi-agency projects, but collaboration across agencies also can create unique or larger scale challenges and opportunities. While previous chapters describe how to plan for and implement Lean and IT solutions to solve problems in a process, below are tips and considerations for when multiple agencies collaborate.

Tips for Project Planning

- **Learn from others.** When scoping your project, reach out to other agencies to learn what others have done, benchmark performance, and potentially invite others to participate as observers or participants (e.g., to learn or share ideas).

- **Engage with other agencies early in Lean and IT improvement projects**. Early engagement is key to having the right parties involved in the improvement effort at the right stages and to planning for a process that is most effective and addresses the needs of each agency involved. Once you have a project idea, consider whether it would be useful to invite other agencies to participate. Involve participating agencies in all phases of a project: scoping, events, implementation, and follow-up.

- **Be strategic about selecting participants in project teams to keep group size manageable while ensuring adequate representation**.

> **State-EPA Collaboration to Improve Regional Priority Setting Process**
>
> - **New Hampshire Department of Environmental Services** and **EPA Region 1** used Lean and IT to improve the Performance Partnership Agreement (PPA) process, which they use to set goals and areas of cooperation.
> - They cut process steps by 35% and developed a shorter, simpler process that makes efficient use of senior executives' time in identifying strategic priorities for joint efforts.
> - They also developed a SharePoint site to eliminate errors in communication, increase efficiency, and provide a single point of coordination for state and federal partners.
> - These efforts reduced the time to complete the PPA process by 25% from eight to six months and enhanced coordination between the agencies.
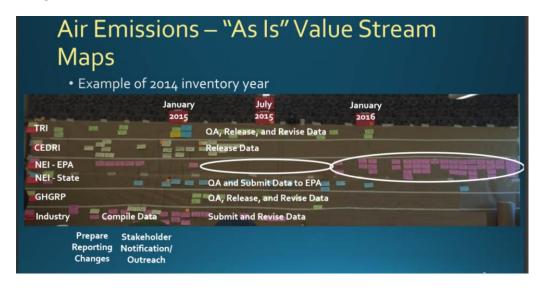
Choosing whom to involve is important in any situation; in joint agency collaboration, there is the possibility for large groups of people to be involved in the effort, which can be less efficient and more difficult to manage. Determining who is essential to each part of the project is key to managing the process and effectively moving solutions forward. Balance your interest in inclusiveness with interests in having productive working meetings. Kaizen process-improvement events, for example, should be scoped to have a manageable number of participants in the room (typically, 8-12), but with enough perspectives to provide valuable input. Stakeholder engagement and agency in-reach can be valuable ways to gather additional perspectives before and after key milestones during the process-improvement

efforts. If relevant to your project, consider the balance of state and EPA participation as well as the geographic diversity of participants.

E-Enterprise Air Emissions Project – A Multi-Agency Solution to a Systemic Data Constraint

The E-Enterprise Combined Air Emissions Scoping Project provided an initial review of resources necessary to reduce industry burden for air emissions reporting across four point-source reporting programs. The goals included improving timeliness and transparency of data, creating consistent information sharing between programs, and improving data quality and accessibility – all to support timelier decision-making across jurisdictions. The team conducted a Lean value stream mapping event that included experts from state and local agencies, four EPA programs, and three members of the regulated community. Using this three-day Lean event, the team was able to develop detailed value stream maps for each program (the "as-is" architecture) and begin discussing a future "to-be" state to accomplish the project goals.

This is an early example of E-Enterprise defining a problem and providing early engagement of EPA, state, local, and industry partners to solve a systemic problem across the enterprise. The problems identified by this team have been discussed by states for many years but the only way to improve the overall data process was to tackle larger issues at the national level first.

Tips for Process Improvement and Implementation

- **Establish a point of contact for each agency involved**. Different agencies have different lines of authority, which could further make communications and follow-through more difficult or nuanced. Having a point of contact for each agency involved in the effort can help create clear lines of communication between agencies and create accountability within individual agencies.

- **Establish multiple team leaders for joint events/projects.** For projects affecting a joint process between two or more agencies (e.g., a state-EPA process), having two team leaders from representative agencies (e.g., one from EPA and one from a state/tribe) can provide extra accountability for implementation tasks and results. For projects focused on one agency's process that include outside perspectives from other agencies (e.g., a state project with EPA involved as a "customer"), this is less important.

- **Use in-person meetings at key points in the process**. Lean events and key meetings are best conducted in person when possible. While internal agency process-improvement efforts sometimes encounter this, it is very likely that people in multi-agency efforts will be in different locations.

- **Use IT solutions to aid collaboration during process-improvement efforts.** IT can facilitate communications among agencies during all parts of process-improvement projects, from scoping to implementation and follow up. For example, IT could provide a way of sharing documents and tracking tasks online.

- **Use MVPs to scale solutions and address different needs**. When multiple agencies are involved, the scale of process improvements can be even larger than within one agency. The use of MVPs in projects can be a useful way to test potential solutions that affect agencies (or programs within them) with different needs. Smaller scale implementation of process improvements and/or IT solutions allow for making adjustments prior to full-scale implementation.

- **Continue collaboration efforts during implementation and once you move into operation and maintenance**. Coordination during the implementation period for improvement projects is just as important as coordination during the identification and planning for those changes (e.g., during Lean events or project team meetings). Furthermore, once an IT system is in operation, the need to collaborate between partners does not end. Continuing to work together on messaging, outreach, and maintenance needs will ensure that systems are integrated and used across the enterprise.

Overall Coordination Tips

- **Consider agency differences**. Identify key differences in agency culture, structure, and decision-making, and design your project to mitigate weaknesses and play to the strengths of each agency. When identifying relevant agencies to work with during process improvements, be mindful of differences in agency structures across jurisdictions. For example, many states have separate environmental and health agencies, but others have a single agency, which may affect how programs are structured and who their stakeholders are. Many state governments also have centralized IT resources, which may require additional coordination. Tribes may also have different considerations based on what programs they have been delegated and varying levels of IT support.

- **Consider replicating your efforts.** Consider how your Lean and IT improvement efforts may benefit other agencies. Consider sharing the results and process changes with other agencies that your agency works with or that you know work on similar processes. Identify a point of contact for your project that would be willing to answer questions about the project after it is completed.

While multi-agency collaboration can require more attention and coordination than improvements within an agency, there are greater potential benefits that can be gained. Coordination with other agencies can help broaden the resources available and perspectives involved in an improvement project, ultimately providing the opportunity for more successful solutions for multiple agencies. Using collaboration for relevant Lean and IT improvements can increase the effectiveness of these activities and thereby improve environmental protection and operational results.

Chapter 8: Conclusion

We hope this Toolkit will help your agency in its efforts to operate more efficiently and effectively to protect human health and the environment. Combining Lean thinking with IT solutions allows agencies to maximize the performance gains possible from using either improvement strategy in isolation. This Lean and IT Toolkit offers guidance, tools, and tips for environmental agencies on that journey.

We envision this to be a living document that can be updated over time to help environmental agencies achieve the next level of improved environmental performance, customer service, and efficiency. We invite you to share your feedback on the toolkit and your experiences using Lean and IT to improve the efficiency and effectiveness of agency programs and processes.

For more information or to share your experiences, please contact any of the following individuals:

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Beth Graves	**Shana Harbour**
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www.ecos.org (202) 266-4923 bgraves@ecos.org	www2.epa.gov/e-enterprise (202) 566-2959 harbour.shana@epa.gov

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Appendix A: More Information on Lean

What Is Lean?

Lean is an improvement approach and set of methods that can dramatically enhance the speed, quality, and transparency of processes by eliminating all forms of non-value added activity or "waste." Lean eliminates unnecessary time and process wastes, such as backlogs, rework, and errors (see Table 1 for additional examples). It is often said that Lean is "common sense uncommonly applied." Environmental agencies have used Lean thinking to improve all kinds of agency processes, ranging from permitting and enforcement processes to administrative processes such as communications, hiring, and grants.

Wastes	Examples
Defects	Errors in documents, unclear workflows for data QA/QC, redundancy in data checking at various points in the process
Over-production	Unneeded reports or copies, excess email or other communications, doing unnecessary work
Waiting	Work waiting to be reviewed, approved, and forwarded to the next step; time spent researching or searching for something; data sits in physical files waiting to be digitized
Non-utilized Resources	Under-utilizing staff skills and idea, purchasing technology that rarely or never gets used
Transportation	Conducting field visits rather than using remote technology to identify issues, unnecessary routing of documents, unnecessary staff travel
Inventory	Backlog of work, excess email messages, too much information stored on local drives
Motion	Staff spending time looking for needed files, data, or supplies
Excess Processing	Transactions capture more information than necessary, providing more detailed documentation than needed

Table 1: Examples of Waste Types, as Tailored for Government Agencies

Lean is powerful because it does the following:

- Involves cross-functional teams in process-improvement efforts.

- Uses data about how processes actually work to guide decisions about improvements.

- Takes a "whole systems" approach to process improvement.

- Emphasizes simple, high-impact solutions over expensive, time-consuming solutions that may be less cost-effective.

- Enables agencies to deliver higher quality products and provide better service to customers by focusing on what matters and eliminating unnecessary activities.

- Focuses action in concentrated "bursts" of activity, as well as supports a continual improvement culture of eliminating waste.

- Empowers employees to identify and implement solutions that will make their work easier.

There are other names for "process improvement" (e.g., quality improvement). Lean is the current state of the art for how many agencies are doing process improvement, but there are many specific approaches with which to do process improvement. Especially when beginning a Lean initiative, organizations often hire outside consultants to provide facilitation support for Lean events and projects. As organizations develop internal capacity for implementing Lean, this need for outside assistance typically decreases.

Key Lean Methods

Lean is often implemented in short bursts of activity known as events, which typically range from one to five days. These events typically place an emphasis on actions that can be completed and show results relatively quickly. (Some agencies break up implementation of Lean events into multiple periods rather than focused events, although this can be less effective at generating rapid results.) In addition to Lean events, Lean has other methods for solving problems agencies face, including fixing disorganized or messy work areas or developing new software products to meet a particular need. Lean also encourages people to identify waste and solve problems as part of their daily activities, supporting "Just Do It" process-improvement activities. Examples of Lean methods include the following:

- **Value stream mapping events** are periods of up to three days during which a team of participants maps out an entire process in detail from beginning to end, identifying areas for future process-improvement efforts. This method provides a high-level understanding of the process, from a big-picture, strategic perspective, and identifies specific opportunities for improvement.

- **Kaizen events**—also called rapid process improvement events—focus on eliminating waste in a system or process, improving productivity, and achieving sustained improvement. They are a 3-5 day facilitated, team-driven improvement event (or 1-2 day "mini-Kaizen event") in which teams map the current process, identify areas of waste, prioritize and begin to implement improvement opportunities, and map a new, improved process. In some cases, "mini-Kaizen events" lasting one to three days may be used.

- **5S** is a method for maintaining a clean and orderly workplace based on five steps: Sort, Set in order, Shine, Standardize, and Sustain. It can be implemented by individuals or by teams.

- **Agile Development** is a structured methodology for software development that incorporates Lean concepts. Agile uses quick "sprints" of development where staff are encouraged to develop and test out increments of a software system as they go. In the traditional ("waterfall") system development approach, all requirements are defined up-front and completely built into the system design and implementation; this approach does not respond well to changes to or identification of new

requirement or new technologies. Related methods include **scrum,** which focuses on a "plan-do-check-act" cycle for IT project management.

- **Visual project tracking boards.** Visual tracking boards are sometimes called **kanban boards** (kanban means "signal") when there are limits placed on how many projects can be in each stage of the software-development cycle.

- **A3** is a tool that follows the basic plan, do, check (or study), and act cycle to help individuals or teams solve a problem. The name A3 name comes from the size of paper (11 x 17 inch) used to document the problem-solving process. Steps in the A3 process include defining the problem, reviewing data, documenting the current state and target state, identifying root causes and solutions, and tracking the implementation plan. A3s also aid in communicating about the project.

- **Six Sigma** is a process improvement methodology that aims to improve processes by reducing variability and removing defects (or errors) using quality management methods including statistical analysis of processes. Six Sigma improvement efforts follow the **DMAIC** methodology, which includes these five steps:
  - o **Define** the problem
  - o **Measure** key aspects of process data
  - o **Analyze** the data
  - o **Improve** or optimize the current process
  - o **Control** the future state process to correct any deviations

The above list is not comprehensive of all available Lean methods. Moreover, these methods can be combined based on project needs (e.g., Lean project teams can use Six Sigma analysis in Lean events; project teams also can use A3s to communicate the results of Lean or other process-improvement projects. In addition, agencies can apply "Lean thinking" concepts to streamline processes (i.e., analyzing processes to identify and eliminate wastes) outside of formal Lean events or projects. The EPA Lean Government Methods Guide has more information on Lean methods, how to implement them, and how to select Lean methods appropriate to the situation your agency faces.

Appendix B: Lean Government, Lean IT, and E-Enterprise Resources

This Appendix lists websites, publications, and books related to Lean government, Lean methods (including Lean Startup, Lean process-improvement methods, and Agile development), Lean IT, and the E-Enterprise for the Environment Initiative.

I. Lean Government Websites and Resources

    a. EPA's Lean Government Website and Toolkits (focused on help environmental agencies to use Lean to improve the efficiency and effectiveness of their processes): http://www.epa.gov/lean/government

- The Lean in Government Starter Kit

- The Lean Government Primer, "Working Smart for Environmental Protection"

- Lean Government Event Scoping Guide

- Lean Government Methods Guide

- Lean Government Metrics Guide

- Lean Leadership Guide

- Lean in Air Permitting Guide

- The Resource Guide to Effective Utility Management and Lean

    b. State Lean Government Websites (partial list):

- Colorado Department of Public Health and Environment Lean website: http://www.cdphelean.info/home

- Colorado Lean and Performance Improvement Tools: https://sites.google.com/a/state.co.us/colorado-performance-management/performance-planning-and-lean

- Lean Connecticut website: http://www.ct.gov/opm/cwp/view.asp?a=4595&q=538306&opmNav_GID=2162

- Connecticut Department of Energy & Environmental Protection Lean website: http://www.ct.gov/deep/cwp/view.asp?a=2699&Q=455414&deepNav_GID=1511%20

- Iowa Office of Lean Enterprise website: http://lean.iowa.gov

- Maryland World Class Consortia and Lean Government website: http://mwcmc.org/leangovernment

- Michigan Lean Consortium (public and private) website: http://michiganlean.org/

- Minnesota Continuous Improvement website: http://mn.gov/admin/lean/

- New Hampshire Lean website: http://lean.nh.gov/ (Case studies at: http://lean.nh.gov/ProjectCaseStudies.aspx)

- Lean Ohio: http://lean.ohio.gov/

- Oregon State Lean website: http://www.oregon.gov/DAS/TRFM/Pages/goinglean.aspx

- Rhode Island Office of Management and Budget Strategic Planning/Lean Resources webpage: http://www.omb.ri.gov/strategic/#section1

- Washington State Lean website: http://www.results.wa.gov/what-we-do/apply-lean

- Washington State Department of Ecology Lean website (government and manufacturing): http://www.ecy.wa.gov/about/lean/

- Wisconsin State Lean website: http://walker.wi.gov/wisconsin-priority/reforming-government/Lean-Government

- Wisconsin Department of Natural Resources Lean website: http://dnr.wi.gov/about/lean.html

II. Books and Resources on Lean, Lean IT, Agile, and Lean Startup

a. Lean Thinking and Lean Office

- George, Michael L. *Lean Six Sigma for Service: How to Use Lean Speed & Six Sigma Quality to Improve Services and Transactions.* New York: McGraw-Hill, 2003.

- Martin, James William. *Lean Six Sigma for the Office.* Boca Raton: CRC Press, 2009.

- Martin, Karen. *Kaizen Event Planner: Achieving Rapid Improvement in Office, Service, and Technical Environments.* New York: Productivity Press, 2007.

- Miller, Ken. *We Don't Make Widgets: Overcoming the Barriers that Keep Government from Radically Improving.* Washington DC: Governing, 2006.

- Venegas, Carlos. *Flow in the Office: Implementing and Sustaining Lean Improvements.* New York: Productivity Press, 2007.

- Womack, James P. and Daniel T. Jones. *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. New York: Simon & Schuster, 1996.

Note: For additional resources, see the books, articles, and websites included on EPA's Lean Government publications webpage: www.epa.gov/lean/government/publications.

b. Lean IT

- Bell, Steven C., Charles T. Betz, and John G. Schmidt. *Run Grow Transform: Integrating Business and Lean IT.* New York: Productivity Press, 2012.

- Bell, Steven C. and Michael A. Orzen. *Lean IT: Enabling and Sustaining Your Lean Transformation.* New York: Productivity Press, 2011.

c. Agile Development

- Manifesto for Agile Software Development, 2001, www.agilemanifesto.org.

- Sutton, James and Peter Middleton. *Lean Software Strategies: Proven Techniques for Managers and Developers.* New York: Productivity Press, 2005.

d. Lean Startup

- Ries, Eric. *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses.* New York: Crown Business, 2011.

- Lean Startup Lessons Learned Blog, 2015, http://www.startuplessonslearned.com/.

III. Other Lean and Continuous Improvement Resources

a. Lean Enterprise Institute, www.lean.org (includes a discussion forum on Lean government)

b. National Association of County & City Health Officials (NACCHO), *Roadmap to a Culture of Quality Improvement,* http://qiroadmap.org/

c. Public Health Quality Improvement Exchange (PHQIX), https://www.phqix.org/

IV. E-Enterprise for the Environment Resources

a. ECOS E-Enterprise Website: http://www.exchangenetwork.net/e-enterprise/

b. EPA E-Enterprise Website: http://www2.epa.gov/e-enterprise

c. ECOS E-Enterprise Fact Sheet: http://www.exchangenetwork.net/ee/EEnterprise_What_it_is_Why_it_Matters_July2014.pdf

d. E-Enterprise Blueprint Executive Summary: http://www.exchangenetwork.net/ee/EEnterprise_Conceptual_Blueprint_013114_Executive_Summary.pdf

Appendix C: Case Studies

Case Study: Massachusetts Department of Environmental Protection Enterprise-wide Data Management System

Project Description

The Massachusetts Department of Environmental Protection (MassDEP) is preparing an initiative to develop an enterprise-wide data management system called the Energy and Environmental Information and Public Access System (EIPAS). EIPAS will support permitting, compliance, and enforcement operations across the Massachusetts Energy and Environmental Affairs secretariat. In order to design one information technology (IT) solution for a wide variety of programs, procedures, and operations, MassDEP focused on streamlining, standardizing, and aligning procedures across all MassDEP programs as much as possible (e.g., looking for similarities and taking action to minimize differences). MassDEP used Lean and other process-optimization techniques to document current practices, identify opportunities to streamline, and simplify processes in anticipation of implementing online permit filing and other applications that will constitute the first phase of the EIPAS data management system.[6]

Project Goal

The goal of this project is to streamline and, where possible, standardize core agency-wide program processes so that the new IT system will:
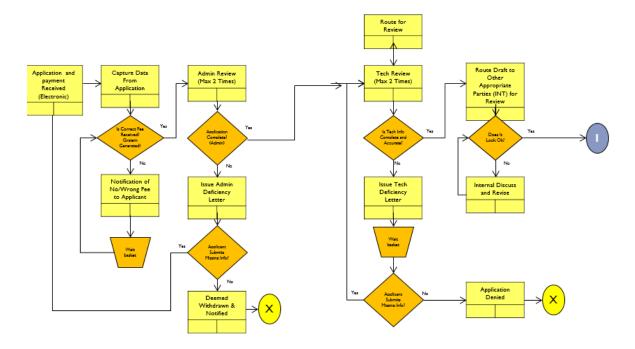
1. Implement new technology solutions for efficient and useful processes (rather than codifying old, inefficient processes in the new system);

2. Provide a roadmap for future MassDEP technology development (e.g., the addition of new permit types, content areas, or user applications);

3. Provide an enterprise-wide solution with long-term utility (e.g., develop flexible solutions that can be leveraged across regulatory programs and agencies).

Process Improvement Efforts

Overview of the Process: MassDEP started the planning process by developing an inventory of select key agency processes and programs. It applied a prioritization scheme to select processes and programs for initial study and then focused more closely on a selected set of processes. MassDEP started this effort by holding detailed agency process-optimization workshops (APO Workshops, which are similar to Lean events) for air and groundwater permitting processes. The workshop results included recommendations for process improvements before the

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[6] MassDEP uses the term Agency Process Optimization (APO) to refer to its process-improvement efforts that use Lean and other techniques.

development of the EIPAS system, as well as documentation of workflow processes. MassDEP then began an "assimilation" process by duplicating the core elements of the workshop experiences with shorter and simpler consultation sessions on each of MassDEP's permits/affirmative authorizations. After these consultation sessions, MassDEP was able to categorize over 300 permits into eight permit "families" or types, each of which has an associated workflow. MassDEP also collected documents that could be standardized into enterprise-wide templates (e.g., emails that acknowledge receipt of an application). Additionally, the workshop output led to recommendations for process improvements that could be implemented both before the EIPAS project is constructed, and throughout its construction.

Standard Permit Workflow (Future State)

Specific Lean Activities: Once MassDEP selected the target of the process optimization workshop, project scoping was done in detail and MassDEP developed a scope document for each workshop to clearly define what was in and out of scope for the event, the objective of the event, personnel involved, and the anticipated goals or outcomes from the event. The APO workshops used problem-solving techniques consistent with Lean thinking, including:
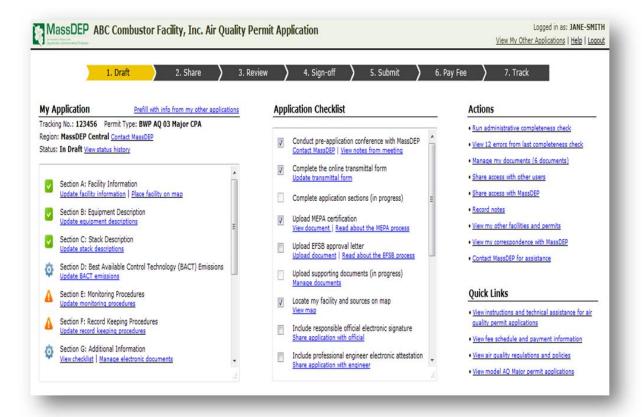
- Mapping existing and future workflows including rework loops,

- Identifying pain points (this serves as a list of opportunities for improvement),

- Brainstorming solutions,

- Creating an affinity map between opportunities and potential solutions,

- Conducting a benefit/effort analysis, and

- Developing an action plan.

One additional workshop employed an expanded set of planning and management tools, including affinity diagrams, interrelationship diagraph, necessity/feasibility grid, tree diagrams, application of a prioritization matrix, development of a planning matrix and contingency plan, and an activity network diagram.

The consultants with whom MassDEP worked on the project also trained in-house agency facilitators in the tools and techniques needed to effectively manage these workshops.

Process Changes and Results

The implementation of the action plan, referenced above, resulted in recommendations to agency leadership for improvements to MassDEP permitting processes and agency-wide agreement to adopt a standard workflow. These results were captured in workshop documentation that will inform development of the IT solution. The results of the optimization workshop process were a combination of procedures that had been streamlined or optimized, new templates or forms to streamline correspondence, and recommendations for IT solutions to support the new optimized processes.

Sample EIPAS Online Permit Screen

Lessons Learned

- **Change Management.** Early on, MassDEP discovered that change management and active support for proposed changes from all levels in the agency were critical to the success of the agency optimization process and achieving desired outcomes, particularly when IT solutions were slow to develop (and those

solutions would have "enforced" the process changes recommended from the optimization effort). In MassDEP's experience, the key elements of an enterprise-wide change initiative are:

- o Strong and unwavering support from the executive level down through the agency for the optimization initiative, emphasizing *why* the changes that will result from the workshops are essential to the agency, and that all identified programs must invest the required time to make the effort a success.

- o Consistent and ongoing communication from the optimization team to executive leadership that provides details and progress updates to inform the top down message. Examples of the messaging included: how the workshops will be run; how to be prepared for interactive sessions; helpful information and documentation in advance of the meeting; and recognizing "wins" and publicizing progress made after workshops are completed.

- o Reinforcement following workshop completion to ensure adoption of any recommended changes. This includes executive level announcement of any significant process changes, and wide circulation of workflows (that will be adopted upon implementation of the IT system) for review, inspection, feedback.

- o Workshops should be led by a trained and neutral facilitator. Given that participants will have varying perspectives on the work at hand and pre-conceived notions of how the results should be shaped, facilitators must elicit the varying and often conflicting perspectives while also keeping those natural tensions at a productive level. This is a skill not everyone has. Further, when MassDEP did use its own expert facilitators, it did its best to ensure they were not an "interested party" to the outcomes.

- **Plan Enough Time for Workshops**. Initially, MassDEP implemented a "Lean-light" process in the interest of time and resources, but staff soon discovered that if the workshops were too short (e.g., 2 days), the project team had to spend considerable additional time after the workshop finalizing the details of the action plan and getting agreement from the participants to that plan. MassDEP tested out a longer workshop with an entire day devoted to work on the action plan and had much better results: significantly more support of the outcome and faster implementation of solutions.

- **Optimize Before Automation:** IT solutions are frequently recommended as an outcome of process-streamlining projects as agencies shift away from manual handling of paper documents to more efficient electronic document submittal and communications. Lean projects can help to optimize the IT solutions by (1) prioritizing the IT development cycles and (2) scoping and consolidating user needs in a way to optimize the IT solution across the enterprise.

- **Take Conscious Effort to Manage Workshop Scope:** It is important to keep workshop participants focused on the "what," not the "how." Frequently when IT solutions are developed from a Lean process-optimization activity, participants tend to develop detailed design requirements for the IT solution rather than defining the objective of the IT solution and letting the IT designers decide how best to achieve that objective. The end result of creating detailed design requirements can be an IT solution that is immediately outdated or a solution that is awkward and does not consider or use the full scope of services IT could deliver.

- **Preparation, Preparation, Preparation**. MassDEP was surprised at the level of effort required to prepare for the multi-day workshops. First, creating and gaining consensus of a meaningful Workshop Scope Document that clearly depicted the boundaries of the workshop focus, the participants, the workshop methods, and the expected outputs can be painstaking work. Secondly, the planning of logistics for the workshop is complex. Fortunately, MassDEP worked closely with its consultants on the pilot optimization efforts. Achieving meaningful results from the workshops requires carefully sequencing and preparing a number of group exercises; each group exercise requires planning and, in most cases, preparing the room so the workshop team can quickly tackle each exercise.

Implementation Status

MassDEP has completed several process optimization workshops and identified associated process improvements, as discussed above. Most of the IT solutions have yet to be implemented. Delay in development of the IT solutions was not anticipated, and these delays have led to some erosion of support for additional analysis of process improvements.

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Case Study: Wisconsin Department of Natural Resources Water Program E-Permitting System Development Process Description

The Wisconsin Department of Natural Resources (DNR) Water Program created an automated system for electronic permit applications (e-permitting). This system allows permitees to apply online and track the progress of their application through the WI DNR system. The system also tracks the permit for internal staff to ensure that applications are reviewed and addressed in a timely fashion and can be routed to the appropriate staff contacts.

Problem Statement and Goals

For close to ten years the WI DNR received requests from customers and key stakeholders to improve the permit application process. Permit applicants found the process cumbersome and confusing, often with multiple pages of similar information to complete. Staff required to review the applications often had to request corrected information from applicants, increasing workload and overall review time for an application. In 2011, the DNR made the decision to move permitting to an online system to address the following goals:

- Reduce the overall number of documents required and information requests for permitees.

- Reduce the review time for any given permit. This includes reducing the amount of effort required to track down missing, incomplete, or incorrect information from permitees.

- Provide transparency to permitees on the application process ("Where in the process is my permit?")

- Notify internal staff of permit status to ensure each review step was completed.

The WI DNR is divided into six offices – five regional field offices and a centralized headquarters – and the agency did not have formal internal documentation for how different permits should be collected, processed, and reviewed. This meant that while staff assumed they were processing applications in a similar fashion, there was a wide variety in the steps and actions taken between each office. Staff recognized that these differences needed to be addressed prior to the development of an automated system and Marjorie Damgaard, as the project manager, initiated a process to identify areas of waste within the current process prior to the final development of a SharePoint e-permitting system.

Process-Improvement Efforts

This project focused on permits in the DNR Water program. Within the water department there are six different program areas, each with anywhere from **80+** different types of permit activities. The first step for the agency was to create consistency across the program and normalize steps within the permit process. DNR staff used the

following tools to gather permit workflow information and identify common steps and areas where specific guidance would be necessary to get everyone on the same page.

- Meetings were held with each regional office to collect their permit workflow information. This information was fed into an agency-wide process flow map.

- Swim lane diagrams were developed to identify the "who, what, and when" of the permit process. This provided a broad picture of who reviewed each permit type during various steps in the process and how the permit moved from one person to the next.

- Areas of consistency were highlighted, especially when there were slight differences that were easy to address.

- Staff identified important "touch points" with a permit that needed more substantial improvement. These included updated forms, standardized tasks in the permit workflow, and the ability for agency management to run broad reports on permit applications.

This process was successful because of the mix of staff included from the beginning including staff that were experts in the business process for each permit type, managers, technical experts, legal staff, and early engagement with the public and key stakeholders who would eventually use the IT solution developed for permits. The agency used online meeting software to aid meetings where staff were spread out across the state in combination with in-person meetings when possible. This level of communication was very important internally to help reduce the fear and uncertainty staff may have with a new system and to ensure that they felt their voices were heard in the process, even if every staff suggestion was not included in the final product. In the end, one of the most important pieces of the staff puzzle was a strong,

> The Wisconsin E-Permitting System provides a web-based portal that includes:
>
> - Online forms for over 80+ water activities
> - Agency-wide communication
> - Multiple-program collaboration between state program areas like Wastewater, Aquatic Plant Management, CAFO, Stormwater, Waterway and Wetland, and the Office of Energy.
> - First in the DNR to offer eSignature, ePayment and dual agent/landowner review
> - First to offer a mapping component
> - Diverse solution-focused team

dedicated manager that was bought into the overall improvement of the permit process. This person provides leadership when staff requires an outside voice to help navigate logjams and make key decisions that affect multiple program areas.

Once SharePoint was identified as the IT solution for e-permitting, the agency continued to meet frequently with internal staff responsible for reviewing permits to ensure feedback was collected on the tool and provided multiple opportunities to train staff to get them comfortable using the tool. One barrier to adoption of the e-permitting systems was that it was new for staff and their comfort level with technology varied. Providing drop-in sessions and as-need technical help removed this barrier to adoption and allowed staff to get comfortable so that they could then explain the system adequately to permitees. The agency also provided webinars for tool users that provided detailed explanations of how to apply for a permit electronically and time for questions as needed. DNR staff continue to attend related conferences and other meetings where they can provide an

overview of the e-permitting tool and how it works to audiences that may not be aware or completely comfortable using the new system.

SharePoint allowed the agency to connect and optimize existing legacy systems within each program area. The upfront work to document the overall permit workflow, identify efficiencies, document standard operating procedures, and clarifying roles and responsibilities were also relatively easy to build into the SharePoint tool. SharePoint provides some out-of-the-box tools for workflow development and form creation, but DNR did hire a SharePoint specific programmer to help build the customizations needed for their system. This included addressing payment requirements during the permit application process and the development of metric reporting dashboards for internal managers.

SharePoint does have some drawbacks when it comes to browser compatibility and user interface. These were addressed with detailed how-to guidance on the e-permitting website in both written and video format *(http://dnr.wi.gov/permits/ water/getStarted.html).* SharePoint allowed the Water department to create a modular e-permitting tool that could be easily adapted and customized for each permit type as it came online. The system started with just a few permit types that were forced to use the new tool. Their success has prompted numerous different programs and permit types to join the online system with new programs asking to join the system on a quarterly basis.

Project Scoping Checklist

The initial project scoping and information gathering used the following steps:

1. Contact the appropriate staff to gather information on how permits were submitted and process. For this process, a common template was created to gather this information initially from staff via email.

2. Begin to map the business side of the permit process – what information is needed at each step of the process.

3. Bring in IT expertise early in the mapping process so that the IT solution is in sync with the business process improvements.

4. Develop a decision document that is the start of a framework for the features and functions built into the e-permitting tool and helps identify the highest priority needs. This document also serves as a record of decisions made for reference if needed which improved overall communication between staff.

   - The decision documentation also became helpful when there were state legislative changes that came up during the tool development.

5. Develop a user acceptance training environment for both internal and external users. For external users, testing was encouraged early and often to gather essential feedback and encourage them to feel ownership of the tool they will eventually use.

Process Changes and Results

The business process improvements for water permitting helped reduce overall general permit application review from 30 to 15 days and individual permit review from 105 to 52 days. The development of the SharePoint e-permitting system allows the agency to track impacts on permit due dates and automatically notify staff of requirements for public hearings, public notice holds and weather extensions. After an initial start with a few specific permit types, there are now over five different categories of permits accepting applications through the online web-portal with many more categories of permits are requesting to be included requesting use of the tool over the next year. The number of permits that can now be processed in a 90-day period has gone up drastically.

The e-permitting system also allows managers to run complete dashboard reports on the status of individual permits to help keep permits moving through the system, reassign permits to maintain staff workload balance, and to the extent possible prevent a permit from presumptive approval because it was not reviewed in a timely fashion. The system addresses document retention and storage requirements at the state level and allows Freedom of Information Act (FOIA) and other information requests to be completed quickly with less burden on staff.

The goals of the e-Permitting system includes transparency for our customers and allows the public to track the status of a permit application as well as allows them to print documents, save to their hard drive or share content with others. This further reduces or eliminates the need for DNR employees to follow up on requests and instead allows them to focus on processing permit applications.

Implementation Status

The WI e-permitting system is fully online for most of the permits in the water agency. The next step is to determine if it is possible to share any of the knowledge gained in the development of the SharePoint modules with other states using SharePoint internally.

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Case Study: EPA Region 1 Improvements to the Lab Purchasing Process

Process Description

EPA Region 1's New England Regional Laboratory has completed a process improvement effort on its lab purchasing process. This encompasses any purchases that do not require a formal procurement process, from sample bottles to chemicals used in the lab.

Problem Statement and Goals

Prior to this project, the lab routed hardcopy purchasing orders manually from origination to approvals. There were different decision trees depending on the order (e.g., if an order was for a chemical it had to go through the Health & Safety Officer; if it was an IT order, then it had to get approved by an IT person, etc.). As the purchase order moved through its approval process, there were bottlenecks where the document was held up at different points in the process. Tracking the document in the process was difficult and often required the staff person placing the purchase order backtracking through the system to determine its status. This process was inefficient, with many duplicate purchases for a single item often being placed during a short period. The process was also unevenly distributed across the year, with bottlenecks during peak ordering months.

The lab's goals for this process-improvement project were to:

1. Simplify, clarify and streamline the purchase-order process so that the staff person placing the order could efficiently determine where the request was in the approvals process and when the order received approval.

2. Develop a standard, electronic order, approval and tracking system.

3. Reduce the number of individual purchases by 20 percent by setting up a visual inventory system (bundling purchases).

4. Evenly distribute purchasing workload across all months of the fiscal year.

Process-Improvement Efforts

The lab initially identified an IT-related solution that would reduce the need for paper forms, but realized the need to Lean the process first to streamline the workflow. The lab decided to use a Lean value stream mapping event to allow a project team to better understand the process and identify ways to improve it. During the Lean event, the project team mapped the process with different color sticky notes, analyzed the process map to develop streamlined procedures, and identified process changes to simplify and reduce the inefficiency in the process. After the event, the team met monthly to check on implementation status of the solutions.

> Once the lab identified the problem, the project team initially developed an idea for an IT-based solution to "fix everything," but the team quickly figured out that they needed to streamline the process first.

Current Process Map

Future Process Map

The team for this improvement project included several lab staff who were involved in various parts of the process, from the staff that placed the purchase orders to those who were responsible for approving the orders on different levels. In addition, EPA also had internal facilitators and an IT staff person involved to guide the improvement process and help implement the solutions.

Process Changes and Results

The Lean event and improvement process helped to reduce the complexity of the process, and eliminate inefficiencies and redundancies through the following changes:

- Some shifting and clarifying of roles and responsibilities: For example, 508 compliance research used to be sent on with the purchase order for those later in the process to complete, but instead now the purchase originator did the 508-compliance research. They also determined who would cover responsibilities while someone was out of the office to reduce bottlenecks.

- In addition to improving the process when someone would initiate a purchase order, the team also implemented a visual inventory system to reduce the total number of orders. If a certain supply gets below a certain level, this visual cue indicates to staff to reorder supplies (with a threshold of how much to reorder depending on shelf life (e.g., of chemicals)).

Metric	Old Process	New Process	Percent Change
Days to complete an order	12	5	↓60%
Number of Process Steps	27	16	↓40%

Results are anticipated based on the new process design.

The team further enhanced the efficiency and effectiveness of the process by converting the hard copy order forms and manual process to an electronic process. Specific changes in the first phase included:

- Developing an electronic PDF form:

    o They developed an electronic PDF form that originator fills out. Instead of routing a hard copy manually, now the PDF form is routed via email. This incremental improvement provided some clarity for staff to follow up with where the purchase order was in the process (as the lab staff could know where it was emailed to and track that).

- Improving the record-keeping system:

- They also enhanced a record keeping system by purchase order – once the supplies were ordered, the system automatically sent an email to the staff person who placed the purchase order so they would know the supplies had been ordered which was an improvement on the previous process of relying on word of mouth.

The next planned IT solution to aid the earlier process improvements is to develop a SharePoint workflow system:

- The SharePoint website will allow all parties involved in the purchase to see who has it and when it is approved.

- It also provides an audit trail and tracking system because the forms will be stored in a database versus individually (in paper or electronically). Currently, even with the fillable PDF forms, the approving official still keeps their own spreadsheet of all of the orders. The SharePoint site will provide this functionality without the additional work to update a separate spreadsheet.

- In the current PDF forms, there is a decision-tree document that shows how the forms should be routed via email. In SharePoint, this will all turn into the automatic workflow based upon the boxes that the user checks.

Both the automatic reordering and converting the handwritten manual routing process into the initial iteration of the electronic process has improved the lab purchasing process. As a result of the implementation of these improvements, errors in the lab purchase forms have been reduced by 50 percent. The SharePoint workflow is expected to streamline the process further.

Implementation Status

The SharePoint solution should be implemented in fall 2015, after which the team will be able to analyze the effectiveness of the new process and IT system.

It is possible that the lessons from this process-improvement effort and/or the SharePoint solution itself could be used by other EPA labs to improve their purchasing processes.

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Lessons Learned

- It was useful to have the team focus on the root causes of the problems and then identify solutions to address those root causes, rather than just trying to create an electronic version of the current process.

- Involve IT early and often. IT likely will not fix all of the solutions – you have to improve the process itself as well. Having IT staff involved provides information for where it can be a solution in conjunction with other improvements.

Case Study: EPA Region 7 Improvements to the Concentrated Animal Feeding Operation Inspection Reporting Process

Process Description

EPA inspects concentrated animal feeding operations (CAFOs) to evaluate their compliance with federal environmental laws. Poorly managed facilities have the potential to pollute the nation's rivers, lakes, streams, and groundwater. EPA Region 7 Environmental Services and Technology Division (ENST) performs 45-50 inspections at CAFO facilities each year to assess compliance with Clean Water Act requirements. ENST/ Environmental Field Compliance Branch (EFCB) completes a report for each inspection and provides it to Water, Wetlands, & Pesticides Division (WWPD)/Water Enforcement Branch (WENF) and Office of Regional Counsel (CNSL) to form the basis for enforcement cases; therefore, it is imperative that they be accurate and timely. The WENF Compliance Officer reviews the report generated by ENST/EFCB and makes the declaration that the report is "Complete & Final".

Problem Statement and Goals

The process-improvement efforts sought to address the following problems:

- Late reports from inspector into the process. Prior to the process-improvement efforts, a majority of inspection reports did not meet the benchmark timeframe (30 days for non-sampling inspections and 60 days for sampling inspections.

- Some reports lacked necessary evidence for enforcement due to the inspector's lack of clear expectations prior to conducting the inspection.

- Late identification of targets hampered inspector's preparation and ability to collect information necessary for enforcement determinations.

- Accuracy – the CAFO law is evolving and what the inspectors need to collect for the attorneys can vary depending on the specific situation and site. Sometimes the Region was not collecting some of either the right information or enough samples.

- The process required the EFCB Branch Chief to review "first draft" reports that may contain numerous errors.

- Coordination of hard copy reports flowed through the Records Center (e.g., to scan photos, maps, etc. and make available electronically) resulting in high transaction times and many records.

The goals of this project were to decrease the number of late CAFO inspection reports, improve the quality and completeness of those reports, streamline the review/coordination process, and eliminate draft report hardcopy records.

Process-Improvement Efforts

EPA Region 7 focused on improving the CAFO inspection report development process by using Lean methods to map the process and identify potential solutions (including IT solutions). Most of the changes were designed to develop better quality reports during the development phase and streamline sharing/reviewing the reports with WENF/CNSL.

The team used several Lean approaches. First, they held a facilitated 5-day Lean Kaizen event during which the team created:

- "As is" (or "current state") process mapping to understand the steps, time involved, and wastes in the current process.

- "Future state" process mapping to design a new, streamlined process.

- Fishbone diagrams to analyze root causes of problems.

Fishbone Analysis for the CAFO Inspection Reporting Process

The Lean facilitator then held a mini-Kaizen event with the inspectors to examine the finer details of how inspectors write reports, which was the one part of the process that the team did not focus on during the 5-day Lean Kaizen event. They used Appreciative Inquiry (AI) to focus on the positive aspects of the process and determine how to implement those in a systematic way (e.g., instead of asking what was not working, they focused on examples of reports that worked well and identified what made them successful in order to replicate this.)

Following these Kaizen events, the team held regular, monthly team meetings to review progress and keep the project moving forward.

Process Changes and Results

Based on the Lean events, the EPA Region 7 project team made several process improvement changes to meet the goals of the project:

- The team instituted formal pre- and post-inspection meetings with EFCB/WENF/CNSL to ensure targets are identified sooner and that they are properly scoped with common expectations for the inspection and final report. They established a simple pre-meeting and post-meeting checklist of topics to cover during these discussions. The post-meeting also allows the staff to fast track an inspection report if there are high priority concerns with a site, allowing for prioritization of reports.

- The team added a "stepped" review process for the draft reports to improve the quality of the reports reaching the EFCB Branch Chief to allow for a faster release of the report to WENF. Previously the draft reports would go directly to the EFCB Branch Chief for review (along with inspection reports from other programs). With the stepped review process, the team instituted a QA/QC for grammatical and structural components and a Peer review process to provide the technical review. The team created a checklist for the inspectors to use when reviewing these reports. Now after the QA/QC and peer reviews, the report and completed checklist goes to the Branch Chief for a more streamlined review.

- Region 7 created a SharePoint site to enable online coordination of electronic draft reports. This eliminates hardcopy transit time between reviewers and the creation of multiple draft copies in the Records Center. This IT solution naturally came out of the improvement process by working with their IT department to analyze several solutions. The SharePoint site is helping to streamline the work. For example, this system allows the report to go to the Records Center only when it is final, eliminating the need for multiple steps. In fact, one participant noted that the SharePoint site has "revolutionized the process."

- Region 7 developed a fillable Excel-based tracking document to capture key performance indicators within the new process to help the team discern how well it is working and to make necessary adjustments. The tracking document automatically develops a timeline based on dates in the process (e.g., date of inspection and date draft report is completed). The team can assess the metrics from this tracking document to determine where steps are taking more of less time than envisioned to determine where any refinements could be made.

> Region 7 identified SharePoint as an important solution within their process-improvement efforts because it allows them to:
>
> - Customize the site for their needs and any future changes they may make
> - Make changes to the site without having to go through their IT department
> - Access the site in the field
> - Build upon other program uses and previous user understanding of SharePoint.
> - Keep past versions of documents to aid in discovery purposes.

Type of CAFO Inspection	Target Inspection Report Completion Time	Actual Average Report Completion Time in Comparable Period Prior to Process Improvements	Actual Average Report Completion Time After Process Improvements
Sampling Required	60 days	98 days	51 days (↓ 48%)
No Sampling Required	30 days	68 days	42 days (↓ 38%)

Note: Additional process improvements are expected to bring the actual report completion time to target levels.

Lessons Learned

- Value stream mapping and root cause analyses were instrumental to identify opportunities to reduce waste and streamline the process.

- Emphasizing that it is the process that does not allow people to be successful versus people failing the process. The fishbone analysis solidified this and created investment from participants.

- The Appreciative Inquiry approach provided a non-threatening environment to identify solutions.

- The 5-day in-person Lean Kaizen event was effective to identify the process improvements by focusing all of the involved parties for a sustained period. Upper level management support to have staff dedicate this time was invaluable to the success of the project.

- Process-improvement efforts are more successful when the IT solutions naturally come out of the normal Lean process. During the mapping of the current process, EPA Region 7 flagged where something could potentially be improved with an IT solution and explored it later in depth.

- Given the amount of SharePoint EPA Region 7 has been using with their solutions, the Region found it useful to have someone on the team (during the Lean process) with knowledge of SharePoint to discuss what SharePoint can and cannot do (as a potential solution).

- Region 7 found it important to heavily involve the IT people in the development of timelines for the solution and make sure it matches with other Lean elements. The team scheduled key points to check in to monitor progress and periodically brought those responsible for the Lean implementation and IT side together.

Implementation Status

Region 7 has implemented most of the identified process improvements. As of August 2015, they are still working to complete a hire for the QA reviews and scanning of materials, which they anticipate will bring the report completion time closer to the target. Region 7 is anticipating reviewing the newly available metrics for the process at the end of the FY to see if any adjustments to the process or IT solutions should be made.

Other programs in Region 7 have expressed interest in using the tracking spreadsheet from this project (with modification) to track key performance indicators for their programs as well.

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Appendix D: Lean Charter Template

The following Lean Team Charter Template, which was developed to support EPA Lean projects, may be used to clarify and promote understanding of the scope and expectations for Lean events and projects.

Lean Team Charter

Project Details

Project Name:	Event Dates:	Room:
Region/Office:	Event Start & End Times:	
Management Briefings *Dates:* *Times:* *Locations:*	Final Presentation *Date:* *Time:* *Location:*	
Project Sponsor:	Team Leader:	Facilitator: Co-Facilitator:

Project Description

Process Description:
Customers & Deliverables of the Process:
Problem(s) to Address in Project: *[What is the problem (real or perceived) the team is trying to address in the project? What evidence do you have that the problem exists? How could we deliver more value for the customer?]*

Project Scope

[What are the start and end points in the process that the project will address?]
Process Start:
Process End:

Boundary Conditions

[What are the boundaries and limitations of the scope (i.e., what is excluded from the process being addressed)? What types of changes are off limits or out of bounds to the team?]

Goals, Objectives, and Metrics

[Goals define the desired outcomes for the project – that is, what success looks like. Objectives set specific and measureable targets for improvement. Express your goals and objectives as percent reductions if you do not have current, baseline data for the process, or set specific targets for the future if you can.]

Quantitative Goals & Objectives

The following table provides a summary of the team's quantitative targets for the Lean project.

Metrics	Current Performance	Target (Desired Performance or % Change from Current Performance)
EXAMPLE 1: Lead Time	100 business days	25 business days
EXAMPLE 2: Processing Time	TBD at event	↓30%
1. Lead Time		
2. Processing Time		
3. Number of Process Steps		
4. Percent Complete and Accurate		
5. Participant Satisfaction with the Process (1-5 scale)		
6. [Other metrics]		

Qualitative Goals & Objectives

[Specify any qualitative goals and objectives for the project, such as clarify roles and responsibilities, create standard work procedures, improve communications, improve customer satisfaction, etc.]

Pre-Work

The following actions represent what tasks need to be completed prior to the Lean event.

Action	Owner	Due Date
1. *[pre-event task]*	*[person responsible]*	*[mm/dd/yy]*
2. *[pre-event task]*	*[person responsible]*	*[mm/dd/yy]*
3.		

Follow-Up Schedule

The team will confirm these dates during the event in the context of progress and future needs.

30-Day Management Briefing: *[mm/dd/yy]* **60-Day Management Briefing:** *[mm/dd/yy]* **90-Day Management Briefing:** *[mm/dd/yy]*	**Other Key Milestones:**

Team Members

[Ideally 8-10 people. The majority (75-80%) should be people who work in the process; also include 1-2 supervisors of the process, and 1 customer or stakeholder. Note the name and function that each person serves, such as data entry, document production, supervisor, quality control, IT specialist, customer, etc.]

1. [Name, function]
2. [Name, function]
3. [Name, function]
4. [Name, function]

5. [Name, function]
6. [Name, function]
7. [Name, function]
8. [Name, function]

On-Call Support

[Identify any individuals who will be available as needed during the event or project to answer questions, address issues, or make decisions to enable to the team to succeed. Include contact information if appropriate.]

- [Name, function]
- [Name, function]

Approvals

Our signatures show our commitment to this project and our willingness to take actions to ensure its success.

	Project Sponsor	Team Leader	Facilitator
Signature:			
Date:			

Appendix E: Lean Implementation Plan Template

Lean Implementation Plan: [PROJECT TITLE]

Project Details	
Project Sponsor	
Team Leader	
Facilitator	
Event Date	

Follow-Up Meetings	
30-Day	[mm/dd/yy]
60-Day	[mm/dd/yy]
90-Day	[mm/dd/yy]
6-Month	[mm/dd/yy]
1-Year	[mm/dd/yy]

Status Key	
	TO BE INITIATED
	ON TARGET
	OFF TRACK
	COMPLETE

Date Created: [mm/dd/yy]

Last Updated: [mm/dd/yy]

ID #	Action	Owner	Start Date	Target Date	Completed	Timeline Jan-yy	Feb-yy	Mar-yy	Apr-yy	May-yy	Jun-yy	Jul-yy	Aug-yy	Sept-yy	Oct-yy	Nov-yy	Dec-yy	Comments
1	[insert action/task]	[insert lead on action and any staff with a supporting role]	[mm/dd/yy]	[mm/dd/yy]	[mm/dd/yy]													[insert notes relevant to the action and status]
2	[insert action/task]	[insert lead on action and any staff with a supporting role]	[mm/dd/yy]	[mm/dd/yy]	[mm/dd/yy]													[insert notes relevant to the action and status]
3	[insert action/task]	[insert lead on action and any staff with a supporting role]	[mm/dd/yy]	[mm/dd/yy]	[mm/dd/yy]													[insert notes relevant to the action and status]
4	[insert action/task]	[insert lead on action and any staff with a supporting role]	[mm/dd/yy]	[mm/dd/yy]	[mm/dd/yy]													[insert notes relevant to the action and status]
5	[insert action/task]	[insert lead on action and any staff with a supporting role]	[mm/dd/yy]	[mm/dd/yy]	[mm/dd/yy]													[insert notes relevant to the action and status]

Lean Implementation Plan Example: Property Inventory Process

Project Details	
Project Sponsor	FirstName LastName
Team Leader	FirstName LastName
Facilitator	FirstName LastName
Event Date	September 20-23, 2014

Follow-Up Meetings	
30-Day	10/21/2014
60-Day	11/20/2014
90-Day	12/18/2014
6-Month	3/19/2014
1-Year	9/21/2015

Status Key	
	TO BE INITIATED
	ON TARGET
	OFF TRACK
	COMPLETE

Date Created:

Last Updated:

ID #	Action	Owner	Start Date	Target Date	Completed	Sept-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Comments
1	Modify the IT Tracking System for use in property inventory	J. Doe	10/1/2014	2/1/2015	TBD		■	■	■	■	■							On track to be done by due date; new system design awaiting management approval at weekly meeting
2	Purchase new equipment	J. Doe	9/25/2014	11/1/2014	TBD	■	■											Behind schedule; budget constraints; researching alternate options to meet need
3	Create a checklist of tasks to complete the annual property inventory	J. Smith	9/23/2014	10/21/2014	10/15/2014	■	■											Completed and under review by management
4	Pilot the IT Tracking System for 2015 Inventory	J. Doe	3/19/2014	7/1/2015	TBD								■	■	■			Initiate pilot once IT system is ready

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