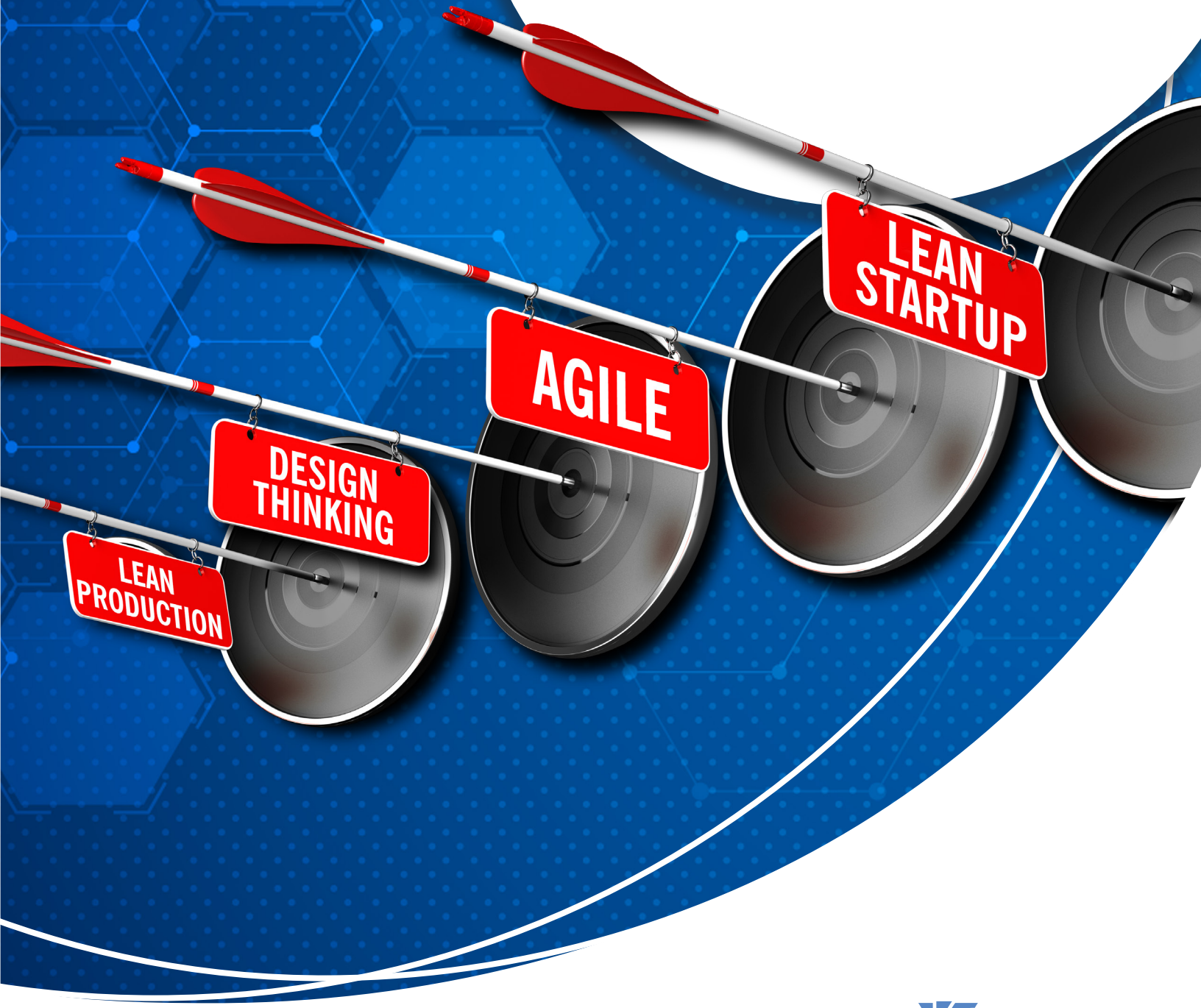
IBM Center for The Business of Government

Transforming How Government Operates:

Four Methods of Change



Andrew B. Whitford
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IBM Center for
The Business
of Government
2020

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FOREWORD

On behalf of the IBM Center for The Business of Government, we are pleased to present, *Transforming How Government Operates: Four Methods of Change,* by Andrew Whitford. School of Public and International Affairs, University of Georgia.

DANIEL J. CHENOK

ADAM JELIC

This report highlights how government agencies can use innovative methods and tools to transform operations in a way that meets their missions and better serves their stakeholders. The report continues the IBM Center's focus on the way government agencies can leverage methods and tools that have been effectively used in the private sector, such as Agile, Lean Methodologies, and Design Thinking.

Many of the problems of government can be solved by technology, but the real roadblock is knowing how to fix the problems citizens experience when they interact with government. More than anything, government workers who want to make government operations and services innovative need new methods and tools that can help them make better decisions and deliver more effective results.

Such frameworks provide practical pathways to help agencies transform their operations in a way that makes more effective use of resources. Transformation involves changing how people do their work, how processes are built to support faster and more effective service delivery, and how technologies are brought forward in new ways that leverage commercial best practices—all focused on improving mission results for businesses and citizens. While government leaders understand the need to transform in response to 21st century demands, less is understood about actions they can take to address this imperative.

Professor Whitford describes Agile, Lean Methods, and Design Thinking as frameworks that can help government executives and public manager change the way government does business. The brief case studies presented in this report illustrate how specific agencies have employed these tools and methods to transform how they operate and better serve their citizens. Whitford also identifies some challenges to using these methods and tools as well as certain issues government executives should consider when using innovative ways to enhance how government works.

This report joins a library of IBM Center reports that focus on how to improve government operations. This becomes even more relevant given the emphasis on improving how government operates found in such documents as the President's Management Agenda, passage of the Idea Act, and OMB Circular A-11. Prior studies on this topic include *Agile Problem Solving in Government: A Case Study of The Opportunity Project,* by Joel Gurin and Katarina Rebello, which explores how agile problem solving can enable public-private collaboration that helps address some of their most significant mission-focused issues facing government agencies today; *A Guide to Critical Success Factors in Agile Delivery* by Philipe Krutchen and Paul Gorans, which was an early assessment of the promise of agile for the public sector; *Digital Service Teams: Challenges and Recommendations for Government* by Ines Mergel, which provides insights into digital services activities that leverage agile techniques for governments in the U.S. and around the world; and *Applying Design Thinking To Public Service Delivery* by Jeanne Liedtka and Randy Salzman, which focuses on the expanding use of design thinking in government to transform how agencies engage citizens, enhance operations, and innovate across a broad spectrum of public management challenges. We hope that the insights offered in this report will help government executives more effectively address their most significant management challenges while also transforming how their government agencies operate—becoming agile and effective enterprises that better serve stakeholders.

Expanding on these efforts, the Center has named Ed DeSeve as a Visiting Fellow for agile government. Ed will lead work on infusing agile thinking throughout government agencies, drawing on lessons from agile software development but expanding the scope of these lessons across other key government functions and mission areas. Ed also leads the recently established National Academy of Public Administration's Agile Government Center (AGC) that serves as the hub of a network that will bring together governments, nonprofits, foundations, academic institutions, and private sector partners to assist in developing and disseminating agile government principles and case studies of agile policies and programs. This network will be a source of assistance to those who want to adopt and implement Agile to provide public goods and services that fully meet customer needs and build public trust.

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EXECUTIVE SUMMARY

New Methods And Tools For Transforming How Government Works

Many commentators now recognize the importance of the creation of 18F in 2014 as a new strategic approach to simplifying digital services. One reason 18F shook up the innovation landscape was its affiliation with Eric Ries' book *The Lean Startup.*[1] Ries' new approach for developing products and business processes had spread throughout many different types of companies since its popularization in 2008. Notably, the Lean Startup methodology argued for building products or services iteratively—over time, as experiments—to better fit the needs of customers. Case studies indicated that this method improved results, reducing market risks and overall production costs.

The point of 18F has been to "improve the public's experience with the government by helping agencies build, buy, and share technology that allows them to better serve the public."[2] Yet, many miss the broader point. Focusing on the transformative power of technology within government, they have missed the broader reshaping of innovation processes in government.

Many of the problems of government can be solved by technology, but the real roadblock is knowing how to fix the problems citizens experience when they interact with government.

Often this roadblock comes from a lack of knowledge. Academics have long debated the differences between data, information, and knowledge.[3] Yet, the fact is that knowledge remains the currency of most decisions in the public sector. The roadblock may be the lack of knowledge, the lack of access to knowledge, or the difficulty of processing knowledge.

More than anything, government workers who want to make government operations and services innovative need new methods and tools that can help them make better decisions and deliver more effective results. Such tools provide practical pathways to help agencies transform their operations in a way that makes more effective use of resources. Transformation involves changing how people do their work, how processes are built to support faster and more effective service delivery, and how technologies are brought forward in new ways that leverage commercial best practice—all focused on improving mission results for businesses and citizens. While government leaders understand the need to transform in response to 21st century demands, less is understood about actions they can take to address this imperative.

This report highlights how government agencies can use innovative methods and tools to transform operations in a way that meets their missions and better serves their stakeholders.

These stories provide glimpses of how agencies at the federal and state levels are using these methods to "build in" the process of listening and reacting to those viewpoints of users, clients, and citizens. The stories center on specific methods and tools used by many agencies: Lean Production, Agile software design and development, Design Thinking, and the Lean Startup.

1. Ries, Eric. *The Lean Startup*. 2008. Crown Business.
2. U.S. General Services Administration. Technology Transformation Services. 2018. https://www.gsa.gov/about-us/organization/federal-acquisition-service/technology-transformation-services.
3. Boisot, Max H. and Agusti Canals. "Data, information and knowledge: have we got it right?" *Journal of Evolutionary Economics.* 2004.

Starting with these methods can get us closer to improving citizen experiences and program results, but these stories suggest that using these methods and tools comes with various challenges. The last part of the report explores these challenges and their impact on whether these method and tools take hold and deliver results.

Making Government Operations and Services More Effective

Before describing these methods and tools in greater detail, it is useful to see the big picture. Of course, none of these methods is used solely by government agencies. All have made their way from other domains like business or academia into the repertoire of tools available to agencies wanting to improve the services they provide to customers, clients, users, or citizens. Table 1 shows this migration in broad strokes: Each method has helped with different parts of the improvement process, and some are more mature than others.

Table 1. Methods for Improving Organizational Effectiveness and Performance

Method	Purpose	Target	Era in use in government
Lean Production	Minimizing waste	Manufacturing systems Business Process Improvement	Mature
Agile	Making things	Software design and implementation	Developing
Design Thinking	Addressing the complex human-centered issues	Matching needs of all types to what is feasible	Developing
Lean Startup	Starting from need	Finding and testing minimum viable products, and pivoting when necessary	Nascent

While the Lean Startup is a new phenomenon, its basic building blocks come from the world of Lean Production and manufacturing, where managers have learned much from Toyota and its Kanban and just-in-time systems. Lean Production models have spread throughout firms around the world. Similarly, governments have used Lean Production-flavored methods for many years.

In contrast, Agile methods for software production are a much more recent phenomenon. As the private sector sought new ways to designing, building, and implementing large-scale software projects, agencies (including 18F) saw Agile as a solution to complex public problems. Unlike Lean Production, though, government's experience with Agile is best seen as developing.[4]

In many ways, Design Thinking may be the oldest of the three methods. Humans have long tried to match users' needs with what is technologically feasible—just as architects have tried to build structures that people found easy and enjoyable to use. Yet, Design Thinking as a

4. Lappi, Teemu. "Project Governance in Public Sector Agile Software Projects." *International Journal of Managing Projects in Business.* Volume 10, Issue 2. https://www.emeraldinsight.com/doi/abs/10.1108/IJMPB-04-2016-0031.

strategy used by agencies is relatively new. Design Thinking has its roots in the computer sciences but is now better known for its core role in the fields of industrial design, architecture, and engineering.[5]

The next section introduces these four methods and tools: Lean Production, Agile, Design Thinking, and Lean Startup. In the section that follows that description, the report focuses on a set of cases that help us better see the value of these methodologies in action. In each case, no one methodology is used in isolation—each is used as part of a portfolio of methods and tools.

These short case studies also help us see more clearly what the methodologies bring in most public sector practice settings: a reorientation of attention so that the needs, wants, and experiences of users are front-and-center, and a restructuring of the learning process to focus on iteration between building and testing so that the product better satisfies user needs and more effectively meets an agency mission.

5. Cross, Nigel. *Design Thinking*. 2011. Bloomsbury Academic. See also Rowe, Peter G. *Design Thinking*. 1987. MIT Press.

Tools to Help Agencies Effectively Meet Their Missions

Lean Production, for Greater Efficiency

A 2007 report of the IBM Center for The Business of Government argued that Lean Production and similar methods held great potential for refocusing the processes of government on the needs of customers, clients, and users. That report provides a clear picture of the prospects for Lean Production in a reimagined public sector.

Specifically, Lean Production is best thought of as a "management approach that seeks to maximize value to customers, both internal and external, while simultaneously removing wasteful activities and practices."[6] In his report, John Maleyeff recounts how Lean emerged from a broadening awareness of the benefits of certain practices that had come to define the "Toyota way."[7] Toyota had deployed a management system, invented largely by Shigeo Shingo and Taiichi Ohno, that had redefined the management of large-scale, complex manufacturing processes. He identifies five core contributions of Lean (see box).

Core Elements of Lean Production and Manufacturing

1. Specifying what the organization means by value by referencing the consumer's perspective

2. Identifying the stream of processes within the organization that can be used to provide value

3. Removing from the value stream those activities that do not add value from the consumer's point of view

4. Creating "pull" by insuring that all work activities within the organization begin with reference to the demand of consumers

5. Given all of these steps, the organization then strives for perfection.

Most organizations outside of the manufacturing arena have struggled with interpreting and deploying Lean Production from their perspective. Over the last decade, we have learned that it is certainly possible to use the method for public service improvement but we have also learned it is not a natural fit. Concepts like inventories—a key aspect of the Toyota production system's "Kanban" approach—do not have natural analogues in services.

From Maleyoff's perspective, the core constraints in many settings turn on whether the broader organization has a common focus, something not always in place in government agencies, but that success can come when executives actively participate in the improvement process alongside middle managers and staff.

In practice, many equate Lean Production with the affiliated techniques that have become known as Six Sigma. While as Maleyoff demonstrates there are strong similarities between Lean and Six Sigma, the differences remain important for this current report. Six Sigma is also a management approach, but its focus is "to maximize profits by systematically applying scientific principles to reduce variation and thus eliminate defects in product and service

6. Maleyeff, John. *"Improving Service Delivery in Government with Lean Six Sigma."* IBM Center for the Business of Government. 2007. http://www.businessofgovernment.org/report/improving-service-delivery-government-lean-six-sigma. Page 8.
7. Ohno, Taiichi. 1988. *Toyota Production System.* Productivity Press.

offerings."[8] Six Sigma is explicitly statistical and focuses strongly on quality control processes, and principal adopters like the GE Corporation saw it as an important family of techniques for reducing variation in production processes. Its principal methods are highly formalized and seek to enforce strong discipline on the organization and its outputs. Consequently, training and certification define how the process is implemented.

This report focuses on how Lean Production serves as a main root of the new Lean Startup framework described in more detail below. Generally speaking, Maleyoff's report describes seven ways in which the Lean Production helps shape organizations but the key aspects can be summarized as:

- Both internal and external customers have needs and desires.
- Those needs are how we should judge the value-added content of organizational processes.
- Data should drive decisions about those judgments.
- Improvement should be structured and consistently implemented as a regimen.[9]

Agile, for Making Things

Agile is a more recent phenomenon than Lean, so agencies are still learning how to apply Agile when looking for innovation in government operations and services. Lean Production left its manufacturing roots long ago, but Agile remains by-and-large a family of techniques and approaches for changing how things are made.

It helps that Agile has a "manifesto" for driving its evolution.[10] The four core Agile values are thought to fix common inadequacies in how everyone builds and deploys complex software (see box below). In addition, Agile's core principles drive software designers to reshape the production process.

Core Values of Agile

1. Individuals and interactions over processes and tools
2. Working software over comprehensive documentation
3. Customer collaboration over contract negotiation
4. Responding to change over following a plan

8. Maleyeff, John. *"Improving Service Delivery in Government with Lean Six Sigma."* IBM Center for the Business of Government. 2007. http://www.businessofgovernment.org/report/improving-service-delivery-government-lean-six-sigma. Page 9.
9. Maleyeff, John. *"Improving Service Delivery in Government with Lean Six Sigma."* IBM Center for the Business of Government. 2007. http://www.businessofgovernment.org/report/improving-service-delivery-government-lean-six-sigma. Page 10.
10. "Manifesto for Agile Software Development." 2001. http://agilemanifesto.org/iso/en/manifesto.html.

Agile centers interact with and learn from customers about the software that is being built. Learning and engagement identifies core needs for fabrications to address. And it was easy to see the opportunities for improving software development in the public sector. For instance, a 2014 IBM Center for the Business of Government report[11] targeted "waterfall" approaches—the most common way government builds software—and their rigid focus on laying out project requirements before moving on to design, development, testing, and deployment.

Agile's four values and 12 principles are important because they mandate an infinite feedback loop. Requirements, design, developing, and testing commence all at the same time, with the plan being to produce, in a short time period, a version of working software. That software version is then experienced by the user base with the expectation that they will provide guidance about prospective changes that may improve the overall execution. Those experiences reveal to developers aspects of the "requirements, design, developing, and testing" that can be improved in short order—so that a new version of working software can be rapidly deployed to the user base. As the principles indicate, there is no natural limit on the number of iterations this cycle will take; indeed, in many ways the feedback loop is expected to last forever.

This is certainly different from the waterfall approach. Agile is fast and light in terms of software development and delivery. Agile does not involve substantial investment in initial planning. Additionally, teams are called 'agile teams'—scrums are an alternate name for 'daily stand-up' that originates from rugby.

Agile is assessed by the deployment of working software—with the expectation that it should and will change. Finally, Agile requires high levels of collaboration between technical staff and the user base. These things have naturally led to Agile's evolution from a software design method to the design, production, and deployment of customer-facing processes. But its overall focus largely remains on how we make things.

Over time, Agile has permeated software development and maintenance. For instance, many organizations now employ DevOps practices to ensure continuous integration and continuous delivery throughout the code, build, test, release, and operate stages. While DevOps shows how Agile is in many ways the industry standard in information technology, the long-run impact of Agile will likely be like that of Lean Production: to change how we think about improvement in organizations.

11. Gorans, Paul and Philippe Kruchten. *"A Guide to Critical Success Factors in Agile Delivery."* IBM Center for the Business of Government. 2014. http://www.businessofgovernment.org/sites/default/files/A%20Guide%20to%20Critical%20Success%20Factors%20in%20Agile%20Delivery.pdf.

IBM CENTER REPORTS

Exploring the Use of Agile Methods in Government

A Guide to Critical Success Factors in Agile Delivery

by Paul Gorans and Philippe Kruchten

This report provides an early assessment of the promise of agile for the public sector. It provides a guide to help government mission executives and program leaders understand how best to leverage Agile values, benefits, and challenges. Agile can be used as a tool to leverage IT in a way that minimizes time and cost and maximizes mission and operational effectiveness. This guide sets forth ten critical success factors for implementing an Agile delivery. The critical success factors are based on lessons learned from delivering large, complex projects and programs, as well as formal assessments of troubled Agile initiatives. Agile delivery approaches support the federal government's goals of doing more with less and improving the agency's ability to manage their budgets and delivery dates.

Ten Critical Success Factors for Implementing Agile Delivery

1. Changing the Acquisition Process to Support Agile Delivery
2. Integrating Executive Champions and Stakeholders into an Agile Initiative
3. Using Existing Knowledge and Not Reinventing the Wheel
4. Implementing More Verbal Communication and Dashboards
5. Including the Right Product Owner and Mission Subject Matter Experts
6. Implementing Reviews that Support Agile Delivery
7. Selecting Top Staff for Lead Roles in the Agile Project
8. Planning for IT Infrastructure and Tooling Needs
9. Conducting "Just Enough" Upfront Work Before the Start of the Agile Project
10. Integrating Critical Specialty Skills to Support Agile Teams

Digital Service Teams: Challenges and Recommendations for Government

by Ines Mergel

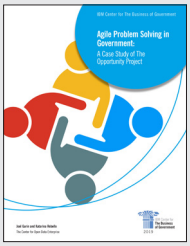
This Report provides insights into digital services activities that leveraged agile techniques for governments in the U.S. and around the world. This report shares insights about three types of digital service teams:

Centralized teams directly supporting national priorities, such as the U.S. Digital Service, or the United Kingdom's Government Digital Service

Enterprise teams supporting innovation in IT acquisition and internal consultancy services, such as 18F, an office within the Technology Transformation Service at the General Services Administration (GSA) that states it is a "services company and product incubator" with the goal of providing digital development and consulting services for other federal government agencies or programs

Agency-level teams, such as those pioneered in the U.S.: the Digital Service at the Department of Veterans Affairs, the Environmental Protection Agency, and the Department of Defense. The interviews conducted for this report focused on the structure of the teams, the use of agile and human-centered design processes, changes to human resource (HR) processes to attract information technology (IT) talent from the private sector, the incentives for IT professionals to join the U.S. federal government, and the changes made to federal IT acquisition processes. The report identifies six challenges that digital service teams face in their efforts to implement digital transformation projects in a government context.

1. Embracing an agile development approach
2. Attracting IT talent from the private sector
3. Maintaining and scaling a start-up culture in government
4. Improving the acquisition of innovative IT
5. Funding digital service teams
6. Addressing whether innovation should be "bought or built"



Agile Problem Solving in Government: A Case Study of The Opportunity Project

by Joel Gurin and Katarina Rebello

This Report outlines the key elements and critical success factors involved in The Opportunity Project. The Opportunity Project (TOP), a program run out of the Bureau of the Census at the U.S. Department of Commerce, has for several years served as a catalyst in adapting agile techniques to solve complex agency mission problems, through a process that brings together agencies, industry, and citizens. This report summarizes the work of the Opportunity Project in 2018, explores examples that show the impact and challenges of this process, and presents lessons learned and recommendations for similar work across agencies in the future. The report concludes by assessing the value of The Opportunity Project as a model for applying agile methods to solve complex mission problems for agencies. This study of The Opportunity Project provides a number of lessons from TOP's challenges and successes, which can inform agencies as they work with TOP and develop similar programs focused on their own mission space. These learned lessons are presented here using the seven stages outlined in TOP's toolkit.

1. Choose a Problem
2. Form a Team
3. Conduct User Research
4. Explore Data
5. Design and Build
6. Share the Product
7. Keep Improving

Design Thinking, for Achieving Purpose

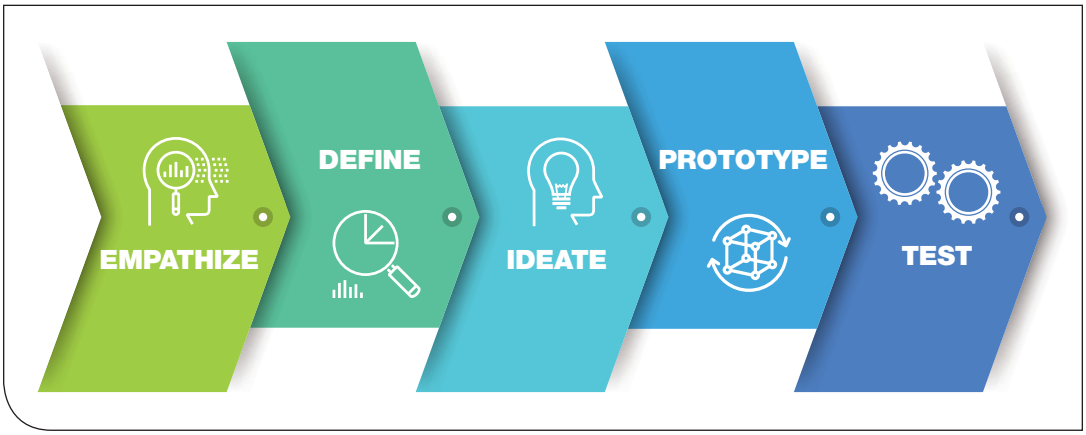
Design Thinking plays a different role—a role that is important because it connects Lean and Agile to the overall point of the Lean Startup movement. This is what makes all three methods both complementary and essential.

Think of Design Thinking less as a recipe and more as a family or group of processes and tools, then it makes it easier to see how Design Thinking is a broad approach to integrating user needs, wants, and experiences into the building process. In general, Design Thinking starts with users and then threads that involvement into something that looks a lot like Lean Production, Agile, and the Lean Startup.

Figure 1. shows the "empathize-define-ideate-prototype-test" cycle from Stanford University's Hasso Plattner Institute of Design, one of the better-known Design Thinking rubrics.[12] The empathizing designer wants to "know your users and care about their lives" to build something meaningful. Practically speaking this usually involves tools like developing user cases, video or audio evidence, in-depth focus group studies, and other ethnographic tools to find out what users need. "Empathizing" is observation, engagement, watching, and listening.

12. Hasso Plattner Institute of Design, Stanford University. "An Introduction to Design Thinking Process Guide." Stanford University. 2018. https://dschool-old.stanford.edu/sandbox/groups/designresources/wiki/36873/attachments/74b3d/ModeGuideBOOTCAMP2010L.pdf.

Figure 1: The "empathize-define-ideate-prototype-test" cycle



After empathizing, designers try to synthesize the diverse information from users with the goal of defining at least one, and perhaps only one, central need to be addressed. In ideation, teams work together create possible solutions for users. The tools used here almost always involves traditional brainstorming but should also include other techniques like sketching, mindmapping,[13] prototyping, or bodystorming.[14]

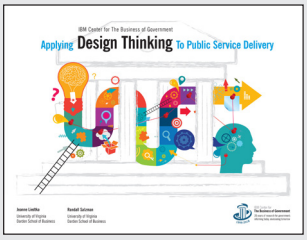
The goal in ideation is to increase both the volume of options that improve the user experience —and to improve the variety (or flexibility) of the set of possible solutions. These options naturally lead to prototyping. Prototyping is based on the idea that people think better when building things. Tools used here range from storyboards to fully-functional mockups of physical spaces.

The benefits of prototyping are ease of implementation and inexpensive delivery—and learning from how users interact with the prototype. This means that in the end prototyping and testing really happen at the same time. Yet, testing is different because the focus is on the user and not the prototype. Tools available here are varied but range from traditional observational methods to sophisticated "A/B testing."

The focus throughout is on learning. Designers build "a sort of micro-theory about the problem or the user needs"[15]—and then test it against the cold, hard reality of watching users use things that designer built. In fact, Design Thinking is itself a kind of learning model.[16] Even though there are many different versions of Design Thinking—the general learning model is mostly the same. That's what makes it "Design Thinking."

13. Mind maps are visual diagrams of information, such as words, images, or other concept-bearing ephemera that are shown in relation to a central concept.
14. Bodystorming can be thought of as an elaboration of role-playing—for instance, placing designers in a location where they work or act as if the product they are designing already exists so that they visualize how the experience would change. The design of physical locations is especially enhanced by bodystorming.
15. Mueller, Roland M. and Katja Thoring. "Design Thinking vs. Lean Startup: A Comparison of Two User-Driven Innovation Strategies." 2012 International Design Management Research Conference. 2012. https://www.researchgate.net/publication/234066097_design_thinking_vs_lean_startup_a_comparison_of_two_user-driven_innovation_strategies.
16. Beckman and Barry provide one of the best-known descriptions of Design Thinking as a broader learning model. Beckman, Sara L. and Michael Barry. "Innovation as a Learning Process: Embedding Design Thinking." California Management Review. 2007. Volume 50, Number 1. http://journals.sagepub.com/doi/10.2307/41166415.

Design Thinking requires cross-functional and cross-disciplinary teams to carry out these the steps. It requires people who can "move between the abstract and concrete, and between analysis and synthesis," assembling teams composed of such people, and then finding leaders capable of running such teams.[17]

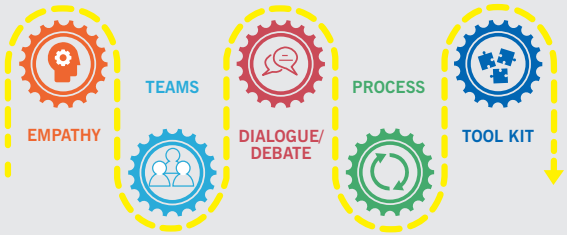


Applying Design Thinking To Public Service Delivery

by Jeanne Liedtka and Randall Salzman

Design thinking is currently enjoying unprecedented attention from organizations in search of avenues for innovation, both in the public and private sector. Described as a "human-centered approach to innovation that puts the observation and discovery of often highly-nuanced, even tacit, human needs right at the forefront of the innovation process, "design thinking" or "human-centered design" includes a series of iterative activities. The first stage consists of initial exploratory activities focused on gathering primarily qualitative data to identify user needs, design criteria, and problem definition, followed by the generation of ideas, which are then prototyped and tested before being piloted. Design thinking is often contrasted with alternative innovation strategies such as technology-driven innovation. It shares an emphasis on understanding root cause, co-creation with key stakeholders, and prototyping and experimentation with other popular initiatives like The Lean Startup, Agile Software Development, and behavioral insights, but also adds a tool kit for creative idea generation based on data-driven user criteria that these other approaches lack.

This report focuses on the expanding use of design thinking in government to transform how agencies engage citizens, enhance operations, and innovate across a broad spectrum of public management challenges. The authors identify five core characteristics essential to most design thinking approaches.



Based on extensive research and first-hand interviews, the authors then present four case studies from the U.S. and around the world that illustrate the purpose, intent, and success of design thinking in action.

Drawing on these studies, and from conducting hands-on training and work-shops of design thinking principles and tools, the authors offer recommendations to government executives who can take advantage of design thinking to drive innovation in their organizations.

Using Design Thinking to Drive Innovation in Your Organization

1. Provide a Structured Methodology and Tool Kit
2. Offer the Opportunity to Learn It Well
3. Provide Necessary Infrastructure and Resources
4. Align Culture to Support

17. Beckman, Sara L. and Michael Barry. "Innovation as a Learning Process: Embedding Design Thinking." California Management Review. Volume 50, Number 1. http://journals.sagepub.com/doi/10.2307/41166415. Page 53.

Lean Startup, for Starting from Need

The point of The Lean Startup was to show leaders how to think like entrepreneurs and use continuous innovation processes to reshape their organizations. Ries' second book, 2017's *The Startup Way,*[18] put some "meat on the bones" of his original points when he showed how large multinationals, small tech shops, and even the U.S. Department of Education have tried to integrate Lean Startup principles.

In 2012,the General Services Administration (GSA) pushed implementers from around the federal government to take on Lean Startup as a way of reframing governance toward agility in delivery.[19] For instance, Lean Startup was used in the design process for the Consumer Financial Protection Bureau. Ries talks about how the Department of Education's creation of College Scorecard was built using Lean Startup principles.

Lean Startup principles are rooted in "starting from need," itself taken from Taiichi Ohno's 1978 book on Toyota[20]—later popularized as the "Toyota way."[21] Of course, government has long sought to build-in Lean principles.

Most agencies have learned it is much harder to implement the "Toyota way" in the public sector than it is in a manufacturing context. Many have turned to Six Sigma, and while there are strong similarities between it and Lean Production, its focus is mostly on using reducing variation and eliminating defects.[22] This focus is enhanced by training and certification of its users. Lean Production focuses on using data to change organizational processes to better meet the needs of internal and external customers—so does the Lean Startup.[23]

What Ries offered organizations of all types was a framework that made everyone an entrepreneur—and asked them to act like entrepreneurs. He offered five principles:

1. Because "entrepreneurs are everywhere," all employees work inside startups that make things and provide services under the conditions of extreme uncertainty.

2. Because "entrepreneurship is management," leaders must deal with extreme uncertainty on a daily basis.

3. Organizations live to learn through validation via experiments.

4. As organizations build things, they must measure how users respond and then respond by "pivoting or persevering."

5. Leaders measure progress, set milestones, and hold people accountable given these goals of building, learning, and responding.

In the 2017 book *The Startup Way,* Ries spelled out these principles in terms of a task-based framework:

18. Ries, Eric. *The Startup Way.* 2017. Currency Press.
19. Parcell, Jacob. "Agile 'Sprinting' to Digital Governance Recommendations." Digital.gov. August 12, 2012. https://www.digitalgov.gov/2012/08/12/agile-sprinting-to-digital-governance-recommendations/.
20. Ohno, Taiichi. 1988. *Toyota Production System.* Productivity Press.
21. Ohno, Taiichi. 1988. *Toyota Production System.* Productivity Press. Toyota described it as the "Toyota Way" in 2001; this phrase was popularized by Liker in 2004. Liker, Jeffrey. 2004. The Toyota Way. McGraw-Hill.
22. Maleyeff, John. *"Improving Service Delivery in Government with Lean Six Sigma."* IBM Center for the Business of Government. 2007. http://www.businessofgovernment.org/report/improving-service-delivery-government-lean-six-sigma. Page 9.
23. Maleyeff, John. *"Improving Service Delivery in Government with Lean Six Sigma."* IBM Center for the Business of Government. 2007. http://www.businessofgovernment.org/report/improving-service-delivery-government-lean-six-sigma. Page 10.

1. Make assumptions about what is necessary for the enterprise to succeed.

2. Test the assumptions by building a minimum viable product.

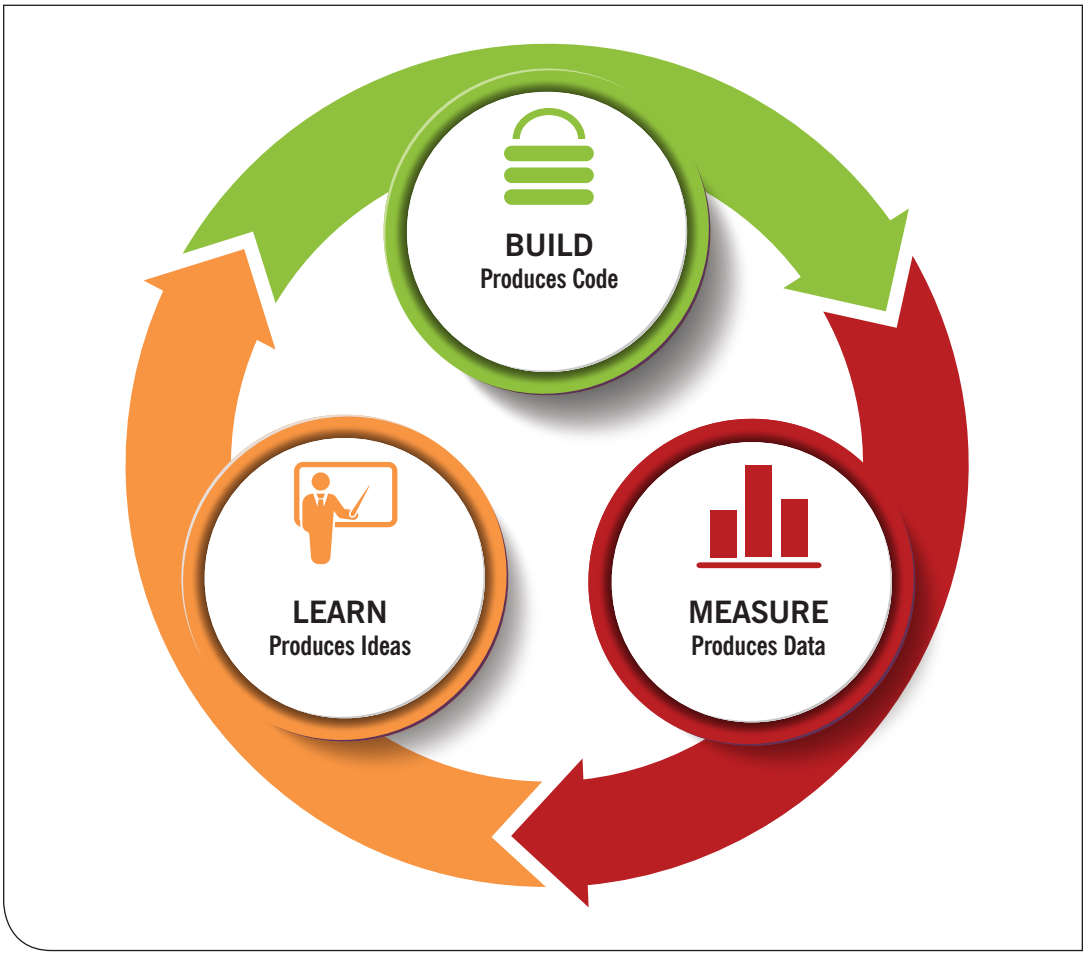
3. Respond to these experiments as validated learning.

4. Wrap these tasks in a build-measure-learn feedback loop.

5. Regularly assess whether the approach is working and, if not, pivot.

The build-measure-learn loop is really important in this approach. It makes sense intuitively, but it is best seen rather than heard. Figure 2 shows one way of thinking about this cycle. Each step in the cycle produces useful information. The Build step produces code (in the context of software production). That code enables the Measure step, which produces data. That data enables the Learn step, which produces ideas. Those ideas improve the next Build iteration. This learning model is similar to the testing phase in Design Thinking.[24]

Figure 2: The build-measure-learn loop



24. See Mueller and Thoring for a side-by-side comparison of the Lean Startup and Design Thinking models.

As noted above, because people building tools and policies usually lack sufficient knowledge at the beginning of the process about what is the problem and what is the best way to solve it, the problem is to find ways to access the knowledge held by users, clients, customers, or the public. After that, builders have to change what they are doing based on that knowledge. Practically speaking, developers test their knowledge by building minimum viable products (MVPs) and then observing how end users react to them.

Think of the Lean Startup method as a wrapper for some very familiar tools and methods. But there are good reasons to embrace the Lean Startup framework.

For instance, there are real benefits to speed and adaptation—if only because there are no perfect business plans.[25] Plans as assumptions are likely to collapse when they meet real customers. Likewise, the policies and tools that governments employ are only meaningful if real end users, clients, or citizens see them as beneficial. Waterfall and similar building methods mean that products are often outdated before real users see them.

The impact on business processes is clear: if stealth mode is impossible, the best outcome is to implement, learn, and respond quickly, rather than hoping that what one builds is the right product ex ante.

Openness can reduce risk. Hoping that a long-run, high-cost project will perform as assumed is untenable. Instead, the Lean Startup framework emphasizes short development cycles, fast learning, and frequently soliciting feedback from users about the product and whether it meets their needs.

At Toyota, asking "why" five times was how they got to the root causes of problems. In modern government agencies, asking "why" five or more times can reveal when the designer of the program, policy, or tool did not really understand how the client, customer, user, or citizen would use it. Or why they wanted it in the first place. Or what their basic needs were.

Also, the Lean Startup approach of build, measure, learn is beginning to be applied in U.S. federal government contracting through the increased use of blanket purchase agreements (BPAs), indefinite delivery/indefinite quantity (IDIQs), and other modular forms of contracting. Doing this effectively gives government agencies the ability to pivot or persevere without huge expenditures.

Complementary *and* Essential

One point that emerges from the stories below, though, is that both Agile (with its focus on software) and Lean Production (with its focus on business processes) are complementary with the move toward broader Design Thinking. Together these methods offer an integrated suite of approaches for agencies who want to start from need.

Just like in a Lean Startup, designers iterate among ideation, prototyping, implementation, and learning. Experiments are important tools for figuring out problems before they are experienced on a broad scale. Most importantly, all of these methods—Lean Production, Design Thinking, Agile, and Lean Startup—are used throughout government.

25. Blank, Steven. "Why the Lean Start-Up Changes Everything." Harvard Business Review. May 2013. https://hbr.org/2013/05/why-the-lean-start-up-changes-everything.

These methods are complementary *and* essential. Consider this brief discussion:

- The Lean Startup is about learning, building, and measuring because each step feeds the next iteration of the learn-build-measure loop. But Lean also builds on user experiences because starting from need jumpstarts paring down business processes to what matters most.
- Agile also focuses on user needs as the primary building block. It focuses on fast iteration and speedy production for testing conjectures about which designs best fill those needs. Agile uses learn-build-design loops to move software projects forward.
- Design Thinking also emphasizes learning (from users), building (ideas that feed into prototypes), and measuring (testing the users' experiences given the prototypes).

Even though Lean Production comes from manufacturing, Agile from software production, and Design Thinking from product design, each contributes to the Lean Startup's learn-build-measure loop.

In government, each plays an important role in shaping innovation in public sector operations and services. Agile contributes to software design. Lean Production reduces variation and improve process quality. Design Thinking is about transformation: reshaping how we assess user needs, wants, and experiences.

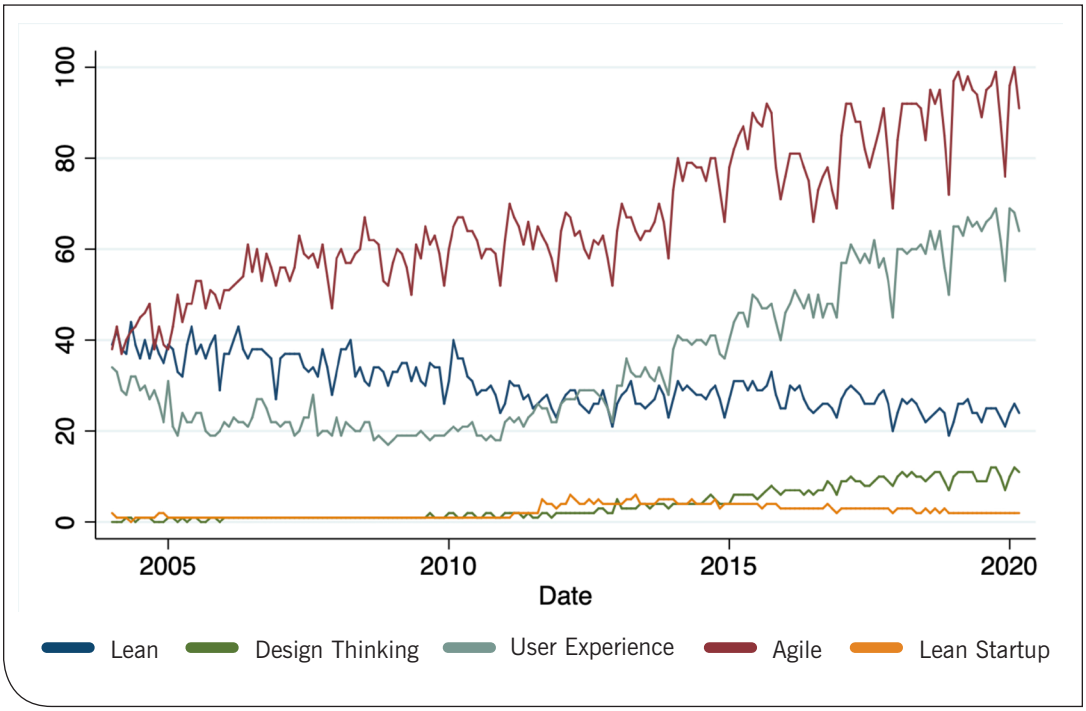
Yet, each is incomplete and needs the others. Agile lacks a rigorous method for the early stage of assessing user need. Lean Production may be too focused on minimizing waste. Design Thinking may not focus enough on production.

Taken together, though, these methods offer an array of tools to help agencies improve public sector services. In today's parlance, they have been bundled them under the umbrella of the Lean Startup, but it may be better to think of a multi-stage process.

Here, Design Thinking helps us understand user needs, wants, and experiences. Everyone can then deploy tools drawn from the methods of Lean Production and Agile. They may be more likely to choose Lean when changing business processes. For software development, Agile is more relevant. At the broadest perspective, the Lean Startup methodology shows the "big picture."

Figure 3 shows Google search trend data for recent years for the relative interest in "Lean Manufacturing," "Agile Software Development," "Design Thinking," and "Lean Startup." What the graph tells us is that, relatively speaking, there is not as much attention paid to Design Thinking or Lean Startup as there has been to Agile and Lean Production. This probably fits with experiences in most public agencies.

Figure 3: Google trend data



Why These Methods Matter

Starting with one of these gets agencies closer to improving citizen experiences and program results, although our multi-stage process suggests most agencies should engage in Design Thinking at the start.

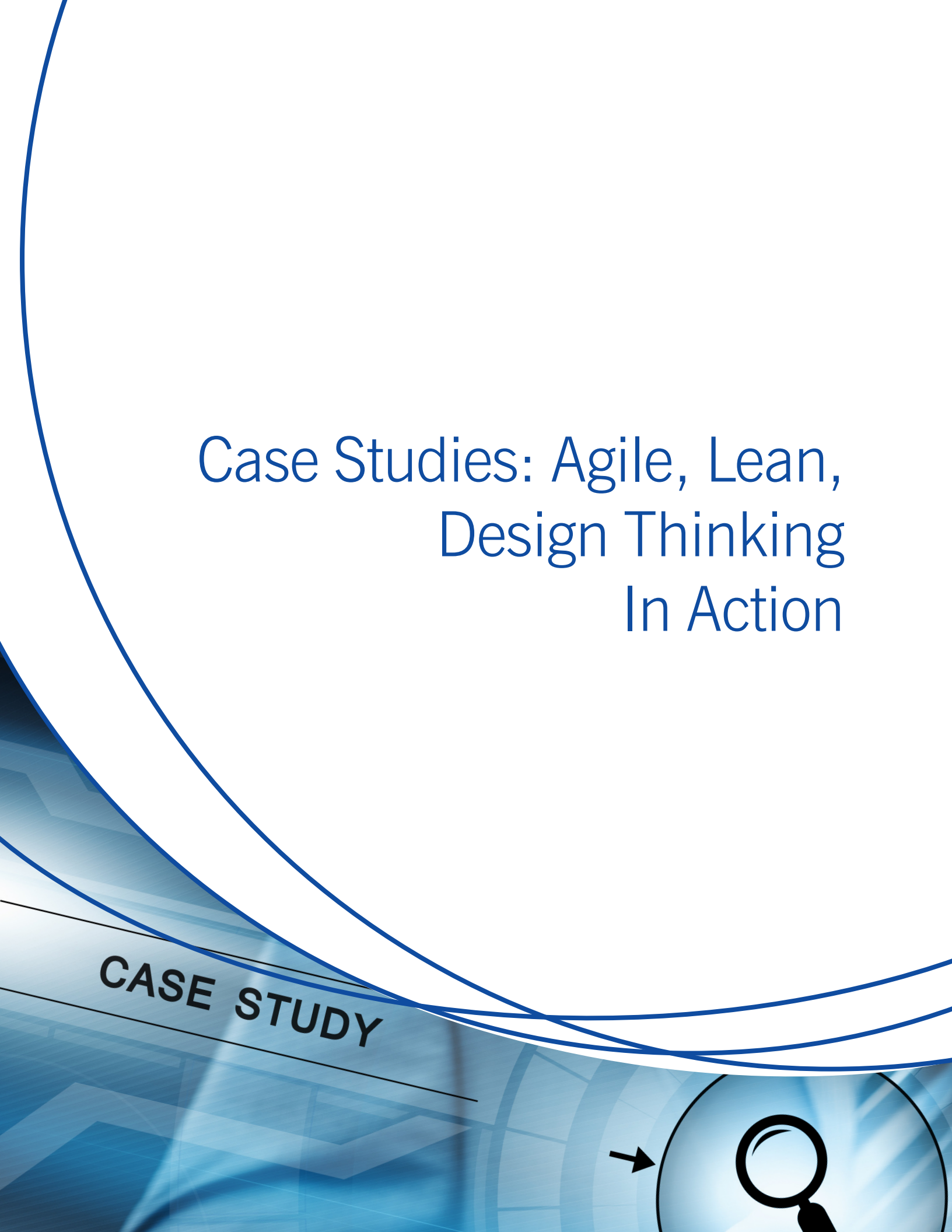
The next section of the report provides four examples. For each of these methods, it is the stories that help us see the promise and pitfalls; the stories come from agency experiences at the federal and state levels. The stories lead naturally to the final section of the report—consideration of the challenges that may determine implementation.

The value of the methods can only come in action. As is often the case, in practice, people have different understandings of methods like Lean Startup, Agile, and Design Thinking. For instance, is Agile a recipe for software design or does it just mean "do things faster"? Or does it just mean "be flexible and adapt when necessary"?

Whether an agency deploys one or all these methods, the goal is that the needs, wants, and experiences of users are front-and-center. From that naturally follows a change in the agency's learning process—from waiting to see what works in practice until the very end, to iterating between building and testing so that the product better satisfies those discovered needs.

The knowledge problem means that everybody is imperfectly guessing what will work. But these complementary and essential tools—alone or together—can help agencies innovate their operations and services, and improve public value.

Case Studies: Agile, Lean, Design Thinking In Action



Spreading Knowledge with College Scorecard

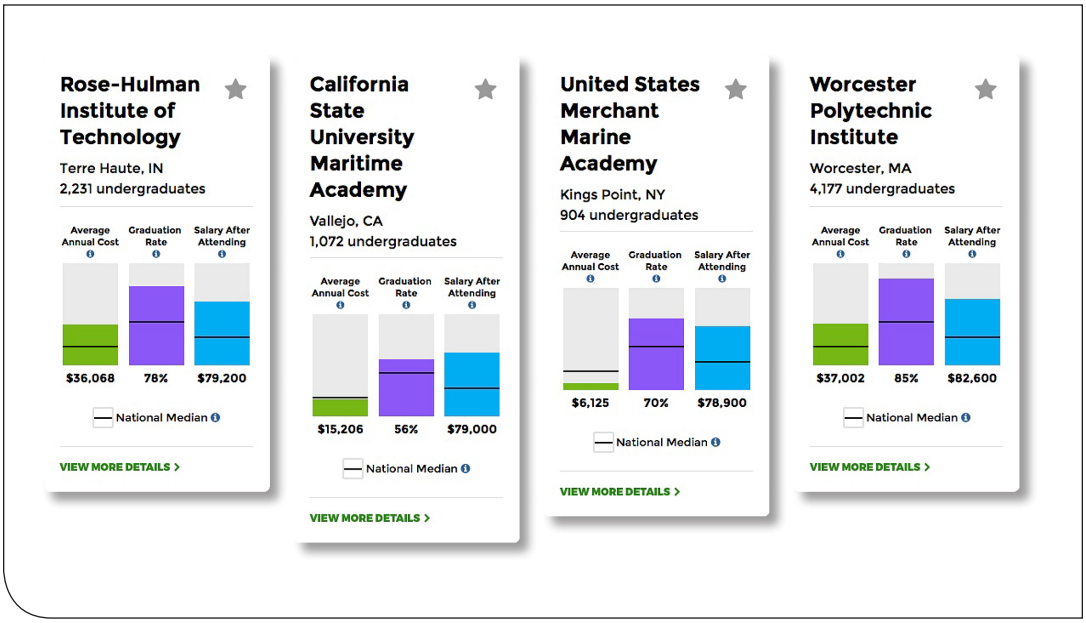
On February 12, 2013, President Obama announced in the State of the Union address that his administration had taken steps to enable prospective college students to make informed decisions through the use of a simple, accessible tool for comparing colleges. The president stated, "Colleges must do their part to keep costs down, and it's our job to make sure that they do. So tonight I ask Congress to change the Higher Education Act so that affordability and value are included in determining which colleges receive certain types of federal aid. And tomorrow my administration will release a new college scorecard that parents and students can use to compare schools based on a simple criterion—where you can get the most bang for your educational buck."[26] On February 13, the U.S. Department of Education (ED) offered the first public release of the College Scorecard and its data for comparing colleges and universities.[27] This release started a multi-year process of determining what to report and how best to present data for end users.[28]

The most important iteration of the College Scoreboard debuted in September 2015.[29] This was after a tumultuous two years of debate about how best to offer a meaningful college ratings system for families who wanted to compare options. Following complaints from colleges and members of Congress about that ratings plan, the new goal was to provide substantial amounts of new information for consumers—at that point, over 171 megabytes of data.[30]

As is natural with the release of new data repositories, additional debates followed about data quality, sample coverage, and the meaning of different measures for individual student expenses—yet https://collegescorecard.ed.gov remains the primary source of comparable information about colleges and student experiences. For instance, a search of engineering four-year programs shows that 78 percent of students at Rose-Hulman Institute of Technology graduate within six years, and that the median salary of graduates is $79,200, 10 years after graduation). More importantly, the data is presented for each school in an easy-to-read, graphical form—here in comparison to the next three-highest ranking schools, as ranked by percentage of graduates earning above the high school graduate median salary (see Figure 4).

26. Obama, Barack. "Address Before a Joint Session of Congress on the State of the Union." February 12, 2013. http://www.presidency.ucsb.edu/ws/index.php?pid=102826.
27. U.S. Department of Education. "Education Department Releases College Scorecard to Help Students Choose Best College for Them." February 13, 2013. https://www.ed.gov/news/press-releases/education-department-releases-college-scorecard-help-students-choose-best-college-them.
28. Turner, Cory. "President Obama's New 'College Scorecard' is a Torrent of Data." February 12, 2015. https://www.npr.org/sections/ed/2015/09/12/439742485/president-obamas-new-college-scorecard-is-a-torrent-of-data.
29. Stratford, Michael. "The New College Scorecard." Insider Higher Ed. September 14, 2015. https://www.insidehighered.com/news/2015/09/14/obama-administration-publishes-new-college-earnings-loan-repayment-data.
30. Turner, Cory. "President Obama's New 'College Scorecard' is a Torrent of Data." February 12, 2015. https://www.npr.org/sections/ed/2015/09/12/439742485/president-obamas-new-college-scorecard-is-a-torrent-of-data.

Figure 4: College Scorecard output



The leader of the new College Scorecard project was Lisa Gelobter, chief digital service officer of ED. Gelobter, formerly vice president of Digital Product for Black Entertainment Television, joined the federal government in April 2015. By September, her team had launched College Scorecard as an open-source consumer web app based in the cloud. It had also delivered an open data application programming interface (API) along with it. The web app opened this vast amount of data to the consumers and the public; the API opened the data to developers and researchers.

In fact, ED teamed with the U.S. Digital Service (USDS) and GSA's 18F to build College Scorecard. USDS has summarized the milestones met in the development process:[31]

- April 2015: Project start date
- July 2015: Code start date
- September 2015: Go-live date
- May 2016: USDS project end date
- September 2016: New data released to scorecard. All data indexed and searchable.

The notable part of this is the timetable—project start in April, code start in July, and live site in September. The box below shows the primary takeaways that USDS highlights from this process.

31. https://www.usds.gov/report-to-congress/2016/college-scorecard/.

USDS summary of the College Scorecard process

1. Understand what people need.

2. Build services using Agile and iterative processes.

3. Run a developer test.

4. Launch a minimum viable product (MVP).

5. Release open data, and build services using the same APIs offered to the public.

It is notable that four of these five points are part of the family of methods discussed above. Understanding what people need is the hallmark of Design Thinking. Building using iteration is of course the focus of Agile software development. Testing is inherent to the Lean Startup, Agile, and Design Thinking. The MVP is the core product of the Lean Startup.

Gelobter has described the fundamental difficulties they faced in the "learn-build-measure" process.[32] An important one was deciding which metrics the tool should display for users who wanted to assess college value. After realizing the huge number of possible metrics given hundreds of megabytes of data available, they "took a step back and asked, 'Hold on. What is the problem we're trying to solve?'" So, they sought out the advice of students, parents, guidance counselors, and other obvious users. As Ries recounts, to do this fast and cheaply, they "went down to the Washington Mall and began seeking out high school juniors and seniors in order to ask them about their experiences in the college application process. They visited the Mall at least once a week, asking the students six simple questions and using the answers to refine their hypotheses about the features they thought customers wanted."[33]

The prototypes that emerged from this process were phones made of cardboard with panels that slid like the app might work. Gelobter noted that the people at the Mall would "use their thumb to slide through." This enabled testing hypotheses about users that were discarded before the hard work of building the web app. "We originally had a feature where in your search results you could add schools to a compare list, for comparing side-by-side. Not a single person had any interest in doing that. No one asked about it. No one clicked on it." All of this sped the process of moving from learning to building.

The broader point here is not that software is better when Agile-like or Lean-like processes guide the development of tools and technologies: It is that the agency acts differently, and as a consequence, the outputs of the agency move at a different speed and a different level of responsiveness. In 2016, Gelobter spoke about this experiment more generally at ED and about how that experience helped change processes more generally.[34] She noted that agencies were "welcoming this change. They are embracing this change and they are asking for more change . . . Somebody said to me when I came 'we thought you'd be wearing a 'cape.'"

Gelobter continued, "They're inviting us in, into doing more than just software but to actually talk about how to change, how to make culture change, how to make culture shift, how to start thinking about using those methodologies that we do for software development, things like user-centered design and human-centered design thinking, thinking about how to put the

32. For example, see the discussion in Ries (2017), pp. 86-88.
33. Ries (2017), p. 88.
34. C-Span. "Improving Government Online Services." January 14, 2016. https://www.c-span.org/video/?402281-1/improving-government-online-services.

customer first and foremost, and how do you actually take that and extend it beyond tech, how do you take it and extend it into policymaking, and into basically what we call user-centered government."

Finally, she noted, "Any tool in their arsenal that they can add to actually fix stuff and make stuff better day-in and day-out—they're all about it."

This is also part of the bigger picture. The starting point is often building a tool, as announced by President Obama in 2013. This engenders a process of deliberation about what that tool should do, including who is the typical user. Agile brought to this process a focus on speed; that focus on speed required rapid decisions about what the tool should do—and that required a methodology for finding users and exploring their needs, wants, and experiences.

While debates continue about what data should be available, how it should be presented, and how users should interpret such information when vetting colleges,[35] by September 2016 over 1.5 million unique users had accessed the tool (compared to 160,000 per year for the previous version).[36] Perhaps more importantly, the tool continues to evolve, along with the ecosystem of applications that rely on the API for access to the tool's underlying data.[37]

Design Thinking at the Office of Personnel Management's Innovation Lab

While Design Thinking is part of what ED carried out while it was building College Scorecard, the Office of Personnel Management's Innovation Lab's mission is to "use human-centered design to build an innovative and creative federal workforce, putting people at the center of our problem-solving process to improve public sector challenges."[38] The Lab has helped other units from inside OPM, from outside OPM within other units in the federal government, and even from other units at the state and local level. Indeed, through its educative and facilitative roles, the Lab has become a primary face of human-centered design and Design Thinking within the federal government. In these roles, the Lab is as much a design shop as it is almost an incubator. It does not have the funding roles that incubators like Y Combinator[39] play in Silicon Valley, but it does serve to build the human capital and knowledge base throughout government that allows individual agencies to use Design Thinking on a day-to-day basis.

35. For example, see Miller, Ben. "Scoring the College Scorecard, What's Good and What Needs Improvement." Center for American Progress. February 2016. https://cdn.americanprogress.org/wp-content/uploads/2016/02/10085654/ScoringScorecard-report.pdf; Kelchen, Robert. "Moving Forward with Federal College Ratings: Goals, Metrics, and Recommendations." Wiscape: Wisconsin Center for the Advancement of Postsecondary Education. 2014. http://wiscape.wisc.edu/docs/WebDispenser/wiscapedocuments/kelchen_policy-brief.pdf; Voight, Mamie, Alegneta A. Long, Mark Huelsman, and Jennifer Engle. "Mapping the Postsecondary Data Domain: Problems and Possibilities." Institute for Higher Education Policy. March 2014. http://www.ihep.com/sites/default/files/uploads/postsecdata/docs/resources/mapping_the_postsecondary_data_domain.pdf; Castleman, Benjamin L., Saul Schwartz, and Sandy Baum. Decision Making for Student Success: Behavioral Insights to Improve College Access and Persistence. Chapter 5. 2015. https://www.taylorfrancis.com/books/e/9781317664932/chapters/10.4324%2F9781315767932-9; Roksa, Josipa. "Gradations or Extremes: Another Look at the College Ratings." Change: The Magazine of Higher Learning. Volume 47, Number 2. 2015. https://naspa.tandfonline.com/doi/full/10.1080/00091383.2015.1019318#.WvtefS-ZNN0; Hurwitz, Michael and Jonathan Smith. "Student Responsiveness to Earnings Data in the College Scorecard." Economic Inquiry. Volume 56, Issue 2. 2018. https://onlinelibrary.wiley.com/doi/abs/10.1111/ecin.12530; Rothwell, Jonathan. "Understanding the College Scorecard." Brookings Institution. September 28, 2015. https://www.brookings.edu/opinions/understanding-the-college-scorecard/.

36. U.S. Digital Service. "2016 Report to Congress: Helping Students Make More Informed College Choices at Department of Education." 2016. https://www.usds.gov/report-to-congress/2016/college-scorecard/.

37. U.S. Department of Education. "College Scorecard Data." 2018. https://collegescorecard.ed.gov/data/documentation/.

38. U.S. Office of Personnel Management. "Lab OPM." 2018. https://lab.opm.gov.

39. Y Combinator. "About." 2018. http://www.ycombinator.com.

The Innovation Lab began in March 2012 as a kind of experiment itself. In the wake of a rescue effort for OPM's USAJobs website, the Lab opened in an open space of the OPM basement. Its layout belies the focus on collaboration and idea-generation tools like brainstorming. A story written at that time noted, "Everything from the large, wooden barn door to the chalkboard-painted walls, curved, interlocking white boards, and Ikea furniture makes the space an oasis for the federal worker weary of the ubiquitous blah of the federal workplace."[40] Until June 2012 or so, the Lab's focus was on hosting meetings within OPM—for instance, on topics like backlogs in how OPM handled employee retirements, or how the agency handled open enrollment issues for existing employees. But agency leadership also used that time to determine that human-centered design should be the Lab's primary output. The Lab's role was to be broader than just serving OPM projects but was also to include training and support activities throughout government.[41]

This broader role grew over time as the Lab incorporated people within OPM with a strong interest or focus on design, and also by bringing in additional staff with experience broadly in Design Thinking. For instance, staff came from formal design training programs, such as the Parsons School of Design or the Rhode Island School of Design. From that point, the role of the Lab and its designers moved beyond hosting meetings about problems to facilitating project teams within OPM in their search for solutions to longstanding human resources problems. Such problems included data collection efforts on the cybersecurity workforce, the recruitment of veterans, and the retention of STEM-trained workers.[42]

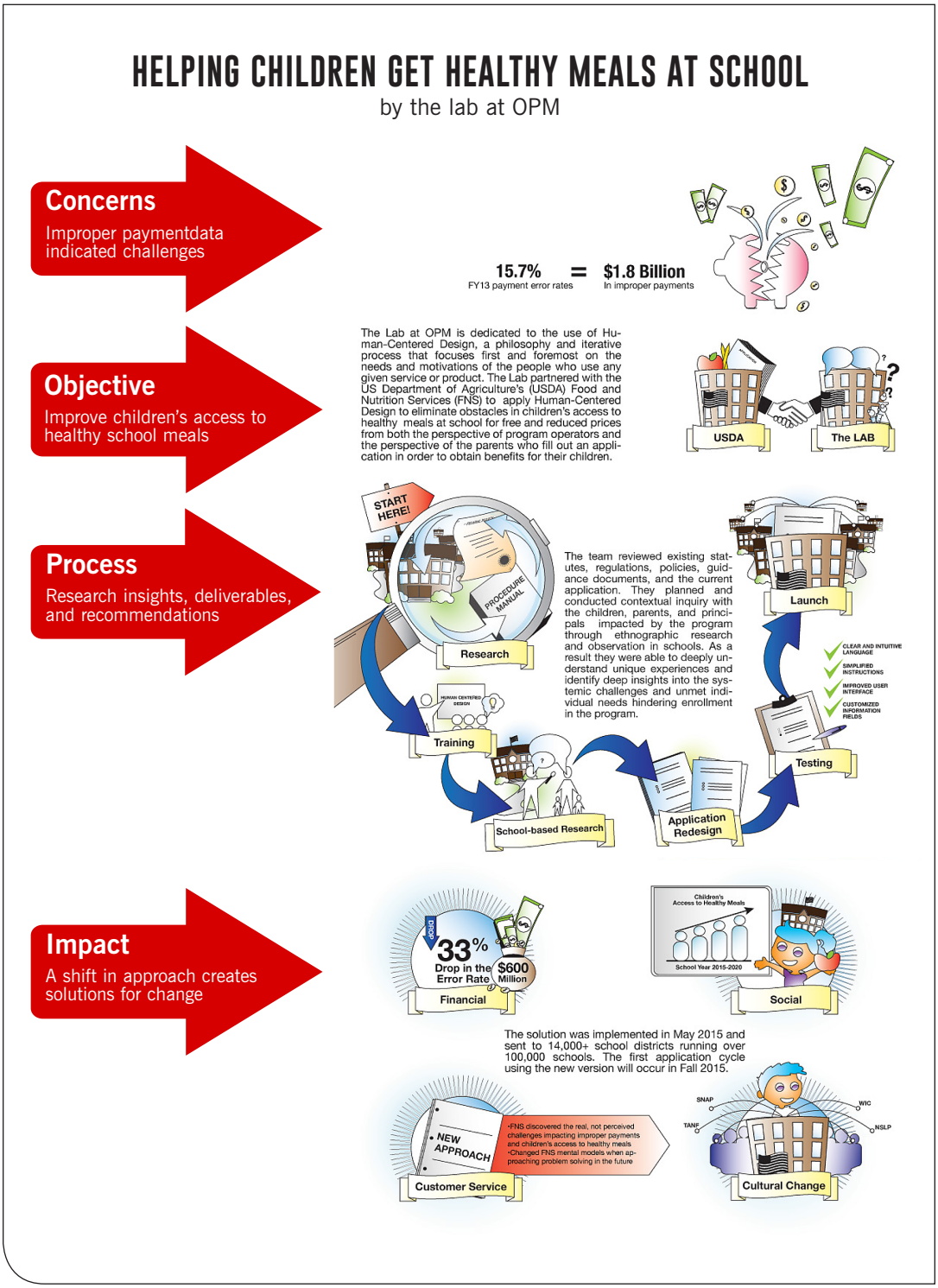
Even this role limited the Lab's potential impact, so over time the Lab has evolved to include other agencies in their facilitation efforts. One notable example is the Lab's work with the Department of Veterans Affairs to change clinic practices in places like Milwaukee through the VA's Innovators Network.[43] Another is the Lab's training experiences with the Department of Defense Naval Surface Warfare Center in Carderock, Maryland—the center of excellence for ships and ship systems in the U.S. Navy.[44] Garth Jensen, the Carderock director for Innovation, attributes the quick payoff to the Lab's "rigorous focus on experiential learning." As one Carderock employee noted, "Human-centered design is not some new buzzword . . . It's a way of helping people step back and see how the big picture collides with the smaller realities of our daily work to then help us make better solutions. It's specifically about designing better products and taking the best ideas and allowing them to come through sooner."

In another notable example, the Lab and their partners at the National School Lunch Program of the United States Department of Agriculture's Food and Nutrition Service (FNS) received the Design Management Institute's 2015 "Design Value Award" for their joint work to improve the process for applying for reduced/free lunches and how the FNS reimburses schools for those meals.[45] With expectations of saving $600 million by 2019-2020 school year, this initiative

40. Kolawole, Emi. "Office of Personnel Management's 'Innovation Lab' a portal to Silicon Valley." Washington Post. August 2, 2012. https://www.washingtonpost.com/national/on-innovations/office-of-personnel-managements-innovation-lab-a-portal-to-silicon-valley/2012/08/02/gJQA3iyDSX_story.html.
41. U.S. Government Accountability Office. 2014. "Office of Personnel Management. Agency Needs to Improve Outcome Measures to Demonstrate the Value of its Innovation Lab." March 31, 2014. GAO-14-306. https://www.gao.gov/products/GAO-14-306. Page 10.
42. U.S. Government Accountability Office. 2014. "Office of Personnel Management. Agency Needs to Improve Outcome Measures to Demonstrate the Value of its Innovation Lab." March 31, 2014. GAO-14-306. https://www.gao.gov/products/GAO-14-306. Page 11.
43. Ryan, Hilary. "Redesigning Healthcare for Women Veterans." Medium.com. November 21, 2015. https://medium.com/vainnovation/redesigning-healthcare-for-women-veterans-b425f7508c1e. In 2018, information on the VA's Innovators Network was available at https://www.innovation.va.gov/innovatorsnetwork/; this information is no longer available.
44. NSWC Carderock Division Public Affairs. "NSWC Carderock Embraces Human Centered Design to Strengthen its Innovative Culture." 2017. http://www.secnav.navy.mil/innovation/Documents/2017/11/CarderockHCD.pdf.
45. DMI: Design Management Institute. "Design Value Awards 2015." https://www.dmi.org/page/2015DVAOPM.

used human-centered design to seek improvement at all points of the process.[46] As Figure 5 shows, this multilayered process centered on users' needs as the key way for identifying those improvements.

Figure 5: Design strategy at the National School Lunch Program



46. For a more detailed description of how this program fit into broader efforts in this area, see: U.S. Department of Agriculture, Food and Nutrition Service. "USDA Announces Progress in Reducing Improper Payments in School Meals." May 4, 2015. https://www.fns.usda.gov/pressrelease/2015/fns-0005-15

Tom Kalil, then deputy director for Technology and Innovation in the White House Office of Science and Technology Policy, noted that "the Lab worked with FNS team members to teach them how human-centered design (HCD) can uncover insights into the unmet needs of the children, parents, and school staff they serve. Working side by side, the FNS team learned, practiced, and strengthened their HCD skills and knowledge, both to support this specific project and more broadly to empower us to apply a similar approach when tackling future program, service, and product challenges. As co-creators in the project, we saw HCD's power to uncover root causes, rather than fix symptoms of public sector problems."[47] Perhaps even more telling is Lab's educative role in the use of human-centered design. Kalil added, "As a result, following the conclusion of this project, several FNS (USDA Food and Nutrition Service) team members are committed to applying HCD to other projects under their purview, and to encouraging other programs in USDA to do so as well."

Perhaps the most far-reaching Lab initiative has been its contributions to the redesign of USAJobs, the primary way the federal government lists civil service job opportunities for most federal agencies. Since 1996, at least one billion job searches have been conducted on USAJobs and over 16 million resumes have been posted. In a given month, over 14 thousand jobs are posted on this platform.[48] Unfortunately, for many years, the user experience has been like "typing information into a black hole," as described by Senator James Lankford.[49]

The website, seen as a platform, represents only a small piece of the entire federal hiring process—but it is an important piece that OPM saw as a natural target for the Innovation Lab. Starting in 2015, the Lab worked with other units to employ Agile mainly scrum and other principles from the Design Thinking repertoire to improve the platform at speed. The Lab's lead designer Sean Baker noted, "That will allow us to push out features on the site quickly over time and allow us to work on the site in an iterative way, instead of just unveiling the curtain and saying look what we've done."[50]

To get there, the Lab followed design principles built on starting from users' needs. This included an array of interviews and other elicitation techniques with the range of users—including both students and other applicants, as well as specialists from human resource groups in the agencies that were listing positions. The goal was to elicit that feedback with respect to specific changes that could be made to the software using six to 12-week windows. Lab Director Stephanie Wade noted, "We don't want to wait until everything is perfect. We want to try to make it better incrementally."[51]

It is important to highlight the way that needs, prototyping, and iteration interact. Rather than following the standard waterfall approach, the Lab and its partners sought to build from need at each step and to keep the process moving. Wade noted, "Our approach is different in the sense that we actually start with understanding the applicants, the people who are using this tool the most, and understanding what their perspective is like, their emotional needs, and

47. Kaul, Tom. "Using Human-Centered Design to Make Government Work Better and Cost Less." Office of the President. September 4, 2015. https://obamawhitehouse.archives.gov/blog/2015/09/04/using-human-centered-design-make-government-work-better-and-cost-less.
48. U.S. Office of Personnel Management. "USAJobs Updates Celebrate 20th Anniversary Milestone." September 12, 2016. https://www.opm.gov/news/releases/2016/09/usajobs-updates-celebrate-20th-anniversary-milestone/.
49. Gunter, Chase. "Why USAJobs Needs an Overhaul." Federal Computer Weekly. April 13, 2016. https://fcw.com/articles/2016/04/13/usajobs-improvements.aspx.
50. Ogrysko, Nicole. "Expect more incremental changes to USAJobs.gov next year, OPM says." Federal News Radio. December 2, 2015. https://federalnewsradio.com/opm/2015/12/expect-incremental-changes-usajobs-gov-next-year-opm-says/.
51. Konkel, Frank. "Inside the USAJobs Revamp and Other Digital Summit Highlights." Nextgov. May 21, 2015. https://www.nextgov.com/emerging-tech/emerging-tech-blog/2015/05/inside-usajobs-revamp-and-other-highlights-digital-summit/113509/.

their challenges with the system are. Before they even get to the federal government, we want to understand who they are as people." This is the essence of the family of methodologies that are called Design Thinking.[52]

In a 2016 interview with *Federal Times,* USAJobs program manager Michelle Early described how the full portfolio of Agile, Design Thinking, and (even) Lean Production contributed to this redesign: "Then along with all of that [data collection from users] and from the human-centered design, and all of this user research, we are continuing to use the Agile development process . . . as well as doing what we call Lean discovery, which is really measuring before, during, and after the process to make sure we are meeting the needs."[53] One of those products in the February 2015 update was a compilation that focused on a "skills aggregator."[54] This included a transition to a new five-step process that included functionality to create or upload a resume. This was the first total redesign of the platform, but notably this was the continuation of a process that would include new updates rolling out frequently.[55]

While the OPM Innovation Lab focused the portfolio mostly on USAJobs, it is notable that these changes have been part of a bigger enterprise to deploy login.gov and other aspects of the MyGov platform.[56] These initiatives continue through units like the USDS in 2018.[57]

Improving Accessibility at Georgia.gov

Google's Assistant, Apple's Siri, Microsoft's Cortana, and Amazon's Alexa are now ubiquitous—available on devices ranging from phones and laptops to speakers and thermostats. Gartner Research predicts that by 2020 over 30 percent of web browsing will be done by voice search;[58] Comscore predicts that it will be 50 percent.[59] While the methods behind voice search date to 2007,[60] what is remarkable is their widespread adoption by so many different types of users. Children use voice search to order items from Amazon and so do parents who are pressed for time or away from the keyboard.

But perhaps the most interesting user cases are seen in the way that voice search has opened the world of the Internet to the visually impaired or those who cannot use traditional input devices for mobility reasons. While recent stories in the popular press focus on the impact of

52. Noble, Zach. "USAJobs makeover is OPM's summer job this year." *Federal Computer Weekly.* June 1, 2015. https://fcw.com/Articles/2015/06/01/USAJobs-12-weeks.aspx

53. Cordell, Carten. "The New Face of USAJobs." Federal Times. May 17, 2016. https://www.federaltimes.com/enterprise-view/2016/05/17/the-new-face-of-usajobs/.

54. Cordell, Carten. "OPM updates the application process on USAjobs.gov." Federal Times. February 24, 2016. https://www.federaltimes.com/management/hr/2016/02/24/opm-updates-the-application-process-on-usajobs-gov/.

55. Carter-Conneen, Mike. "OPM starts rolling out USAJOBS 'total redesign'." WJLA. February 25, 2016. http://wjla.com/news/local/opm-starts-rolling-out-usajobs-total-redesign.

56. Easton, Stephen. "Eight lessons on innovation from Obama's administrative head." The Mandarin. March 27, 2018. https://www.themandarin.com.au/90511-eight-lessons-innovation-obamas-administrative-head/.

57. Ziadeh, Amanda. "What's Next for the White House's Tech Squad?" GovernmentCIO. February 21, 2018. https://www.governmentciomedia.com/whats-next-white-houses-tech-squad.

58. Gartner. "Gartner Reveals Top Predictions for IT Organizations and Users in 2017 and Beyond." October 18, 2016. https://www.gartner.com/newsroom/id/3482117.

59. Engleson, Susan. "The Future of Voice From Smartphones to Smart Speakers to Smart Homes." Comscore. December 15, 2017. https://www.comscore.com/Insights/Presentations-and-Whitepapers/2017/The-Future-of-Voice-From-Smartphones-to-Smart-Speakers-to-Smart-Homes.

60. Sherwani, J., Dong Yu, Tim Paek, Mary Czerwinski, and Alex Acero. "Voicepedia: towards speech-based access to unstructured information." Interspeech 2007, 8th Annual Conference of the International Speech Communication Association, Antwerp, Belgium. August 27-31, 2007 https://www.researchgate.net/publication/221481386_Voicepedia_towards_speech-based_access_to_unstructured_information. See also Wang, Ye-Yi, Dong Yu, Yun-Cheng Yu, and Alex Acero. "An Introduction to Voice Search." IEEE Signal Processing Magazine. Volume 25, Issue 3. 2008. https://ieeexplore.ieee.org/document/4490199/.

voice search for users in these situations, this outcome is intentional: voice search was originally seen as the one way to satisfy this unmet user demand.[61]

In 2013, Amit Singhal, the head of Google's search rankings team, argued in a conversation with Guy Kawasaki at SXSW Interactive that "The destiny of Google's search engine is to become that 'Star Trek' computer, and that's what we are building."[62] The problem for most content providers, and perhaps especially so for those in public sector settings, is that that goal—to provide seamless voice search of large amounts of effectively unstructured data—is often more "Star Trek" than reality.

In important ways, states and local governments are even less likely than the federal government to build out content in ways that respond to such demands. For instance, the National Association of State Chief Information Officers' 2017 State CIO Survey noted that only 40 percent of states have a digital services organization, that only 20 percent plan to create one, and that in 22 percent of cases the responsibility lies at the local level.[63] Respondents also focused on key challenges. One overriding concern was how best to implement digital services—i.e., using outside vendors, centralized implementation, or decentralized approaches. In addition, CIOs were concerned about overall agency readiness, continuation of collaboration across organizational boundaries, and sustainability of budgets.

These concerns, though, might apply to any agency. What is more remarkable is where state agencies stand with regard to adopting industry-standard practices. The 2017 Survey also shows that about 47 percent of respondents say that there is widespread use of Agile or related practices, with or without central guidance. Only about seven percent say that there is widespread use of DevOps or other related cultural approaches to rapid build-test-release software production—although the trajectory may be on the upswing.[64] DevOps in practice can be an important mechanism for insuring the organization follows Agile practices over the long-haul.

For states and local governments, the challenges range from lack of political attention and limited funds to workforce quality and lack of knowledge about best practices. These ranges of problems show why organizations at these levels are often the least capable of adopting cutting-edge solutions that match the best of what we see in the private sector. Yet, the relative independence of these organizations, coupled with local demands and the possibility of policy entrepreneurship, creates opportunities for some organizations to take on best practices like voice search.

Consider the implementation of voice search in the context of Georgia.gov—the State of Georgia's official online portal. The portal itself provides content and services for 115 state agencies; it also provides entry points for an array of cities and Georgia's 159 counties. Perhaps more importantly, though, the Georgia Technology Authority (GTA) manages the state's platform for enterprise-level web-publishing. This platform itself supports 82 state agencies and their websites. This report focuses on the GTA's use of Design Thinking and

61. Hallmah, B.Z., A. Azlina, P. Behrang, and W.O. Choo. "Voice recognition system for the visually impaired: Virtual cognitive approach." 2008 International Symposium on Information Technology. 2008. https://ieeexplore.ieee.org/document/4631738/.
62. Singhal, Amit and Guy Kawasaki. "The Future of Google Search in a Mobile World." SXSW Interactive. 2013. https://www.youtube.com/watch?v=0k2ufqVh-pU.
63. National Association of State Chief Information Officers. "2017 State CIO Survey." 2017. https://www.nascio.org/Portals/0/Publications/Documents/2017/NASCIO_2017_State_CIO_Survey.pdf?ver=2017-10-25-174540-510.
64. National Association of State Chief Information Officers. "2017 State CIO Survey." 2017. https://www.nascio.org/Portals/0/Publications/Documents/2017/NASCIO_2017_State_CIO_Survey.pdf?ver=2017-10-25-174540-510.

Agile, because "Both the portal and the enterprise platform are carefully designed to ensure friendly navigation, accessibility for users with disabilities, and robust search capabilities."[65]

From a user's perspective, the Georgia.gov site emphasizes simplicity and minimalism (see Figure 6). Search functions and popular topics are prominently located, along with a "this week" section for recent news and changes. Of course, in all cases such usability is contingent on "ability"—such as the user's capacity for vision or any mobility concerns. Even if an organization did not see it as part of their mandate to serve market segments with vision or mobility issues, the average user's taste for "point and click"-driven browsing should drive the decision of whether to incorporate voice search. But for public sector organizations, the goal of universal access also drives this decision.

As in the case of the College Scorecard or USAJobs, the problem is to start from need. The GTA team uses Design Thinking to consider how end users will engage with the content that various products will contain or transmit. As Nikhil Deshpande, the chief digital officer of Georgia, has written, "Citizen engagement is the North Star of any digital strategy. Technology is just the enabler."[66] Their team's overall process involves considering who the user is, where and how do they interact with the services being offered, the channels they use in their engagement, and the devices that enable those channels; those are then generalized as personas that "describe the characteristics and behavior patterns of your citizens" that can be paired with scenarios "to capture the context and motivation of their interaction." The team then uses standard tools like experience mapping to build a better picture of user needs.

Deshpande recounts that providers like agencies need the user experience information that comes from tools associated with Design Thinking to avoid problematic missteps (for instance, the "need" for a mobile app instead of improving a mobile-friendly website).[67] This broader point was part of the learning process about the design of Georgia.gov. He noted, "When the state designed its main website in 2002, it worked from an assumption that everyone would start at Georgia.gov, a central portal, and then be routed to the correct website on one of the many branches of the state government's expansive tree of services. It sounds reasonable enough, but through testing—which in Georgia includes user testing and video recordings of what the user is doing and thinking as he tries the latest version of a digital service under development—the state found that more than 60 percent of users were arriving to web pages through a Google search, and very few were using their interface as intended."

This basic lesson continues as the agency incorporates voice search into its underlying content provision infrastructure. The discovery of the need for voice search came from continuously testing the basic infrastructure GTA had built and improved over time. Deshpande noted, "A lot of the partners we worked with on the accessibility projects had a lot of people with limited abilities that [tested our websites]. They confirmed that they and the community they knew depended on devices that helped them with assistive technologies and really relied heavily on Alexa to look up all kinds of information."[68]

65. Georgia Technology Authority. "About GTA." 2018. https://gta.georgia.gov/about-gta.
66. Deshpande, Nikhil. "It's Time to Prioritize Your Organization's Digital Strategy." Statescoop. February 6, 2018. https://statescoop.com/nikhil-deshpande-80-20-digital-services.
67. Wood, Colin. "Why User-centered Design Research is Time-consuming and Totally Worth It." Statescoop. April 24, 2018. https://statescoop.com/why-user-centered-design-research-is-time-consuming-and-totally-worth-it.
68. Wood, Colin. "Georgia is Using Alexa to Reach More Disabled Residents." Statescoop. April 19, 2017. https://statescoop.com/georgia-is-using-alexa-to-reach-more-disabled-residents.

In early 2017, Georgia became one of the first states to use Amazon's Alexa-driven platform for providing access to information and transactional services. Ask GeorgiaGov, an Alexa skill, now provides content from most agencies and many jurisdictions.[69] Part of this was to consolidate existing resources to improve the voice-based service—and so perhaps also to improve all services. Deshpande noted, "We focused on the popular topics based on user searches and used an intent-based architecture to focus on these specific services. We worked with 60 to 65 agencies to distill the needed information, as opposed to pages and pages of information that used to be hosted on agency website."[70]

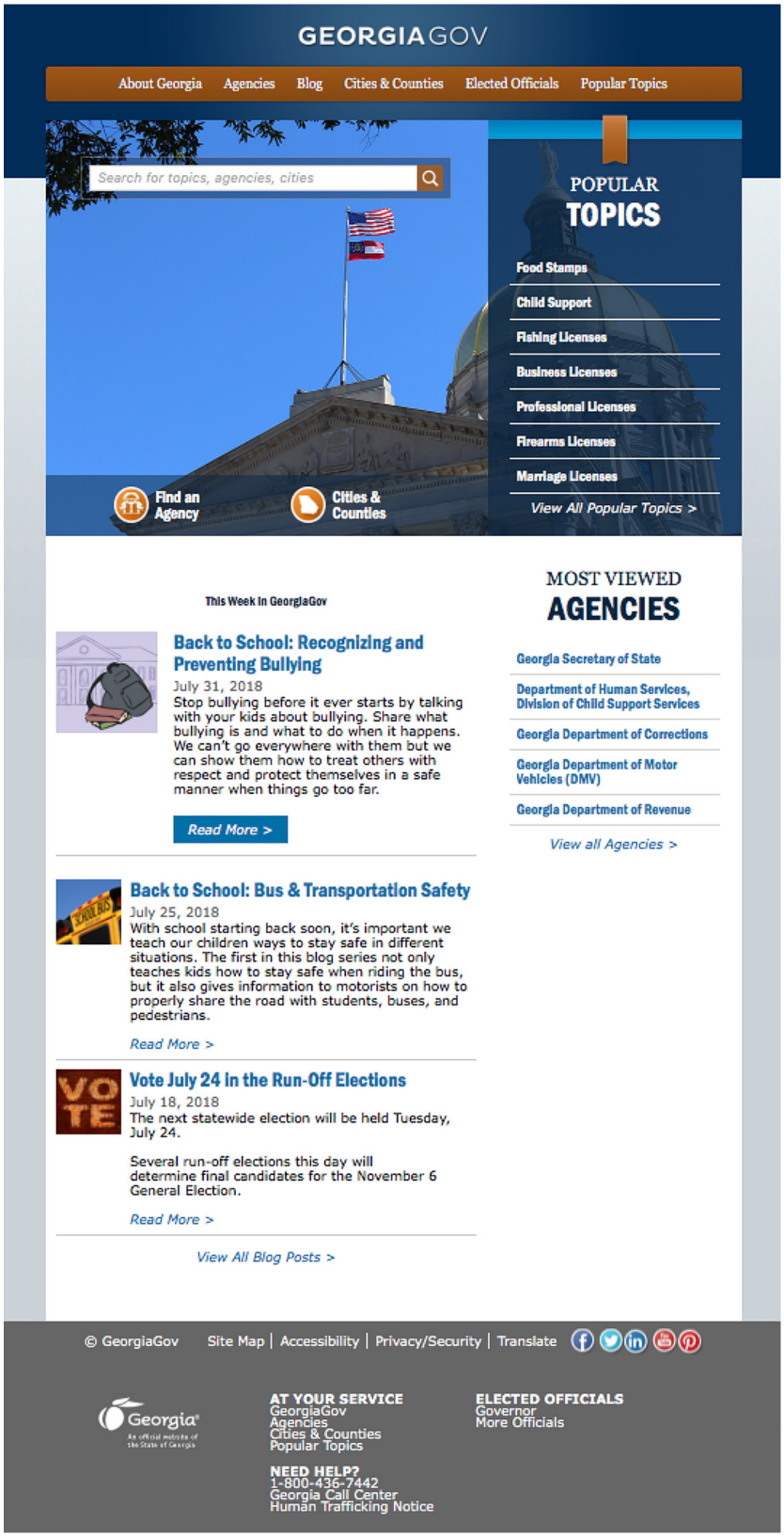
This consolidation of the agencies' content strategies to work across many different possible channels required substantial effort. One change was to the content itself: reducing word counts and removing references. Another, perhaps more important, was to use new forms of user testing for assessing the product due to the lack of a formal interface. Deshpande noted, "We are monitoring to see the success factors that enable people to get answers within a couple of attempts of conversations. There are some places where we see that they are taking a little longer, so we are looking at how to change those conversations by tweaking content or the code itself."[71]

A broader effort was to implement such technology in the traditional public sector constraints associated with personnel and budgets. In this case, Georgia.gov is built on Drupal-based cloud services offered via Acquia. As the state's web hosting partner, Acquia helped establish a "conversational interface pilot" under a novel contracting agreement whereby Georgia accessed Acquia Labs capabilities.[72] The underlying website infrastructure is built on Drupal's OpenPublic distribution.[73] The Lab and GTA have made the results of this project available to the open source community,[74] in part because of Acquia's longstanding commitment to free and open-source software (FOSS) and Agile operations.[75]

While the hallmark of Ask GeorgiaGov is the way it responds to user needs by breaking the product and rebuilding it to improve responsiveness, it is important to note that the Design Thinking that made this possible is carried out by shops using software design methodologies like Agile—or at least affiliated "Agile" methods like DevOps or Continuous Delivery.[76] The promised results of Design Thinking come when the shops building the tools have work traditions that do not get in the way of starting from user needs.

69. A video demonstration of the skill is at Acquia Octo. "Alexa, Ask GeorgiaGov." Vimeo. 2017. https://vimeo.com/216737044.
70. Friedman, Sara. "Georgia Rolls Out Alexa Skill for Government Services." GCN. October 16, 2017. https://gcn.com/articles/2017/10/16/georgia-alexa-skill.aspx.
71. Friedman, Sara. "Georgia Rolls Out Alexa Skill for Government Services." GCN. October 16, 2017. https://gcn.com/articles/2017/10/16/georgia-alexa-skill.aspx.
72. Wood, Colin. "Georgia is Using Alexa to Reach More Disabled Residents." Statescoop. April 19, 2017. https://statescoop.com/georgia-is-using-alexa-to-reach-more-disabled-residents.
73. Drupal. "OpenPublic." Drupal.org. March 4, 2016. https://www.drupal.org/project/openpublic.
74. Drupal. "alexa 7.x-1.x-dev." Drupal.org. July 25, 2017. https://www.drupal.org/project/alexa/releases/7.x-1.x-dev.
75. Acquia. "Alexa, ask GeorgiaGov." Acquia. 2018. https://www.acquia.com/blog/alexa-ask-georgiagov/15/05/2017/3303821.
76. McGuire, Jeffrey A. "'Agile' is Dead: When Marketing Takes Your Words." Acquia. April 12, 2017. https://www.acquia.com/blog/sugar-free-marketing/agile-dead-when-marketing-takes-your-words/12/04/2017/3302811.

Figure 6: The Georgia.gov site



Building Labs at the Centers for Disease Control and Prevention

An under-recognized job of all governments is to construct and maintain buildings for those agencies tasked with serving citizens and implementing policies around the country—indeed around the world. In 2017, the General Services Administration estimated that the backlog of deferred maintenance alone was greater than $1.4 billion; the average age of the 1,600 GSA-administered buildings was 47 years.[77] At the individual project level, the GSA treats those under $3.095 million as "small" projects; those above that threshold are capital projects.

But how the GSA handles these facilities and projects is a coarse point of reference. Consider all of the defense facilities outside GSA control, or other large projects that are not included in this universe of buildings. Because government remains, by and large, a people-centered production process; buildings are necessary to house those people and the tools they use. While it is easy to dream of government by robots and algorithms, even most private manufacturers rely on people to make things—and this is especially true in service industries like consulting.

Few companies have as many buildings as the federal government and none are as widely dispersed in geographic space. In most cases, few are as expensive to build and maintain as the most expensive federal facilities, and this is especially true if we think of the broader set of public works projects, such as Boston's "Big Dig." In these situations—where government is building expensive facilities meant to serve for many years—can Design Thinking, Agile, Lean Production, or Lean Startup help?

Obviously, buildings are designed since this is the entire point of architecture as a profession. Over the last several decades, though, builders have thought quite a lot about how to bring Lean Startup, Agile, or Design Thinking into the process of building buildings. Because construction is not software engineering, it is easy to assume that it is inherently difficult—if not impossible—to apply Lean, Agile, or Design Thinking to the production of very large physical assets.[78]

As one commentator noted, there are fewer facility builds than software projects but the budgets are so much greater. Because of this, construction represents a greater source of benefits from deploying Agile or Lean techniques.[79] In fact, the construction industry has used Lean Production techniques since the early 1990s, if only for waste reduction. But since then, the advent of Agile and related techniques has caused a rethinking of what is the point of design and what are the roles of builders in the construction process.

In a nutshell, two threads are worth considering. First, builders and architects are grappling with "what it is to design."[80] Just as software engineers are leaving waterfall approaches for broader and more sustained engagement with users, construction is changing as well. Second, the teams that build buildings are changing how they manage projects. Indeed, the new mod-

77. "Real Property: GSA Is Taking Steps to Improve Collection and Reporting of Repair and Alteration Projects' Information." U.S. Government Accountability Office. July 2018. GAO-18-595. https://www.gao.gov/assets/700/693319.pdf.

78. Iqbal, Suhail. Leading construction industry to lean-agile (LeAgile) project management. Paper presented at PMI Global Congress 2015 - EMEA, London, England. Newtown Square, PA: Project Management Institute. https://www.pmi.org/learning/library/leading-construction-lean-agile-9930 and Moriel, Roy S. Feasibility in Applying Agile Project Management Methodologies To Building Design and Construction Industry. 2017. Harrisburg University of Science and Technology. http://digitalcommons.harrisburgu.edu/cgi/viewcontent.cgi?article=1017&context=pmgt_dandt.

79. Iqbal, Suhail. Leading construction industry to lean-agile (LeAgile) project management. Paper presented at PMI Global Congress 2015 - EMEA, London, England. Newtown Square, PA: Project Management Institute. https://www.pmi.org/learning/library/leading-construction-lean-agile-9930.

80. Michael Mehaffy and Nikos A. Salingaros. The Future Of Architecture Must Be "Agile". Metropolis. December 20, 2013. https://www.metropolismag.com/design/future-architecture-must-be-agile/.

els look like Agile's sprints—the high-paced, rapid iteration well-known now in software design and engineering.[81] These two parallel changes—to *how we design buildings and how we build those designs*—are reshaping modern construction.

The Center for Disease Control and Prevention's (CDC) ongoing renewal of its physical facilities provides a unique lens on how Design Thinking can improve the value produced in high-cost, high-stakes projects. For instance, the agency is now in the process of replacing its primary high containment laboratory that includes BSL-4 (biosafety level four) facilities—a building completed in 2005 and opened in 2009. The new facility is projected to cost at least $350 million, although the total budget that includes other campus improvements would be at least $480 million.[82] High containment facilities are highly complex engines, composed of physical buildings, mechanical systems, and software for managing myriad safety and security processes. These facilities are the most secure of the world's high containment labs.

On its face, this seems like the ultimate exercise in waterfall thinking. The current facility cost $165 million, was completed in 2005, opened in 2009, and planning for its replacement began by 2018.[83] Dr. Inger Damon, CDC's director of the division of high-consequence pathogens and pathology, noted that the facility[84] "runs constantly, 24 hours a day, seven days a week, 365 days a year. It is beginning to age and it is becoming increasingly difficult to find parts that are needed for the facility." BSL-4 laboratories "work with exotic agents that pose a high individual risk of life-threatening disease by airborne transmission and for which treatment may not be available," such as Ebola, Lassa fever, and emerging influenza viruses.[85]

It would seem that such waterfall thinking would be easy, that there would be a "recipe" for building BSL-4 facilities. But there is no entity overseeing the thousands of American BSL facilities. Moreover, oversight of federal facilities, which is sometimes weak, occurs at the agency level.[86] Also, there no one way to build a high containment facility. In fact, CDC is a central source of "best practices" in facility construction for thousands of other U.S. and international facilities.

At CDC, the Office of Safety, Security and Asset Management (OSSAM), which exists at the agency level within the Office of the Chief Operating Officer, is responsible for "providing a safe, secure, functional, and healthy workplace environment."[87] Within OSSAM, the Asset Management Services Office (AMSO) administers all CDC assets. AMSO's responsibility is "ensuring that assets are managed effectively while maintaining efficient operations and logistical support, customer satisfaction, and environmental stewardship." AMSO builds and runs the buildings, like this planned new facility, where CDC scientists and clinicians work to reduce threats from emerging infectious diseases. AMSO also oversees the building's design, as well as how users and other stakeholders' needs and preferences are included in the project.

81. https://www.sciencedirect.com/science/article/pii/S1877705816339601.
82. Sun, Lena H. "CDC seeks new labs for bioterror pathogens to replace aging facility." February 23, 2018. https://www.washingtonpost.com/news/to-your-health/wp/2018/02/23/cdc-seeks-new-labs-for-bioterror-pathogens-to-replace-aging-facility.
83. "McCarthy Completes Construction of CDC Research Laboratory; Lab One of Eight in North America Built for Study of the Most Infectious Pathogens."2005. BusinessWire. https://www.businesswire.com/news/home/20051018005876/en/McCarthy-Completes-Construction-CDC-Research-Laboratory-Lab.
84. Hensley, Ellie. "CDC plans $350 million high containment lab in Atlanta." Atlanta Business Chronicle. February 23, 2018. https://www.bizjournals.com/atlanta/news/2018/02/23/cdc-plans-350-million-high-containment-lab-in.html.
85. "High-Containment Laboratories: Coordinated Efforts Needed to Further Strengthen Oversight of Select Agents." U.S. Government Accountability Office. Testimony Before the Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives. November 2, 2017. GAO-09-1038T. https://www.gao.gov/assets/690/688087.pdf Page 1.
86. "High-Containment Laboratories: Coordinated Efforts Needed to Further Strengthen Oversight of Select Agents." U.S. Government Accountability Office. Testimony Before the Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives. November 2, 2017. GAO-09-1038T. https://www.gao.gov/assets/690/688087.pdf Page 2.
87. U.S. Centers for Disease Control and Prevention. Office of Safety, Security, and Asset Management (CAJS). September 21, 2016. https://www.cdc.gov/maso/pdf/OSSAMfs.pdf.

When CDC builds a new facility like the planned new high-containment facility, the agency threads elements of Design Thinking, Agile, and Lean Production throughout both the pre-building and post-building phases. This total design process includes the following important elements:

- When the agency issues requests for qualifications (RFQs), clear and complete statements of the different contractors' commitment to and capacity for Design Thinking are a central part of the assessment phase.
- When the agency is planning the building and its attributes, this "empathizing stage" focuses on the various "users" and their needs and demands—as well as on how the building shapes or constrains their individual and joint actions.
- When carrying out this empathizing stage, the agency establishes long-range, multi-year teams that include 60 or more people to bring together the diverse interests, needs, and information and expertise bases for inclusion in the planning process.
- These teams include a wide array of types of participants, including cleaners, scientists, and engineers on both the design and maintenance sides of the equation. These "owners/agents" will commit to regularly providing feedback and guidance when presented with different mockups or prototypes of the building, its facilities, and the systems that knit together such diverse actors.
- Throughout this process, which can take 12 months or longer, the groups regularly interact through many other tools drawn from the repertoire of Design Thinking, Agile, and Lean. One important tool used throughout is charrettes, the group planning and brainstorming processes that are central to Design Thinking.
- After building the facility, the process of "shaking, rattling, and rolling" the proto-facility takes around two years. This time period is a long process of involving all of those who had participated at the planning stages—but now they are the users that show whether the facility's features work as expected. At this point, any new requirements that have emerged during the building phase are addressed as possible.

This is a layered process of starting from need, engaging with and integrating users' views into the facility's design, and then shaking out the facility by having users test the build given their particular needs and preferences. This layered process may seem like overkill. But the core constraint here is fundamental to the target—to build a facility that maximizes the capacity of users to do their job, while insuring that the facility minimizes the risk associated with the pathogens that BSL-4 facilities handle on a daily basis.

It is important to recognize that this engagement with users at the level of the design process through tools like prototyping and charrettes is consistent with broader themes that drive CDC management. OSSAM is itself a leader in Lean processes, whether it be for security purposes, insuring compliance with green initiatives, or (in this case) building high-containment laboratories. Similarly, the Office of Chief Information Officer has broadly engaged with Agile and related software development methodologies, including when it contracts for software using outside vendors.

One reason for this broad engagement with tools like Design Thinking, Lean, and Agile is likely that agencies like CDC are "knowledge organizations." The predominance of technicians and scientists, along with the requirement that the CDC be on the forefront of knowledge acquisition and use in many fields, means that the organization focuses on a day-to-day basis on finding, using, and (in many cases) determining "best practices." Tools like Design Thinking, Lean, and Agile are naturally part of their repertoire.

Challenges and Considerations

Challenge 1: Incorporating Change Agents from Outside the Organization

In each of these cases, it is possible to see the change agents that brought these methods and tools to government from outside the agency. These change agents have been or continue to be responsible for the behaviors on which Agile, Lean Startup, and Design Thinking are built. Unlike some other forms of organizational culture or organizational change, these methodologies are led by change agents. The simple reason for this is that the ways government does business in these cases—the collection of inertia-driven traditions we now refer to as "waterfall" methodologies—only change if a "change agent" (or process owner or whatever phrase we want to use for the policy entrepreneurs) pushes to shake things up.

Consider the cases presented in this report:

- U.S. Department of Education was able to build the College Scorecard because it hired people from outside the agency to champion that initiative. Those people implemented strategies gleaned from the Lean Startup.
- The OPM's Innovation Lab's mission is largely to train and enable other agencies to do Design Thinking. Important members of the Innovation Lab have come to the unit from outside government—e.g., Rhode Island School of Design.
- Georgia.gov hired leaders with training from design schools—e.g., Savannah College of Art and Design. It built its Alexa skill by hiring a specialty contractor with a background in Agile and DevOps.
- CDC builds facilities using contractors that use and deeply understand Design Thinking. Those contractors work for many different principals. Also at CDC, OSSAM's strong focus on Lean Production methods makes it easier for its constituent organizations to employ affiliated methods in areas where waterfall dominates.

Many have written about the benefits of these methods for firms or public agencies that want to change how software is built. Few have written about the people or shops who adopt one of these alternatives and champion their use in organizations set in their ways from decades of inertia. Perhaps these agents are different from other policy entrepreneurs in government, but if so, why are people in government so hesitant to use what are now industry-standard practices?

The USDS model—and to a degree what we have seen in the cases offered here—is built on bringing in change agents from the private sector. Are leaders more credible when they have private sector experience? Are they more defiant in the face of inertia in government? Are they more likely to leave if agencies resist change? Do they have greater leverage for pushing change?

It is impossible to answer these questions without broader survey evidence. Perhaps the most interesting cases are agencies where "proto-leaders" push for adoption of Agile and then, when rebuffed, accede to the standard operating procedures. Unfortunately, those cases are hard to uncover and, in most cases, what really happened is hard to disentangle.

It could be that the followers are the most interesting agents in this change game. There is some evidence of this from the way that groups like USDS or 18F "seed" interest and capacity in other agencies. The reason that change agents matter, though, is that champions enable the followers to do the heavy-lifting required by these methods.

The OPM Innovation Lab works because it has been able to attract and hire multiple people who have made Design Thinking a core part of their experiential background. Imagine if it was impossible to select based on that experience? Or at Georgia, imagine if it was impossible to hire an Agile shop to support building the needed Alexa skill? Both of these are as improbable as a third counterfactual: imagine if CDC built laboratories without employing architects and engineers?

Challenge 2: Implementation Depends on Outside Actors

Workers employing methods like Lean Startup, Agile, or Design Thinking face a choice: do I believe that other organizations are just as committed to the continuous improvement strategies on which these methods rely? Do I trust that the agencies I am working with are also committed to multi-year processes in the face of change, uncertainty, and a constant pressure to move on to the next project?

Consider the cases presented in this report:

- To provide useful information for students and their families—information that shapes market outcomes as students change their expected behavior—the College Scorecard depends on outside actors (colleges and universities) to provide relevant and timely information. Those actors have incentives to lobby against tools like the College Scorecard.
- In Georgia, success depended on outside agencies, whose information was being made available, that were required to change how they presented that information.
- For many projects, the Innovation Lab depends on other agencies capable of pursuing design-based innovation and change. In the case of USAJobs, the system depends on all federal agencies when they use that system to hire new employees.
- CDC's facilities team depends on other units to build new buildings. Those other units must commit to the enterprise at all stages for the system to work the way it should.

It is worth focusing on the issue of contractors here. Probably the most common complaint heard in the interviews was that waterfall is easier because of the nature of contract management at the federal and state levels. The 18F experience with its Agile blanket purchasing agreement shows that it is possible to build paths for the involvement of Agile practitioners. At CDC, the RFQ process selects on Design Thinking capacity. At Georgia, the unique nature of the agency makes it easier to hire Agile shops. Indeed, 18F cleared the way for many similar initiatives, if only because states could see how contracts were written and use those as models.

In some ways, these techniques make the problem of coordinating outside actors easier—if the process moves quickly from design to deployment. Even if it requires regularly revisiting design choices as issues emerge, perhaps the pace of decision makes it easier for outside actors to see the benefits of the process.

Challenge 3: Many Projects Require Long Periods of Time

Yet, some of those commitments may be so onerous that outside actors may not see that they are worth the time and energy.

Consider the cases presented in this report:

- At CDC, end-users are brought in to "shake, rattle, and roll" early versions of a building. That process alone takes at least one year to complete.
- Early versions of the College Scorecard may have had an impact but the long-run impact of the software is only seen when (a) students use the software to select a university, (b) students graduate and enter the labor market, and (c) colleges observe other colleges' performance and learn how to improve their own performance.
- Even though OPM's Innovation Lab has sought to improve USAJobs, many outside observers see substantial opportunities for improvement. The platform has yet to reach industry-standard levels of quality.

Involved stakeholders may resent the time they must commit to long projects—especially if they are asked to contribute to what some may say is "someone else's job." Imagine if CDC's lab planning process, which depends explicitly on involving even janitors in the planning process, was not seen as an important use of janitorial time?

Clearly, methods like Agile, Lean Startup, and Design Thinking are disruptive. In any public sector setting, the status quo is the easiest choice; it is the most likely outcome when new issues emerge, new communities demand change, or new interests question how things are done. Indeed, it is natural and probably a good thing that the status quo is the most common outcome because the alternative—constant change—can bring unforeseen consequences.

But the status quo also has a cost—the cost of missed opportunities. These methodologies all recognize that the deadweight loss of missed opportunities is probably the greatest threat to organizational survival. At the outset, the change agents and their band of followers face that inertia toward the status quo. Then if they gain a foothold, they face the likelihood that "failing often" (in Lean Startup parlance) brings questions about their entire enterprise: "Should we continue down this new and uncertain path when the old path is worn and familiar?"

To a degree, leaders and their followers can mitigate this risk by trusting the process. That involvement and users will bring enough success to balance the costs of the process.

This hope is harder to sustain when those involved do not see the benefits of such disruptive change on a two- to four-year time scale. Indeed, the sustainability of organizations like USDS, 18F, or the Innovation Lab is suspect in times like these.

In many ways, these judgments are a simple calculation of what economists call "subjective expected utility": What is the chance of a big payoff and when do you expect to receive it? If you believe it is a low to moderate chance event, the expected payoff is not worth much compared to known and present costs—and the payoff is even less valuable if it is expected many years in the future.

There is no simple answer to this risk. Academics often point to layers of protection for such organizations—if the agency is relatively-independent, if the workers are highly-professionalized, if the leaders work to protect these programs in the face of demands for change, etc. All of those protections, though, are limited in their efficacy and susceptible.

Challenge 4: Dissensus

None of these situations is easier if stakeholders hold widely disparate views on what the problem is and how it should be solved. Dissensus, or at least the lack of consensus, complicates everything.

Consider the cases presented in this report:

- In the case of CDC, recent high-profile concerns about lab safety and the handling of materials like smallpox have caused complaints about the agency and its processes for managing safety. A natural response is to rethink everything—to change processes because it shows responsiveness.
- The College Scorecard has been fairly criticized by researchers who study colleges, their performance, and the costs of tuition. Even those who built the Scorecard admitted it was an imperfect attempt at grading colleges by their benefits given their costs. Researchers have complained about the measurement of both.
- As noted above, many critics continue to note problems with OPM's USAJobs.

Selection of any one of these methods and tools should be built on this conclusion—that there is a better process and we know what it is before putting it in place. They should also be based on a second conclusion—that the current process is incapable of generating change by itself.

From one perspective, this is the beauty of innovation processes like Lean Startup, Agile, and Design Thinking. The focus on starting from need and moving forward to improvements is itself a process of resiliency. Adaptation and evolution in the face of adversity are the hallmarks of resiliency. Resiliency is effective risk reduction. It does not preclude "black swan" events. Resiliency to those events is ability and willingness to change in response to the event.

These methods do not produce perfect products. They produce products that are just as imperfect as all other products, but the hope is that they are produced at speed.

The hope is that the process is responsive. In the context of the College Scorecard, can its builders respond to inevitable criticism? Can the CDC respond to claims about safety? Can OPM fix USAJobs?

Of course, is also harder to respond to the challenge of dissensus if the agency needs outside actors, if the process takes a long time to complete, etc.

CONCLUSION

In the long run, the provision of public services can benefit greatly if it takes on some of the behaviors we see in methodologies like Agile, Lean Production, Design Thinking, and the Lean Startup.

The long-run benefits will come from organizations that can overcome significant challenges—from a lack of coordination, from the need for change agents, from varying time horizons, or from dissensus about the problem and its solution.

The Lean Startup framework can help organizations considering how to take the best of these methods and deploy them in units that want to make a difference quickly. However, it is worth remembering that most startups fail. Even in the case of Lean Production, even Toyota's commitment has been challenged over time. Failure should not surprise, but that does not absolve managers from trying to use the best tools available to solve the problems faced by their organizations.

Many organizations will benefit if they only consider why so many firms think these methods are worth their time. In the long run, Agile may just become a metaphor for speed—for fast iteration between design and implementation. Lean may become a metaphor for doing the most with the least resources, for trying to match what we are doing to what is needed in the thinnest way possible. Design Thinking may become a metaphor for centering what is being done on those who need it most. Even as metaphors, these tools may improve the provision of public services.

RECOMMENDED READINGS

All documentation appears in the text in the form of footnotes where necessary.

In addition, three important books on Lean Startup organizations and culture are:

- Oosterwal, Dantar. *The Lean Machine.* American Management Association. 2010.
- Ries, Eric. *The Lean Startup.* Crown Business. 2008.
- Ries, Eric. *The Startup Way.* Currency Press. 2017.

The following article on lean startup is also a good introduction to the methodology:

- Blank, Steven. "Why the Lean Start-Up Changes Everything." *Harvard Business Review.* May, 2013.

These books are important introductions to Lean methods as they have developed for use in the business sector:

- Ohno, Taiichi. *Toyota Production System.* Productivity Press. 1988.
- Ohno, Taiichi and Setsuo Mito. *Just-in-Time for Today and Tomorrow.* Productivity Press. 1988.
- Liker, Jeffrey. *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer.* McGraw-Hill. 2004.

Many books and articles have been written about Lean and its variants. This book can be useful for those struggling to deploy Lean thinking in the public sector:

- Reinertsen, Donald G. *The Principles of Product Development Flow: Second Generation Lean Product Development.* Celeritas Publishing. 2009.

For those wanting a better understanding of the Agile tradition, these books are useful:

- Kernighan, Brian W. and Rob Pike. *The Practice of Programming.* Addison-Wesley. 1999.
- Schwaber, Ken. *Agile Project Management with Scrum.* Microsoft. 2004.
- Elssamadisy, Amr. *Agile Adoption Patterns: A Roadmap to Organizational Success.* Addison-Wesley. 2009.

These recent articles provide insight into how private sector organizations adopt and maintain Agile for both building software and organizations:

- Rigby, Darrell K., Marco D'Avino, and Simon Henderson. "How Agile Teams Can Help Turnarounds Succeed." *Harvard Business Review* Online. July 2, 2018.
- Crocker, Alia, Heidi K. Gardner, and Rob Cross. "How to Make Sure Agile Teams Can Work Together." *Harvard Business Review* Online. May 15, 2018.
- Rigby, Darrell K., Jeff Sutherland, and Andy Noble. "Agile at Scale." *Harvard Business Review.* May-June, 2018.

- Rigby, Darrell K., Jeff Sutherland, and Hirotaka Takeuchi. "Embracing Agile." *Harvard Business Review.* May, 2016.

While Design Thinking is a relatively new addition to the public sector landscape, there are rich traditions in business and design settings. These books are good contributions to these traditions:

- Rowe, Peter G. *Design Thinking*. MIT Press. 1987.
- Martin, Roger. The Design of Business: Why Design Thinking is the Next Competitive Advantage. *Harvard Business Press.* 2009.
- Cross, Nigel. *Design Thinking.* Bloomsbury Academic. 2011.
- Stickdorn, Marc and Jakob Schneider. *This is Service Design Thinking.* Wiley. 2011.
- Blossom, Eve. *Material Change: Design Thinking and the Social Entrepreneurship Movement.* Metropolis Books. 2011.
- Dovey, Kim. *Urban Design Thinking: A Conceptual Toolkit.* Bloomsbury. 2016.
- Lewrick, Michael, Link Paul, et al. *The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems.*Wiley. 2018.
- Liedtka, Jeanne and Ogilvie, Tim. *Designing for Growth: A Design Thinking Tool Kit for Managers.* Columbia Business School Publishing. 2011.

There are many journals and magazines on Design Thinking in fields like architecture, industrial design, and materials science. However, recent articles on Design Thinking in organizational settings include:

- Liedtka, Jeanne M. "Why Design Thinking Works." *Harvard Business Review.* September-October, 2018.
- Kolko, Jon. "Design Thinking Comes of Age." *Harvard Business Review.* September, 2015.

APPENDIX

Research Design

This research project is based on an exhaustive review of many hundreds of documents on Agile, Lean Production, Lean Startup, and Design Thinking in both business and government settings. In addition, many hours of on-the-record and publicly-available video footage were reviewed. Finally, off-the-record conversations were conducted with over 20 individuals in 10 different organizations over the course of several years. Except where recorded as interviews with the author in the text presented here, all information is presented from publicly-available sources to increase verifiability of the inferences drawn about the long-term performance of these organizations.

ABOUT THE AUTHOR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Andrew Whitford is the Alexander M. Crenshaw Professor of Public Policy in the School of Public and International Affairs at the University of Georgia. His research concentrates on strategy and innovation in public policy and organization studies.

His recent book, *Above Politics: Bureaucratic Discretion and Credible Commitment,* was published in 2016 in the Political Economy of Institutions and Decisions series of Cambridge University Press. Written with Gary J. Miller of Washington University in St. Louis, this book is about the most recent financial crisis and how the regulatory state shapes markets, economic performance, and innovation. The book received the American Political Science Association's 2017 Gladys M. Kammerer Award for U.S. national public policy, the International Political Science Association's 2017 Levine Prize for comparative administration and public policy, and the 2016 Book of the Year Award of the Section of Public Administration Research (SPAR) of the American Society of Public Administration.

His first book, *Presidential Rhetoric and the Public Agenda: Constructing the War on Drugs,* written with Jeff Yates of Binghamton University, was published by Johns Hopkins University Press in 2009. His research papers have appeared in peer-reviewed journals such as the Administrative Science Quarterly, the Journal of Public Administration Research and Theory, the Journal of Policy Analysis and Management, the American Journal of Public Health, and the American Journal of Political Science. Current research topics include the use and regulation of emerging technologies, moral hazard in public policy, and tools like machine learning.

He also serves as Co-Editor of the Cambridge Elements Series in Public and Nonprofit Administration, Field Editor at the Journal of Public Policy and an elected Fellow of the National Academy of Public Administration. He received the 2017 Herbert A. Simon Award for "significant contribution to the scientific study of bureaucracy." He has lectured and conducted research around the world. He is currently Visiting Honorary Senior Research Associate in the School of Public Policy at University College London and Research Fellow in Arizona State University's Center for Organization Research and Design.

The IBM Center has published one report by Dr. Whitford. *"Designing Competitive Bidding for Medicare,"* written with John H. Cawley of Cornell University, was published in 2004.

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Digital:

More Than Meets AI: Part II by the Partnership for Public Service and The IBM Center for The Business of Government
Financial Management for The Future: How Government Can Evolve to Meet the Demands of a Digital World by Angela Carrington, Ira Gebler
More Than Meets AI by The Partnership for Public Service and The IBM Center for The Business of Government
The Impact of Blockchain for Government: Insights on Identity, Payments, and Supply Chain by Thomas Hardjono
A Roadmap for IT Modernization in Government by Dr. Gregory S. Dawson
Delivering Artificial Intelligence in Government: Challenges and Opportunities by Kevin C. Desouza
Using Artificial Intelligence to Transform Government by Partnership for Public Service, The IBM Center for The Business of Government

Effectiveness:

Mobilizing Capital Investment to Modernize Government by Steve Redburn, Kenneth J. Buck, G. Edward DeSeve
Scaling Evidence-Based Programs in Child Welfare by Patrick Lester
Reducing Administrative Burden in Federal Research Grants to Universities by Lisa Mosley, Jeremy Forsberg, David Ngo
Emulating Value Chains of Consumer Goods to Save Lives: A Case Study of ColaLife's Work in Zambia by Paulo Savaget, Cassi Henderson, Steve Evans
Responding to Global Health Crises: Lessons from the U.S. Response to the 2014-2016 West Africa Ebola Outbreak by Jennifer Widner
Buying as One: Category Management Lessons From the United Kingdom by Anne Laurent
Improving the Delivery of Services and Care for Veterans by Matthew Hidek, Nathaniel Birnbaum, Nicholas Armstrong, Zachary S. Huitink

Insight:

Integrating Big Data and Thick Data to Transform Public Services Delivery by Yuen Yuen Ang
A Practitioner's Framework for Measuring Results: Using "C-Stat" at the Colorado Department of Human Services by Melissa Wavelet
Data-Driven Government: The Role of Chief Data Officers by Jane Wiseman
Integrating and Analyzing Data Across Governments—the Key to 21st Century Security by Douglas Lute, Frank Taylor

People:

Preparing the Next Generation of Federal Leaders: Agency-Based Leadership Development Programs by Gordon Abner, Jenny Knowles Morrison, James Perry, and Bill Valdez
Assessing the Past and Future of Public Administration: Reflections from the Minnowbrook at 50 Conference by Tina Nabatchi and Julia L. Carboni
Off to a Running State Capital Start: A Transition Guide for New Governors and Their Teams by Katherine Barrett and Richard Greene

Risk:

Managing Cybersecurity Risk in Government by Anupam Kumar, James Haddow, Rajni Goel

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