

White Paper: User-Focused Innovation

For long-term change, experiment immediately.

— Eric Ries, serial entrepreneur and author of *Lean Startup*¹

There are no facts inside the building, so get outside.

— Steve Blank, creator of the Lean Startup methodology and
Adjunct Professor Stanford University²

A. Overview

The purpose of this white paper is to provide an overview of user-focused innovation approaches. Two specific methods, human-centered design and lean startup, are examined to illustrate how user-focused innovation can be used in the federal government to effectively solve problems. The information in this paper is derived from academic journals, news reports, and interviews with former and current federal government innovators and leaders. This white paper provides resources on how federal employees can engage with end-users throughout the innovation process, such as in delivering new products, services, and goods. Appendix A provides additional examples of approaches that have informed user-focused innovative processes, Appendix B and Appendix C contain case studies that illustrate the application of user-focused innovation, and Appendix D provides additional resources.

1. Introduction

User-focused innovation requires organizations to directly connect with their desired end-users and incorporate their feedback in the development process of a product, service, or concept. With the democratization of knowledge, via for example the internet and other platforms, end-users can be increasingly involved in the innovation process, co-creating and customizing products and services. Two popular strategies for implementing user-focused innovation are human-centered design (HCD), otherwise known as design thinking, and lean startup. HCD methods define a process and a conceptual framework to help address complex challenges based on comprehensive user research prior to product development, followed by an iterative product development.³ The lean startup approach, in part, complements HCD methods. The approach applies the underlying

¹ E. Ries, *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*, Crown Business Publishing, 2011, 59.

² S. Blank, email communication, January 5, 2017.

³ IDEO.org, "Design Kit: The Human-Centered Design Toolkit," 2015, <http://www.designkit.org/resources/1>.

waste-minimizing rationale of lean manufacturing to the product development phase of startups. While there are additional strategies that have been developed that involve focusing on the user; this white paper mainly focuses on HCD and lean startup.

2. Why

Employing user-focused innovation methods can help make government more participatory and responsive by increasing stakeholder engagement and cross-sector collaboration in the development of products, services, projects, and policies, as appropriate. User-focused methods can provide insights into the needs, behaviors, and decisions of citizens, and in return uncover how policies and programs affect the public.

Further, user-focused methods can equip federal employees with the tools for generating, testing, translating, validating, and improving solutions to complex problems. Federal employees can quickly learn about what works, and thereby build and scale programs without large initial investments that may be directed in the wrong direction. Furthermore, these methods can enable federal employees to engage with the public as co-designers to identify and address the root causes of problems, rather than focusing only on the symptoms.⁴

3. How

Individuals or project teams employing user-focused methods use it to tackle problems with existing government services, or when a new solution is needed for an existing problem. Federal employees may already use these concepts in their day-to-day operations; nonetheless, user-focused approaches can be further deployed to identify new ways to engage with the end consumers of government programs and services and to help agencies understand ways to achieve outcomes from varied perspectives. Models for engaging users at different stages of a project's development are examined further in the implementation section.

B. Background

1. Origins of User-Focused Innovation

User-focused approaches for design and innovation have originated from a variety of academic fields including architecture and design, engineering and information technology (IT), social sciences, and business management. Table 1, provides an overview of different movements and concepts within four academic fields, including when they emerged. Across the fields, the user plays an active role in the innovation cycle—either as a direct contributor, or as an object of study.

⁴ S. Blank et. al., “Lean Experimentation for the Social Sector,” *Stanford Social Innovation Review*, August 22, 2016, https://ssir.org/podcasts/entry/lean_experimentation_for_the_social_sector_build_smart_to_learn_fast.

Table 1. User-Focused Innovation Across Academic Fields

Field	Concept or Movement	Description
<i>Architecture and Design</i>	Design Methodology Movement (1960s)	Focused on user-centered issues and behaviors; calls for interdisciplinary design teams to solve issues in different contexts
	User-Centered Design (1980s)	Focused on end-user needs, wants, and limitations; implemented through cooperative or participatory design methods
	Service Design (1990s)	Focused on end-user needs through co-creation processes; multiple organizations meet over time to coordinate and reframe on a design
<i>Engineering and IT</i>	Human Centered Design (1980s)	Design of technology systems such as hardware and software, guided by end-user needs
	Human Computer Interaction (1980s)	Examines interactions between the human user and computer; involves feedback between users, designers, and engineers
<i>Social Sciences</i>	Social Construction of Technology Theory (1980s)	Examines how human action shapes technology, and how technology is embedded in its social context
	Ethnographic Methods*	Focused on developing a deep understanding of how users make sense of their world and society, thus producing relatable designs
<i>Business Management</i>	Democratized Innovation (1980s)	Proposes that lead users, rather than manufacturers, drive innovations and thus identify innovations that can be developed for the commercial marketplace
	Open Innovation (2000s)	Seeks to broaden participation, calls for external collaboration and capitalization of external research and development (R&D) efforts and expertise
	Co-creation of Value (2000s)	Postulates that value is derived from co-creation experiences between the firm and customer, rather than products, services, or the firm alone

*Ethnographic methods have been used throughout various disciplines since the late 19th century.

Source: Adapted from Norden Innovation Center, *User-Driven Innovation, Context and Cases in the Nordic Region*, June 2008.

Inspired by the movements and concepts referenced in Table 1, a variety of methodologies have been employed by academics, private and public organizations, and government entities to design and innovate. Although user-focused innovation practices vary widely across organizations, this white paper will later examine two similar, yet distinct, user-focused methods: HCD and Lean Startup.

2. Background on the Human-Centered Design and Lean Startup Innovation Methods

Since the 1980s, a variety of user-focused approaches emerged. Organizations with different needs, functional domains, and resources adopted user-focused principles both formally and informally to guide their innovation activities. Two examples include the HCD and lean startup methods.

In the 1980s, Toyota developed the lean methodology to minimize waste and maximize value-creating practices in manufacturing processes.⁵ Lean manufacturing principles stress the creation of value for the user by minimizing unnecessary waste, and immediate quality control checkpoints during assembly.⁶

The lean principles have, in subsequent years, been adapted by various entrepreneurs to develop management strategies for leading startups and incubators.⁷ At their core, these lean startup methods promote a collaborative, team-based approach to accelerate problem solving. The method stresses the importance of challenging assumptions, reacting quickly to new information, and using hypothesis development and testing as part of customer discovery. Individuals that helped develop this method include, but are not limited to, Steve Blank (developed the customer development model in the 1990s⁸) and entrepreneur Eric Ries (published “The Lean Start-Up” in 2008)⁹.

Another user-focused innovation method, HCD was developed in parallel to the lean startup method in 1991. HCD was popularized by California-based design and consulting firm IDEO.¹⁰ With its emphasis on the end-user, HCD principles have considerable overlap with lean startup, which stress the consideration of multiple points of views, understanding, iteration, and collaboration when undertaking innovation activities.

⁵ J. F. Krafcik, “Triumph of the Lean Production System,” 1988.

⁶ The Lean Startup Circle Wiki, “Intro to Lean Startup,” <http://leanstartup.pbworks.com/w/page/65946049/Intro%20to%20Lean%20Startup>.

⁷ The Lean Startup, “Methodology,” <http://theleanstartup.com/principles>.

⁸ S. Blank, *The Four Steps to the Epiphany: Successful Strategies for Products that Win*, second edition, K&S Ranch, Inc., 2013, 17–28.

⁹ E. Ries, *The Lean Startup: How Today’s Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*, Crown Business Publishing, 2011, 59.

¹⁰ K. Thoring and R. M. Muller, “Understanding Design Thinking: A Process Model Based on Method Engineering,” paper, International Conference on Engineering and Product Design Education, September 2011, https://issuu.com/edvardt/docs/understanding_design_thinking_a_pro.

The HCD method draws from the fields of behavioral science, communication design, and engineering.¹¹ The method, as defined for computer-based interactive systems by the International Organization for Standardization in 1999 and renewed in 2010, adopts multidisciplinary skills and perspectives to develop a clear understanding of the users, tasks, and environments; the consumer is engaged in an iterative design and production processes.¹² Since the 1990s, the HCD method has been widely adopted beyond computer-based systems for a variety of designs, applications, and organizations.¹³

Additional examples of approaches that have informed user-focused innovative processes include the agile methodology and culture-hacking. The *agile* methodology, commonly employed in the information technology (IT) sector, is an iterative development process that encourages teamwork, self-organization and accountability.¹⁴ The concept of *culture hacking* empowers employees to identify weaknesses within an organization's operating culture, and based on lessons learned, propose alternate solutions. The foundational principles of these methods can be applied in a variety of broader contexts. Further information on these methods can be found in Appendix A.

C. Considerations for Use

To understand how user-focused innovations may be applied at federal agencies, practitioners must first understand the type of innovation under pursuit. Figure 1 provides a conceptual overview divided into four broad areas of innovation that are based on how well the problem is defined and how well the solution is understood by either the innovator or the general community.

¹¹ IDEO.org, "IDEO.org Turns Five," <https://www.ideo.org/perspective/five-years>.

¹² International Organization for Standardization, ISO 9241-210:2010, "Ergonomics of Human-System Interaction—Part 210: Human-Centred Design for Interactive Systems."

¹³ N. Jacob, "Human-Centered Design for Government," December 7, 2015, <http://www.governing.com/cityaccelerator/blog/Human-Centered-Design-for-Government.html>.

¹⁴ cPrime, "What Is Agile? What Is Scrum?," <https://www.cprime.com/resources/what-is-agile-what-is-scrum>.

Problem Definition	Known	Breakthrough Innovation (HCD, lean start-up)	Sustaining Innovation (lean start-up)
	Not Known	Basic Research (HCD)	Disruptive Innovation (HCD, lean start-up)
		Not Known	Known
		Solution Definition	

Source: Adapted from G. Satell, "4 Types of Innovation (and how to approach them)," <http://www.digitaltonto.com/2012/4-types-of-innovation-and-how-to-approach-them>.

Figure 1. Matrix of Various Innovation Types

If a problem is well-framed and an early prototype or other solution is developed, then this could be classified as a *sustaining innovation*. For *sustained innovations*, individuals can leverage the efficiencies associated with the lean startup method to scale the known solution.¹⁵ When a solution is not well defined (e.g. an early prototype does not exist), utilizing the HCD method provides an opportunity to explore and rapidly prototype while lean startup methods could be superimposed to increase efficiency in the implementation and distribution of the goods or services.¹⁶ This incorporates both *basic research* and *breakthrough innovation*.

Finally, a *disruptive innovation* may constitute an existing product or service that is newly applied to a problem it was not initially designed to address. HCD principles can be used to research and observe the end-user, to identify the new problem and use-case for the product or service. Additionally, application of lean startup methods help to increase efficiency and rapid user-validation. For example, federal employees may consider the use of HCD and lean-startup to

¹⁵ T. Weinert, LUMA Institute, email communication, July 24, 2017.

¹⁶ Ibid.

understand how a service that is found to be successful in serving the need of one community can be applied and scaled to serve those of other communities and sub-populations.

Note that user-focused innovation may not be appropriate for all goals. For example, Marc Andreessen, noted entrepreneur and investor, offers two private sector examples where Lean Startup thinking and the use of minimum viable products would not be appropriate: The development of the Macintosh computer and Space-X. He posits that “for the Macintosh, the goals for the product were so large that the product had to exist in its entirety for the public to wrap their minds around it.”¹⁷ A minimal product, prototyping, or incremental steps could not achieve the goals alone. Similarly, he argues, a venture like Elon Musk’s SpaceX cannot be done on a small scale; the rocket has to get into space on the first try.

D. Implementation Guidelines

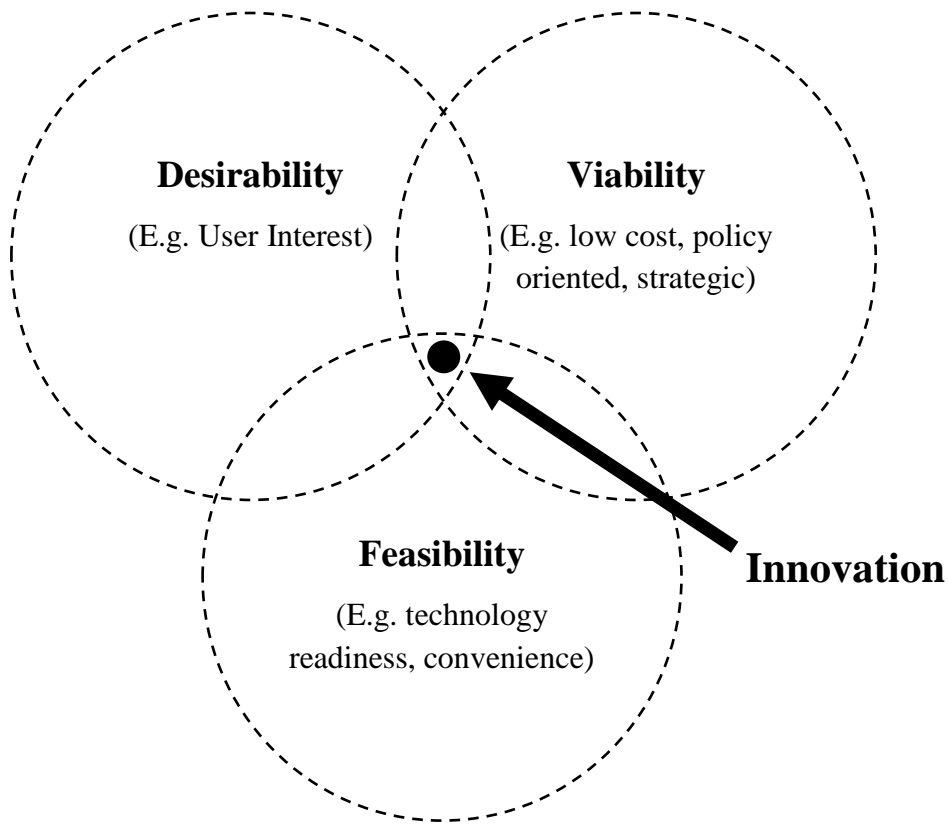
User-focused innovation tools have been developed to guide innovation practices across disciplines and industries. These methodologies can be implemented at any level of an organization and by employees in any position. During implementation, federal employees may consider the use of one or a combination of multiple user-focused approaches. When choosing an approach, federal employees may wish to further understand the goals, target groups, and methods for these approaches when considering their deployment.

To illustrate one implementation pathway, this section will provide an overview of a hybridized user-focused methodology, including an overview of its goals and a conceptual implementation model; a discussion of potential roles federal employees can undertake to support user-focused innovation; and examples of projects that have implemented user-focused methods.

1. Understand User-Focused Innovation Efforts

Three high level concepts can help shape the implementation of user-focused innovation approaches. The interrelated concepts, when balanced, can help aid in the successful development, validation and proliferation of an idea, product, or service (Figure 2). The interplay of these three drivers can inform the innovator while implementing user-focused methods.

¹⁷ E. Kern, “Not Every Startup Should be a Lean Startup,” GigaOm, December 3, 2012.



Source: Adapted from T. Brown, *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*, New York: Harper Business, 2009.

Figure 2. Conceptual Model for Focusing Innovation

First, federal innovators may develop products or services that are *desirable* to the end-user; this may be determined from either indirect observation or direct communication with end-user stakeholder. Second, the product or service can be *viable and valuable*; this may be achieved by reducing cost, increasing efficiency, or aligning the solution to meet policy or strategic goals. Finally the product or service can be *technically feasible and realistic*, especially within a timeframe reasonable to both the federal entities and other stakeholders.

2. Overview of a Hybridized User-Focused Method

The lean design thinking model is a hybridized methodology that merges the practices of both HCD and lean startup approaches. Two user-focused models, HCD and lean startup, are used for a variety of activities, including program creation and management, procurement, and grant making. Both approaches incorporate user-feedback into the design and development process in

order to create a more viable end product or service. Table 2 provides a comparison between the two user-focused innovation methods of HCD and Lean Startup.¹⁸

Table 2. Comparison of HCD and Lean Startup

Category	HCD	Lean Startup
Initiation	Process begins with a problem and no defined solution; extensive user research develops ideas for solutions	Process begins with a developed idea for a solution; however during testing and validation, a solution may change considerably
Target, Goal	Targets general innovation, with primary focus on end-users	Targets high-tech innovation, with a focus on customers (not necessarily end-user)
Methodology	Strong focus on ethnographic and other qualitative research and observations	Strong focus on quantitative, metric-based analysis and market research
Testing	Use of prototypes, “fail early to succeed faster”; process is iterative	Use of prototypes and hypotheses, “fail fast” and pivot; process is iterative

Source: Modified from R. Mueller and K. Thoring, “Design thinking vs. lean startup: A comparison of two user-driven innovation strategies,” presented at the 2012 International Design Management Research Conference, 2012.

The two methodologies can complement each other to address a variety of innovation activities, particularly when a solution is not been widely developed or known (Figure 1). Senior Program Director Tyson Weinert of the LUMA Institute, a design organization that practices and teaches HCD methods, explains this in more detail.¹⁹

When applied correctly, an organization can correctly use HCD to frame the problem, leverage ethnographic and participatory research to gather critical information to better inform potential solutions to the problem, explore and rapidly prototype a variety of possible solutions, etc. And when users/customers help inform the outcome, continuing with a lean mindset will help the solution scale.

Innovation researchers Roland Mueller and Katja Thoring, from Anhalt University, conducted a literature review and analysis to propose a hybrid methodology they call *lean design thinking* in order to benefit from the strengths of both approaches. Lean design thinking is spread out over six broad phases: (1) Understand and Observe, (2) Point of View, (3) Ideation, (4) Prototyping/Customer Discovery, (5) Customer Validation and Creation, and (6) Company Building.²⁰ Between each general phase is a testing suggestion which requires participants to test the conclusion of each phase with end-users.

¹⁸ R. Mueller, and K. Thoring, “Design Thinking vs. Lean Startup: A Comparison of Two User-Driven Innovation Strategies,” presented at the 2012 International Design Management Research Conference, 2012.

¹⁹ T. Weinert, LUMA Institute, email communication, July 24, 2017.

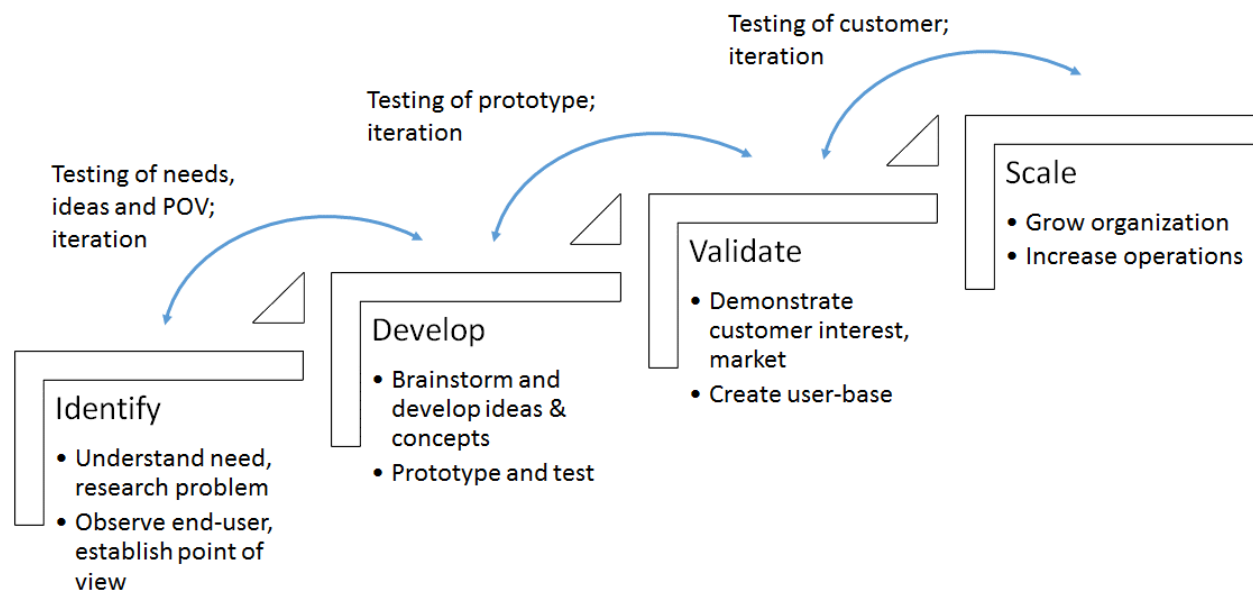
²⁰ R. Mueller, and K. Thoring, “Design Thinking vs. Lean Startup: A Comparison of Two User-Driven Innovation Strategies,” presented at the 2012 International Design Management Research Conference, 2012.

3. Implementation Model for the Lean Design Thinking Method

Federal employees may use the following lean design thinking model as it fits to their specific program and needs, and not all steps or phases may apply to every situation.

a. Description of Four Stages

The model is broken down into four high level stages: (1) identification, (2) development, (3) validation, and (4) scale-up. As depicted in Figure 3, the methodology incorporates testing and iteration between each stage. Thus the progression from stage to stage is not necessarily linear.



Source: Developed from information in R. Mueller and K. Thoring, "Design thinking vs. lean startup: A comparison of two user-driven innovation strategies," presented at the 2012 International Design Management Research Conference, 2012.

Figure 3. Lean Design Thinking Process Method

Federal employees may undertake all of the steps explained above, or a subset. Furthermore, as processes are iterated, practices and lessons from prior stages may be incorporated. For example, if a product during the validation stage is found not to be of interest to a wide user-base, research and observation from the identification stage may be used to inform whether a new product needs to be developed. In greater detail, the stages to implementing user-focused innovation are defined as follows:

- **Identification**—The goal of the identification step is to both broadly and specifically understand the needs of the end-user and the problem that is being addressed. In this stage, both qualitative and quantitative methods are deployed to both research and observe the end-user. Once an understanding of both the end-user and problem is reached, the synthesis of insights can establish the expected point of view of the user.

- **Development**—The goal of the development stage is to brainstorm, prototype, and develop either ideas, products or services. Through iterations of various models and prototypes, the innovator seeks to rapidly develop their product and service. A subset of users may be directly or indirectly included in this stage of the process to support and evaluate various prototypes and ideas.
- **Validation**—The goal of the validation stage is to demonstrate the interest of the end-user, or a greater industry or market, in the developed product or service. In this stage, a user-base may be further developed; the size of the base is one of numerous metrics that can be used to validate a given product or service. Depending on results, a product or service may go back to either the development or identification stage if an ample user-base does not grow.
- **Scale-Up**—The goal of the scale-up stage is to increase operations and proliferate the service or product to a broader user-base. Scaling may simply include an increase in operations to reach an identified user-base, or could be the scaling of an existing product to reach new users. Especially in the case of scaling to incorporate new users, principles from other stages (e.g. identification) may be used to inform practices.

b. Incorporating Users Within Each Stage

The user may be incorporated at any stage, either directly or indirectly. The following are four examples of how the user can be engaged throughout the process.²¹

- **Experimentation:** Users directly articulate needs and are engaged in experiments designed by innovators. Experiments can more generally include surveys, focus groups, or other studies. The results of the experiments help innovators to either understand user-defined problems and potential solutions or help scale the organization's reach.
- **Observation:** Beyond controlled experiments, innovators also employ observation techniques (e.g. ethnographic analyses). In these observations, users do not directly articulate needs. Observations can be useful to either understand user-defined problems and potential solutions or help scale the organization's reach.
- **Ideation and Prototyping Engagement:** Users are directly engaged in the innovation team, their input is requested to test and validate a given design or prototype.
- **User Test for Independent Validation:** Users are not directly engaged on the innovation team, rather they serve as external testers to validate the technology. Through user-testing, feedback from a wide array of potential users not initially included in the innovation team can be used to better refine the product or service before wider distribution.

²¹ Norden Innovation Center, *User-Driven Innovation, Context and Cases in the Nordic Region*, June 2008.

4. Roles to Support Implementation of User-Focused Methods

Federal employees at all levels can utilize the principles of user-focused innovation to take part in the endeavor. The considerations for using user-focused methods can vary depending on the federal employee's level within the organization. For instance, federal employees can consider the varied roles their workforce could play in supporting these approaches (Table 2).

Table 3. Roles to Support User-Focused Innovation across an Agency

Level within agency	Possible Roles
Front Lines	<ul style="list-style-type: none"> • Collaborate with team members with different responsibilities • Advocate for collaboration with other offices • Investigate sociological research on specific countries, communities, or populations to inform language and style of deliverables • Create multiple advertising messages targeted at values of specific audiences • Develop a multitude of user experience decisions for digital and physical products, services, and applications aimed at improving the flow and access of information • Construct a multitude of user interface decisions that impact the usability of digital and physical products, services, and applications for users with disabilities • Develop a list of everyday user-focused practices for one's specific office and circulate the list
Mid-level	<ul style="list-style-type: none"> • Create space for collaboration • Support flexibility and ambiguity in projects • Serve as a buffer for the project team's work • Propose policy, guidelines, and standards that institutionalize better usability for the user • Build partnerships with other offices with similar audiences • Create office hours for other employees to come learn about one's offices' user-focused practices • Meet with other agencies who are leaders in HCD, lean start-up, or other methods • Advocate for dedicated resources to user-focused projects
Executive	<ul style="list-style-type: none"> • Broadcast user-focused projects to other offices across agency • Support information sharing and developing software • Sit in on project team meetings to show support from the executive level as well as to stay informed on user-focused processes • Advocate for increased collaboration on multi-agency campaigns • Advocate for user-focused methods as a business imperative that helps organizations deliver on their mission promises • Decide between the various mechanisms, allocating funding accordingly

5. Examples of User-Focused Innovation Methods Implemented

Both the HCD and lean startup methods originated in the business world, and lessons learned from these practices are also applicable to the public sector, especially for mission-driven programs. For example, lean startup methodologies are specific to the development of a product or service, and involve user-feedback at the end of the development process cycle. Below are a few examples for how user-focused approaches have been implemented.

- **Training:** The HCD and lean startup methods can be used to support experiential entrepreneurship training. One of the most structured and visible applications of user-focused innovation approaches in the public sector has been through the National Science Foundation's (NSF) Innovation Corps (I-Corps). I-Corps provides experiential entrepreneurship training to federally funded researchers to promote commercialization, and other agencies have tailored the training to their own goals. The I-Corps program is a structured approach to teach the methodology and to accelerate commercialization and solution-finding approaches outlined by lean startup. While the same foundational principles hold, one key difference is that I-Corps is based on seeking a market for a new technology, rather than beginning with a customer problem/need and iterating on a solution. The rigorous "boot camp" curriculum emphasizes the necessity of understanding customer or stakeholder needs and in articulating a cogent value proposition in order to implement or scale an idea, technology, product, or program. More information about this program can be found in [Appendix B](#).
- **Procurement:** The lean startup principles complement agile development methods, which are increasingly encouraged in the use of technology contracts and information technology services. Agencies and contracting officers who approach their work with a lean startup mindset may find a natural fit with the best practices recommended in the [TechFAR Handbook](#)²² and [Digital Services Playbook](#)²³, both of which encourage agencies to build agile development methods into their contracting and digital services.
- **Grantmaking:** The HCD and lean startup methods also complement evidence-based grant making approaches. Traditionally, grant programs may lack fully developed feedback loops. Several grant making agencies have begun evaluating how to encourage grantees to adopt lean startup principles and practices through their grant process.

Additional examples of using user-focused innovation approaches used across various federal agencies are described in [Appendix C](#).

²² CIO.gov, "The TechFAR Handbook," <https://playbook.cio.gov/techfar/>.

²³ U.S. Digital Service, "Digital Services Playbook," <https://playbook.cio.gov/>.

E. Lessons Learned

User-focused approaches provide flexible tools for understanding problems, as well as identifying and scaling solutions. Certain challenges can arise during the implementation of these methods. The following three lessons learned can be considered to help facilitate adoption in an agency:

1. Support from leadership and creating an environment that communicates the value of these methods to the organization;
2. Capacity to learn from failure and comfort with risks; and
3. Physical spaces and dedicated personnel.

1. Support from Leadership

Because user-focused processes can engage traditionally untapped stakeholders and structures to work in unconventional ways, project teams sometimes rely on the authority of their management to create buy-in, support the process, and persuade others to participate.

Federal employees may need to demonstrate the efficacy of these approaches to engage senior leadership and help them understand how these approaches can make positive impacts to the organization (See Resource Box 1: Marketing User-Focused Innovation Within Your Agency). In particular, federal employees could:²⁴

- Develop guidance—write guidance or policies to communicate how to implement user-focused innovation practices in a way that can be easily understood by employees across the organization. Guidance can also explain how these practices align with the agency’s core mission or vision.
- Demonstrate value—when engaging leadership, demonstrate the benefits obtained from implementing these approaches. Consider developing case studies as a narrative of successful examples or identifying performance measurements that are important to the agency’s leadership.

²⁴ A. Miller, email communication, December 2016.

Resource Box 1: Marketing User-Focused Innovation Within One's Agency

Building agency-wide support and interest can help federal employees implement and scale user-focused innovation approaches. This support and interest can be achieved through the effective marketing of user-focused innovation approaches within one's agency. One approach to create a marketing plan is called **RAISE**: Research, Adaptation, Implementation, Strategy, and Evaluation.

- **Research:** The key to effective marketing is understanding your audience. Conduct research and analysis, including surveys, focus group testing, interviews, and intake meetings.
 - **Adaptation:** Using the information gathered in the research phase, create tangible ideas and messages targeted at your audience. Budget permitting, this step may also include developing materials to disseminate, such as brochures, pamphlets, webpages, or even short videos. Consider including personal success stories or case studies in these materials; this approach often helps the audience respond more favorably.
 - **Strategy:** Develop an implementation strategy to disseminate the messaging you have created. Training programs and classes, e-blasts, webinars, factsheets, posters, and social media are all effective methods for promoting your message.
 - **Evaluation:** Evaluate how your marketing worked. Create a metric and process for measuring success, and then evaluate the feedback and tailor your plan and messaging accordingly.
-

2. Capacity to Learn From Failure and Comfort with Risks

User-focused innovation practices start from a place of ambiguity and uncertainty about the final form of potential solutions. This situation may be a challenge for project teams using these approaches. These practices typically benefit from teams that have a mindset of experimentation and comfort with risk taking. Taking the risk to design and test an idea through HCD or lean startup approaches can be less costly and time-consuming than the risk of large-scale investments for untested or unsupported ideas.

Failure, in the right situations, can be viewed as a valuable tool and a step towards achieving long-term success. The challenge for program managers and leadership alike may be committing to the process of validated learning. This commitment includes deliberately creating smaller-scale experiments before full deployment, where failure can be used as a learning opportunity to course-correct rather than as a severe consequence. By prototyping approaches that are responsive to stakeholder needs and incorporating feedback from user experiences, agencies can “fail small, and fail fast” when experimenting with new programs and scale-up only the strongest and most effective ideas.²⁵

For agencies or individuals who are just getting up to speed on these processes and principles, or for those who would like to expand their expertise and practice, training is an important resource. Agencies may also consider seeking personnel with expertise in this area to help increase capacity. (For further, see Resource Box 2: Building Capacity to Scale User-Focused Innovation Practices).

²⁵ A. Chopra, “Open Innovator’s Toolkit,” Office of Science and Technology Policy, February 8, 2012.

Resource Box 2: Building Capacity to Scale User-Focused Innovation Practices

One of several struggles that federal employees may face in implementing user-focused innovation is in scaling up practices within their agencies. While user-focused methods may have worked well for a single project, it is helpful to understand the ways to support capacity building in applying these practices to other programs and projects. Several options that may help federal employees include:

- **Training the trainer:** If agencies are struggling to scale-up a project which has succeeded in one office, or one area of the agency, but in another context, agencies could establish a “train the trainer” model, and spread user-focused practices one office at a time.
 - **Visualize:** Try visualization exercises to help colleagues “see” user-focused practices in action. For instance:
 - Print method cards on poster size paper and display around the office (see [Appendix D](#), and 18F’s cards available at <https://methods.18f.gov/>)
 - Display the process and work products throughout one’s office.
 - **Start small:** Employees have had success in spreading these methodologies by gradually introducing their elements into their daily work and conversation, rather than implementing the entire strategy at once.
 - **Seek Expertise:** Consider working with human capital or procurement specialists to hire or contract in-house or rotating experts.
 - **Learn together:** Take an online course with a small group of colleagues. Various organizations provide free online courses (see [Appendix D](#) for information from Acumen and IDEO). Groups that learn together, do together, and then share what they have learned with other colleagues can be influential at introducing and spreading new ideas and approaches.
 - **Host a “User-Focused Innovation Day” (or half-day):** The State Department organized UX Exponential on April 8, 2016 to introduce user-focused methods, such as design thinking, storytelling, and others, to colleagues with little or no knowledge of these terms. By making the unfamiliar familiar, participants better understood how these approaches and changes to how they worked with each other could have positive impacts. Speakers and presenters comprised colleagues from across the government, State Department cross-office teams, and private sector practitioners.
-

Mentoring and networking can also be vital in the training effort. Employees may feel reassured by learning from mentors who have navigated through the innovation process path before. Employees can learn much from their peers as they all undergo the innovation process together and share their experiences to mitigate their fears of failure.

3. Physical Spaces and Dedicated Personnel

Creating a physical workspace for project teams implementing user-focused innovation processes can facilitate methods that are deeply collaborative and focused on stakeholder interaction. For example, dedicated accelerator or incubator spaces provide resources and physical space for teams to meet and conduct project-related activities. Furthermore, these processes can generate many visual artifacts (often paper-based) that become reference documents throughout the process. A physical space can become a central home base for the project with easy access to materials and ongoing work. (See Resource Box 3: Physical Spaces for User-Focused Innovation).

Resource Box 3: Physical Spaces for User-Focused Innovation

Spaces designed for design work and collaboration facilitate flexibility and productivity. A traditional conference room with a table and chairs is a start, but the furniture and layout of such a space are not conducive to the kinds of interaction and collaboration that HCD requires. Moveable, modular furniture such as rolling chairs or stackable stools, rolling tables that can be reconfigured, and seating options, like a couch, assist in creating a space that can adapt to support a variety of activities and interactions. Similarly, spaces with ample whiteboard real estate, blank wall space, and less precious finishes make room for hands-on productivity, creativity, and ideation.

Source: Doorley S., and Whitthoft, S., “Make Space: How to Set the Stage for Creative Collaboration,” Wiley & Sons, 2012, <http://dschool.stanford.edu/makespace/>

To facilitate and plan user-focused activities a project team may also require at least one dedicated person responsible for planning and executing work. Through a central point of contact, clear lines of communication, expectations, and responsibilities can be established. User-focused projects may struggle for attention in an agency environment with competing priorities; thus, dedicated, uninterrupted chunks of time for deep collaboration and creative thinking can be established by one or more individuals dedicated to the project.

F. Future Considerations

User-focused design methods and mindsets are applicable to most settings across the federal government. The adoption of these approaches, however, remains on the edges of government, limited to thinking about how to improve internal processes to better serve the public. There is potential for further application by:

- Offering a framework for direct engagement with the public on how to better solve their problems—more efficiently and effectively by taking a user-focused approach;
- Encouraging the use of approaches when crafting legislation and policies to better align with the goals of the impacted population; and
- Offering user-focused training for senior leadership to help strengthen the organization and increase productivity.

Appendix A. Additional Conceptual Methods

A wide range of innovation approaches incorporate user-focused methods. Although this white paper does not present a comprehensive list of these approaches, two additional methodologies and their principles are provided in this appendix for additional context.

A. Agile Methods

In the late 1990s, new user-focused innovation methods emerged. These methods outlined new management methods for innovation combining the lean practices pioneered by Toyota and the rapid prototyping practices occurring in the software development community.

The Agile methodology is an iterative process that encourages self-organizing cross-functional teams to inspect and adapt.²⁶ In 2001 the *Manifesto for Agile Software Development*, or more commonly known as the *Agile Manifesto*, was released by 17 software development practitioners. The *Agile Manifesto* outlines a collection of values and principles to encompass the variety of methods used in the prior decade to guide software development and innovation.²⁷

The four values, provided below, have been widely used outside the software community by various private and public actors.²⁸

1. **Individuals and interactions** over processes and tools; communication with end users is prioritized to determine what processes or tools are relevant to apply (if any)
2. **Working software** over comprehensive documentation; a software (or more generally a process or product design) is developed in increments, over short periods of time, to allow for feedback from end users
3. **Customer collaboration** over contract negotiation; flexibility is built into contracts to allow for easy changes during the development processes
4. **Responding to change** over following a plan; project plans are developed to be malleable, able to adapt to the needs of users and successes or failures of designs

B. Culture Hacking

Beyond product or service development, innovation may occur within an organization's management structure and culture, led by the employees within. The concept of "culture hacking"

²⁶ cPrime, "What Is Agile? What Is Scrum?" <https://www.cprime.com/resources/what-is-agile-what-is-scrum>.

²⁷ Agile Alliance, "Agile 101," <https://www.agilealliance.org/agile101>.

²⁸ Agile Manifesto, "Manifesto for Agile Software Development," 2001, <http://agilemanifesto.org>.

empowers employees to identify weaknesses within an organization's operating culture, and based on lessons learned, propose novel solutions.

Organizational culture includes the “the accepted norms, values and behaviors”²⁹ within an organization that guides daily workplace operations, chains of command, interpersonal and inter-departmental relations, and information exchange. Employees are both co-creators and users of an organization's culture. Actors in the private sector have developed a new employee-focused method to promote rapid innovation in organizational culture; lessons from this management method are applicable to federal organizations. The concept stems from IT hackers, individuals with “an intimate understanding of the internal workings of a system” who harness identified weaknesses in the system to influence structural changes.³⁰

As the consulting firm Wavestone explains, culture hacking “allows employees to exceed their commitment and give themselves permission to go beyond the corporate framework in order to do things in a different way.”³¹ Although the exact application of this method varies from organization to organization based on unique leadership structures, consulting firm SGE International provides the following high-level principles that guide the culture hacking method.³²

1. **Recognize the need to make a change**, especially before it can actually take place
2. **Challenge the status quo**
3. **Prioritize activities**; utilize the ideas, energy and efforts of employees
4. **Get things done**; share action plans and timelines to gain accountability

In the private sector, this method is used by the online retailer Zappos, and promoted to customers by management consulting firms such as SGE International and Wavestone, among others.

²⁹ T. Buzza, “What Is Culture Hacking,” *Medium*, August 13, 2014, <https://medium.com/@timmybuzz/what-is-culture-hacking-5a97da29e970>.

³⁰ G. Malkin, “Internet Users’ Glossary,” Internet Engineering Task Force, <https://tools.ietf.org/html/rfc1983>.

³¹ E. Molino, “Understanding Corporate Culture Hacking,” *Wavestone*, May 2017, <https://www.wavestone.com/app/uploads/2017/05/corporate-hacking-EN.pdf>.

³² S. Green, “Change: It’s Not Just Something Everyone Else Does,” *SGE International*, January 12, 2017, <https://www.sgeinternational.com/change>.

Appendix B. Innovation Corps (I-Corps)

The founding concepts for the I-Corps program were informed by the extensive experience in supporting the Small Business Innovation Research (SBIR) program at NSF and the challenges we know that exist in transitioning a technology from the lab to the market.

— Errol Arkilic, founder and former lead program director for I-Corps

A. Overview

1. Introduction

Developed in 2011, the NSF I-Corps program provides experiential entrepreneurship training to teams of federally funded researchers.³³ I-Corps was developed to better prepare academic researchers for commercialization of federally funded research.³⁴ I-Corps offers an evidence-based framework to support research commercialization. The “boot camp” curriculum emphasizes the necessity of understanding customer or stakeholder needs and in articulating a cogent value proposition in order to implement or scale an idea, technology, product, or program.³⁵

I-Corps pairs participants with business mentors and uses an intensive curriculum to help them discover a “demand-driven path” from their laboratory research to a marketable product. Rather than pushing out innovations believed to have strong commercialization potential, participants first validate their hypotheses by obtaining feedback. By gathering strong evidence that validates their business model, participants can increase the likelihood they will build something someone cares about. “It’s evidence that you can’t gather in a lab; you have to go to the people that are the important stakeholders in the ecosystem,” explains Lydia McClure, former Program Director for I-Corps at NSF.³⁶

As part of the I-Corps curriculum, researchers learn business principles, such as:³⁷

³³ NSF, “NSF Innovation Corps (I-Corps),” https://www.nsf.gov/news/special_reports/i-corps/about.jsp.

³⁴ T. K. Grose, “To Market, to Market,” *ASEE Prism*, December 2014, <http://www.asee-prism.org/to-market-to-market-dec/>.

³⁵ E. Arkilic, email communication, January 5, 2017.

³⁶ L. McClure, phone interview, July 19, 2016.

³⁷ T. Kalil, and S. Rockey, “From Lab to Bench to Bedside: Accelerating Commercialization of Biomedical Innovations,” National Institutes of Health, June 19, 2014, <https://www.whitehouse.gov/blog/2014/06/19/lab-bench-bedside-accelerating-commercialization-biomedical-innovations>.

- Commercializing a new invention requiring the identification of a viable business model, not just an increase in the technological maturity of an invention
- Discovering the elements of a successful business model (e.g. value proposition, customer segments, sources of revenue) requiring gathering evidence to test and refine their initial hypotheses by talking to many different potential customers and partners—leaving the lab and “getting out of the building”
- Planning and defining a prototype based on early feedback from potential customers reducing the time and cost associated with the commercialization process

I-Corps programs have been adopted and adapted in partnerships with a growing number of federal agencies, including the National Institutes of Health (NIH), Department of Energy (DOE), Department of Defense (DOD), National Security Agency (NSA), United States Department of Agriculture (USDA), Department of Homeland Security (DHS), Advanced Research Projects Agency–Energy (ARPA-E), National Aeronautics and Space Administration (NASA), and the Small Business Administration (SBA).³⁸

2. Why

According to Errol Arkilic, former program director for NSF I-Corp, “I-Corps was designed to encourage agencies to see commercialization as an appropriate activity to support.”³⁹ I-Corps as a training program serves as one way to increase the economic impact of federally funded R&D by accelerating and improving the transfer of new technologies from the laboratory to the commercial marketplace.

I-Corp programs facilitate evidence gathering and provide a framework for quickly responding to that evidence. The I-Corps approach can be deployed further to assist federal agencies in commercializing research as well as developing technology and tools for internal use. To date, agency program variations focus on:

- Extramural university researchers (i.e., researchers receiving federal funding),
- Intramural researchers (e.g., research scientists at agency laboratories),
- Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) funded companies, and
- Non-academic technologists (i.e., alumni or community-based entrepreneurs)

³⁸ White House, “Fact Sheet: President Obama Announces New Commitments from Investors, Companies, Universities, and Cities to Advanced Inclusive Entrepreneurship at First-Ever White House Demo Day,” August 2015, <https://obamawhitehouse.archives.gov/the-press-office/2015/08/04/fact-sheet-president-obama-announces-new-commitments-investors-companies>.

³⁹ E. Arkilic, phone interview, December 30, 2016.

B. Background

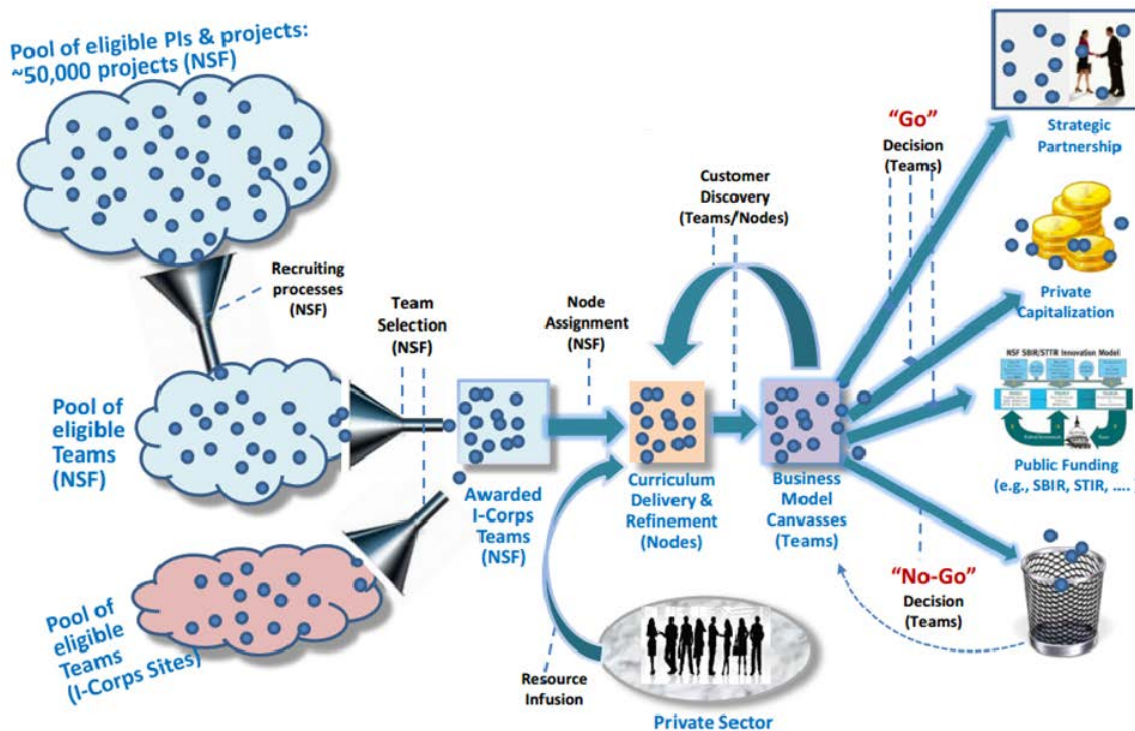
Through the I-Corps program, when researchers go into the field through their I-Corps training, they aren't promoting their technology; rather they are listening to and learning about their potential customers' needs and problems. Participants evaluate whether their research or technology will address those needs or whether their plan requires a course alteration to align their ideas with those of their stakeholders or customers. Once an idea is tested in the real world, the understanding about what is viable often changes.

1. How the I-Corps Model Works

With guidance from established entrepreneurs and through a targeted curriculum, I-Corps participants learn to identify valuable product opportunities that can emerge from research. Over a period of six months, each team learns what it will take to achieve an economic impact with their particular innovation. An overview of the NSF I-Corps process is shown in Figure B-1.

While the training programs in I-Corps are highly structured, they have also been adapted to fit the specific needs at each of the agencies deploying the program. For example, the NSF has helped facilitate the launch of new I-Corps or Lean LaunchPad programs at agencies using a technique called train-the-trainer, where individuals work with the NSF-funded National Innovation Network (NIN) to adopt the I-Corps program for their constituents while ensuring the scale-up and maintenance of quality programming.⁴⁰

⁴⁰ Venturewell, "National Innovation Network," <https://venturewell.org/i-corps/nin/>.



Source: E. Arkilic, "Lean Startup: Lessons from the field of 300 Innovation-Corps (Lean LaunchPad) Teams," NSF, <http://web.stanford.edu/group/ifarmteams/files/ErrolArkilicSlides.pdf>.

Figure B-1. NSF I-Corps Flow Diagram

a. Typical I-Corps Team Structure

The I-Corps team is typically composed of three individuals with distinct roles:⁴¹

- The Entrepreneurial Lead (EL): a Post-doctoral scholar, graduate or other student or other personnel with relevant knowledge of the technology and a deep commitment to investigate the commercial landscape surrounding the innovation. The Entrepreneurial Lead should also be capable of and have the will to support the transition of the technology, should the I-Corps project demonstrate the potential for commercial viability.
- The I-Corps Mentor: an experienced or emerging entrepreneur with proximity to the research institution and experience in transitioning technology out of labs. The I-Corps Mentor must be a third-party resource. The I-Corps Mentor is responsible for guiding the team forward and tracking progress through regular communication with the instructors.
- The Principal Investigator (PI) / Technical Lead (TL): responsible for overall grant management and should have technical knowledge in the space.

⁴¹ L. McClure, email communication, January 4, 2017.

b. Curriculum

The I-Corps curriculum is based on the Lean LaunchPad framework developed by Steve Blank.⁴² The program emphasizes experiential learning and Lean Startup thinking rather than learning by lecture. The canonical I-Corps model is a rigorous seven-week course, in which participants work with trainers and mentors to test how research and technologies could be commercialized by seeking input from potential customers or stakeholders.

Each week, a discrete set of business hypotheses are tested by the researchers by collecting interview data from the proposed target market.⁴³ Business models are developed and iteratively refined from this discovery process. By the end of the course, teams have performed at least 100 interviews with stakeholders or potential customers in their ecosystem. The results of this effort are then evaluated by the team who collectively decide whether they will continue to develop and commercialize their technology, pivot and explore other market segmentation or customer fits, or suspend their commercialization effort.⁴⁴ Instruction is provided via online platforms and through on-site activities at one of eight regional I-Corps Nodes. (See Example B-1: I-Corps Regional Node Spotlight on University Maryland).

Example B-1: I-Corps Regional Node Spotlight on University of Maryland

The University of Maryland (UMD) is one of eight universities selected as regional lead universities in NSF's I-Corps Node program. The eight regional I-Corps nodes form the backbone of the NSF's NIN, which links together over 70 universities with established entrepreneurs and venture capitalists to train faculty and student researchers from throughout the U.S. to transform ideas into products and get them on the market. The training emphasizes conducting hundreds of experiments, or interviews, with as many potential customers as possible; gaining insights about the significant pain points and needs of specific customers; and tracking the results of those experiments on a business model canvas.

UMD offers several variants of the I-Corps program:

- An Intro to I-Corps program for UMD faculty interested in commercializing their research
- A FedTech I-Corps course providing UMD students with opportunities to work with NASA, NIH, DOE, DOD, and other federal agencies to commercialize technologies
- An Innovation Boot Camp workshop and program for clients like the HHS IDEA Lab and the U.S. Department of Justice Concept Lab that combines Lean Startup with Design Thinking to help teams from those organizations advance their innovation projects.

Sources: Maryland Technology Enterprise Institute, "University of Maryland, George Washington University and Virginia Tech Awarded \$3.75M by NSF to Launch National Innovation Network Regional Node," February 21, 2013, http://www.mtech.umd.edu/news/press_releases/nsf_icorps.html; Academy for Innovation and Entrepreneurship, "About," <http://innovation.umd.edu/learn/i-corps/>.

⁴² S. Blank, "Start Up Tools: Lean LaunchPad Videos," <https://steveblank.com/tools-and-blogs-for-entrepreneurs/#LeanLaunchPadVideos>.

⁴³ NSF, "I-Corps Curriculum," https://www.nsf.gov/news/special_reports/i-corps/curriculum.jsp.

⁴⁴ L. McClure, email communication, January 4, 2017.

2. Distinctions Among Lean Startup, Lean LaunchPad, Hacking for Defense/Diplomacy, and I-Corps

I-Corps is based on the Lean LaunchPad curriculum developed by Steve Blank and focuses on the commercialization of research. While several federal agencies have applied I-Corps programming, others have used variants of Lean LaunchPad programming. Agency Lean LaunchPad programs are considered part of the I-Corps network because of their use of the NSF’s National Innovation Network (NIN) to implement their programs. Agencies using Lean LaunchPad can execute MOUs with NSF to access the NIN and other resources.⁴⁵ (See [Appendix D](#) for further information on the NIN).

I-Corps is a structured and visible application of lean startup in the public sector. While lean startup is a broader entrepreneurial methodology, the I-Corps program is one structured approach to teach lean startup methods and to accelerate commercialization of solutions. While the same foundational principles hold, one key difference is that the I-Corps formulation starts with a technology that is seeking a market, rather than starting with a customer problem or need and then iterating to identify the solution.⁴⁶

Hacking for Defense (H4D) is another iteration of lean startup-related programming. In Hacking for Defense/Diplomacy classes, federal agencies provide universities with problems and teams of students use the Lean LaunchPad and I-Corps methods to provide solutions.⁴⁷ (See [Appendix C](#) for further information on H4D).

C. Considerations for Use

I-Corps can have multiple applications. Recognizing that different customer segments exist within government, the I-Corps curriculum has been customized, modified, and enhanced across the federal agencies. Some agencies use I-Corps for agency-funded academic researchers to support commercialization; others fund agency researchers to support commercialization; some use it for SBIR companies so that startups are more likely to succeed, while other agencies use variants of I-Corps for their own staff to fuel agency-adopted innovation.⁴⁸

1. R&D

I-Corps was developed particularly to address the translation of R&D efforts to commercial technologies, but the value of the methodology could be more broadly applied even beyond the I-Corps lens. For instance, agencies could consider that applied R&D has a clear, early “customer discovery” phase with a “go, no-go” decision point dependent on its results. If a viable market is found, the sponsoring agency would then re-evaluate the pursuit of that line of R&D. The approach

⁴⁵ L. McClure, email communication, January 4, 2017.

⁴⁶ R. Holman, phone interview, August 12, 2016.

⁴⁷ S. Blank, email communication, January 5, 2017.

⁴⁸ J. Erickson, email communication, December 18, 2016.

may require additional agency funding at the outset, but in the long run could drive significant cost savings by identifying and promoting the research activities most likely to impact the market.⁴⁹

2. Internal Process Innovation

A number of federal agencies have experimented with derivations of I-Corps that are broader in scope but still maintain the core principles of Lean LaunchPad. Rather than focusing on scientists within labs, these “internal innovation accelerators” provide a flexible model for developing new ideas to meet agency goals. These programs follow the basic elements of startup accelerators that are common in the private sector. The core elements include: competitive entry, seed-funding and resources, coaching and instruction, and a defined time-frame to explore and test out the idea. Most accelerator programs also end with a “Demo Day” where the small startup team pitches its idea to potential investors to take it to the level.⁵⁰

Programs are based on the observation that the best ideas can come from any part of an organization and that the existing bureaucratic structure is not sufficiently supportive of the testing of these ideas to see if they are worth carrying further. While focused on supporting internal staff, they may also involve external partners.

While I-Corps has a fairly specific definition and fits into only certain federal organizations, internal accelerators can be tools for mid- to senior-level management staff in any organization. For instance, with HHS Ignite,⁵¹ HHS found that the flexibility of the accelerator model allowed them to emphasize their toughest challenges while bringing in elements of Lean Startup and other innovative approaches like design thinking to provide the most effective solutions.⁵²

D. Implementation Guidelines

1. Key Steps for Deployment

Provided below is an outline of steps one may take when implementing I-corps.⁵³ Specific considerations and applicability of the steps provided may vary based on agency.

- Consensus agreement on desired outcomes: Identify your group’s and agency’s long-term goals and preferred outcomes (e.g. Go/No-Go on commercial viability of federally funded research, scale/sustainability of promising new programs or processes, entrepreneurial mindset of constituents, culture change, etc.)

⁴⁹ T. Kalil, “Progress on President Obama’s ‘Lab to Market’ Initiative,” Department of Energy, July 12, 2016, <https://energy.gov/articles/progress-president-obama-s-lab-market-initiative>.

⁵⁰ R. Holman, email communication, December 18, 2016.

⁵¹ HHS, “Ignite Accelerator,” <http://www.hhs.gov/idealab/what-we-do/hhs-ignite/>.

⁵² R. Holman, phone interview, August 12, 2016.

⁵³ L. McClure, email communication, January 4, 2017.

- Draft Memorandum of Understanding with NSF: Whether interested in launching a commercially-driven program for STEM researchers through the I-Corps brand or looking to form Lean LaunchPad programming, NSF is able to provide advice and guidance to agencies.
- Curriculum development: Work with similarly deployed I-Corps programs to design the optimal program in terms of time duration, expectations for teams, content delivery, and next steps. The NSF I-Corps program staff facilitated many new variants of the I-Corps program across disciplines and programs.
- Instructors and tools: Programs need to identify potential instructors with the ability and will to be trained in the I-Corps methodology and to lead the program after the pilot. Additionally, to facilitate instruction and to track program outcomes, investment is needed in online software for data collection and analysis and curriculum webinars.
- Team composition and resources: Determine which key stakeholders are critical for participation, including individuals with complementary perspectives and core strengths. At NSF, there are three team members: the entrepreneurial lead is typically a graduate or post-doctoral student, the principal investigator is a technical academic lead, and the industry mentor is a volunteer from an industry in which the project may be applied. Funding may be needed for team salary plus travel for customer discovery and event logistics.
- Funding structure for piloting and growth of programs: Obtain funding for qualified instructors during the pilot. The expected budget is \$20-25K for a single I-Corps instructor to perform the preparation and instruction of the 7-week I-Corps curriculum. With the program infrastructure and teams in place, the creation of a sustainability plan for the evaluation and growth of the program is essential to testing the validity of their proposed plans using customer discovery.

2. Considerations for Instructors

Guiding and selecting instructors is a critical element for a successful I-Corps program; finding them can be difficult. The following are characteristics that can help facilitate effective instruction.⁵⁴

- **Relentlessly Direct:** Instructors should be able to be “relentlessly direct” with their teams and challenge their assumptions and data interpretations without provoking conflict or resentment.
- **Teach the process, don’t consult:** Rather than providing answers, instructors should encourage adherence to the process, even when they personally have relevant background experience. For example they should ask of the trainees, “what are you

⁵⁴ E. Arkilic, email communication, January 5, 2017.

hearing from your interviews? Diagram that. Don't tell me how you *think* it works; tell me who you talked to, and what you learned from them."

- **Credibility:** Instructors should have credibility. It's not enough to enforce adherence to the process; participants have to believe that instructors have relevant experience and insight—otherwise, teams may wonder, "Why should I listen to this person?"
- **Command of the Classroom:** The program is multi-week, multi-hour webinars, and it's difficult to sustain teams' engagement through that platform. Being able to read a room and make the curriculum interactive requires skill in the art of pedagogy.

E. Future Directions

Opportunities exist for programmatic expansion before and after participation in the I-Corps curriculum. For instance, scaling possibilities include extending I-Corps offerings to Phase 2 and 3 SBIR/STTR companies or could expanding I-Corps to other disciplines, such as evidence-based policy or public safety.⁵⁵

NSF recently piloted two new programs, the I-Corps Lite Beat-the-Odds boot camp for SBIR/STTR Phase I recipients and a new I-Corps GO curriculum for those teams that finish the canonical I-Corps program with a solid product-market fit, but do not know how to launch an investable company. The Beat-the-Odds Boot Camp has been incorporated as an optional element in the yearly NSF SBIR/STTR Phase I Grantee Workshop.⁵⁶ I-Corps GO or other future variants—I-Corps "2.0" or I-Corps Next—could differentiate between the search for a business model and the execution of a business model—the latter of which could focus on addressing "what comes next" for teams that do make a "go" decision to transition to execution.⁵⁷

Additional training could be useful for particular niche areas—like the life sciences—where tailored training could educate researchers on how to navigate particular regulatory landscapes on the path to market.⁵⁸ Follow-on training would be also be valuable for those researchers and scientists who face a new set of entrepreneurial challenges that come with potentially scalable startups. I-Corps Next/2.0/GO would teach companies how to implement and execute a company's business model, emphasizing strategies to achieve liquidity and governance structures to promote commercialization.

For instance, Steve Blank noted that future I-Corps programming could focus on transmitting best practices in:⁵⁹

⁵⁵ M. Wynne, email communication, December 16, 2016.

⁵⁶ NSF, "Fall 2016 Phase I Workshop," <http://www.nsfipconf.com/2017fallsbirp1>.

⁵⁷ E. Arkilic, phone interview, December 30, 2016.

⁵⁸ M. Wynne, phone interview, September 1, 2016.

⁵⁹ Ibid.

- Engineering—how to turn their science into minimum viable products and then into commercial products, how to put in place a product roadmap, and the difference between custom engineering/products and scalable products;
- Sales and marketing—how to turn lessons learned in Customer Discovery and Validation into repeatable processes for building sales and marketing programs, organizations, basic product licensing, and pricing;
- Building a company foundation—how to create a culture for speed, urgency, and agility,
- Hiring and retaining talent—salary, equity, and advisory boards;
- Legal and intellectual property—patent strategy and developing an understanding of legal and IP issues;
- Supply chain—manufacturing and clinical research organizations;
- Partnering—the ability to find strategic partners in corporations and/or incubators and accelerators;
- Financing—determining capital requirements, designing a financing strategy, and securing financing. This area would include angel, venture, and/or strategic capital—as well as fundraising skills: pitching, demos, negotiations, and managing investors, and
- Liquidity—how to best position a company for sale, merger, or IPO.

Appendix C. Additional Examples of User-Focused Innovation Methods in the Federal Government

This appendix describes several examples of user-focused innovation methods across the federal government.

A. Hacking for Defense (H4D)⁶⁰

1. Background

H4D is a university-sponsored class that allows students to develop a deep understanding of the problems and needs of government sponsors in the Department of Defense and the Intelligence Community. The class aims to increase the speed at which national security organizations solve mission-critical problems by enabling the DOD and intelligence community to tackle hundreds of critical national security problems each year. In a short time, students rapidly iterate prototypes and produce solutions to sponsors' needs.

2. How It Works

The class uses Lean Startup principles with a specific focus on national security issues. Sponsors work closely with students and guide them as they utilize lean business practices to rapidly iterate prototypes and produce solutions. This approach gives sponsors a connection to a pool of highly qualified and engaged talent and serves as an efficient use of resources to address the Nation's emerging threats. Through their participation in H4D, sponsors also become connected to other innovators in the DOD and Intelligence Community.

H4D begins with a robust problem definition and evaluation to select challenge candidates for the subsequent discussions. The non-profit Hacking For Defense Inc. (H4Di) has been set up as a single point of contact to curate and distribute problems to all the participating universities.⁶¹

H4Di works with representatives of national security organizations to identify a problem to be solved. Agencies then work directly with senior leaders in their organizations to ensure there are sufficient resources allocated to support the testing, deployment, and scaling of the most promising results from the H4D process. Each problem is vetted, scoped, and translated by H4Di to ensure that the problem can be accessible to non-governmental technologists in an unclassified environment while remaining relevant for addressing the root issue. All H4D problems must be

⁶⁰ Information derived from S. Blank, email communication, January 5, 2017.

⁶¹ H4Di—Hacking For Defense, <http://www.h4di.org/>.

unclassified, because most students and faculty members working the solution will not possess a security clearance. Often, an analogous problem environment that is commonly understood by commercial users is used to substitute for a classified problem.

Problems vetted by H4Di and given to the universities include the following:^{62, 63}

- Detection and monitoring of threats (e.g., aerial, marine, and internet-based threats)
- Deployment of technologies (e.g., broadband internet in restricted regions, robotic telesurgery, and facial recognition)
- Data collection and transfer (e.g., data to support Navy SEAL training, unclassified sensor data analysis)

Agencies interested in using the “Hacking for X” framework could benefit by considering the following questions when selecting internal challenges:

- Can the problem be clearly articulated?
- Is the problem critical?
- Can success criteria be clearly defined?
- Can the sponsor devote adequate time to weekly interaction with student teams who are engaged in the problem-discovery and solving process?
- If a student team came up with a prototype solution, could it be deployed in the agency or to beneficiaries within 1–3 years?
- Is there authority to both address the problem and implement any resulting solutions?

3. Key Accomplishments

For federal agencies, H4D allows sponsors to increase the speed at which their organization solves specific, mission-critical problems. For universities, it keeps their programs attached to real-world problems and provides students with an experiential opportunity to become more effective in their chosen field, with a body of work to back it up.

The first H4D class was offered March-May 2016 at Stanford University. The first 2½-day class for new educators and sponsors was held September 7–9, 2016. As of July 2017, eight universities had committed to offering the class.⁶⁴ The national scaling of the class is being funded by the National Defense University.

⁶² Stanford Hacking for Defense, “DOD/IC Problems,” April 11, 2017, <http://hacking4defense.stanford.edu/dodic-problems.html>.

⁶³ Georgetown University’s Hacking for Defense, “DOD/IC Challenges,” <http://www.hacking4defensegu.com/dodic-challenges/#dodic-challenges-1>.

⁶⁴ S. Blank, “National Security Innovation Just Got a Major Boost in Washington,” <https://steveblank.com/category/hacking-for-defense/>.

4. Additional Resources

- H4Di website has additional information; H4Di—Hacking for Defense, “Government Information,” <http://www.h4di.org/government.html>.
- Steve Blank’s blog entries related to Hacking for Defense; search results for “hacking for defense” at SteveBlank.com, <https://steveblank.com/?s=hacking+for+defense>.
- Steve Blank’s blog entries related to Hacking for Diplomacy; search results for “hacking for diplomacy” at SteveBlank.com, <https://steveblank.com/?s=hacking+for+diplomacy>.

B. Department of Health and Human Services (HHS) Indian Health Services (IHS) Whiteriver Indian Hospital Project⁶⁵

1. Background

In 2014, staff from the Indian Health Services (IHS) came together to address the issue of long wait times and overcrowding in an emergency department in Arizona’s Whiteriver Indian Hospital. After engaging in a process of redefining their problem and participating in rapid prototyping, the team tried to develop a new system for processing patients, using human-centered design (HCD) and Lean Startup methods to redesign the hospital’s emergency department.

The Whiteriver Indian Hospital, located in the White Mountain Indian Apache Reservation in Arizona, has over 40,000 emergency department visits per year—four times the national average. Records indicate that in recent years 65% of these visits were not for emergencies. The large inflow of patients with non-emergent conditions led to extended wait times and over 20% of patients left the hospital without being served.⁶⁶ This overcrowding issue represented an estimated \$5.5 million dollars in lost revenue annually for the hospital, in part because many of the patients who left without treatment returned in the future with more severe conditions. After assessing the impact on the hospital and its patients, IHS identified two key concerns: improving patient flow and reducing emergency room crowding.

2. How It Works

A team of IHS staff entered the HHS IDEALab Ignite Accelerator, hoping to gain the funds and skills to develop a solution to this pervasive issue. From the beginning, the project team members thought they had identified the best solution to their problem: the installation of high-technology service kiosks like those that several advanced emergency departments around the country had already adopted. Participation in training in the Ignite Accelerator helped them adopt an

⁶⁵ Information derived from L. Anfune, HHS Division of Program Innovation, email communication, January 12, 2017.

⁶⁶ M. Rivera, “Indian Health Service (IHS) Hospital Check-In Redesign,” HHS IDEALab, YouTube video, July 25, 2016, <https://www.youtube.com/watch?v=qFPiNuUJKWc>

entrepreneurial mindset, in which it was necessary to challenge their own assumptions about the problem and solutions and reconsider the feedback from patients.⁶⁷

First, the team engaged in a customer discovery process during which members interviewed patients and staff at the hospital to learn about their experiences. By profiling the patients and how they interacted with the hospital, they discovered that patient flow and overcrowding was in fact a primary concern, but high-technology kiosks were not appropriate for the elderly, who made up the majority of the population that the hospital served. The team used information gathered from the interviews to iterate a new, lower-technology solution. Team members created a paper form that would allow patients who enter the emergency department to identify the severity of their medical issues, which would, in turn, allow an intake clerk to direct them to the appropriate department for service.

Next, the team began prototyping and iterating on the design. In the initial prototype, the team encountered two problems. First, in such a small, deeply connected community, many patients were not comfortable sharing their conditions with clerks in the waiting room. The form proved effective for those willing to use it, but the solution was appealing only to a portion of the target population. The team also learned during conversations with the Centers for Medicare and Medicaid Services (CMS) that this solution violated the Emergency Medical Treatment and Labor Act (EMTALA).⁶⁸ The act requires that a medical examination be given to anyone who enters an emergency department and requests service, regardless of the severity of the condition presented. The team returned to the drawing board to design, test, and redesign several solutions through further rounds of rapid prototyping and iteration.

The final solution was a combination of paper forms, a fast-track triage process, and hospital renovations. The new fast-track system allows a dedicated physician, not a clerk, to manage intake on the busiest days in the hospital. This physician provides the medical examination, determines severity of the problem, and sends cases directly to the appropriate departments, which helps reduce long waits. The physician also uses paper forms while working with patients to help determine their needs more quickly.

The team was able to leverage the information and data compiled from each pilot to also advocate for funding for emergency department renovations that would provide a fully equipped physician fast-track station and facilitate unhindered patient-staff contact to make assessments of severity of conditions easier and quicker.

3. Key Accomplishments

Integrating human-centered design and Lean Startup thinking into the final solution will reduce waste, increase revenue for the hospital, and most importantly, drastically improve access to care.

⁶⁷ HHS, “Ignite Accelerator,” <https://www.hhs.gov/idealab/ignite-accelerator>.

⁶⁸ M. Rivera, “Indian Health Service (IHS) Hospital Check-In Redesign,” HHS IDEALab, YouTube video, July 25, 2016, <https://www.youtube.com/watch?v=qFPiNuUJKWc>.

The renovations, in progress, are expected to cost \$150,000—but the full implementation is projected to provide the hospital with over \$6 million in revenue and cost savings.⁶⁹ This estimated revenue is derived primarily from an increase in patients served, plus the cost savings from serving patients before their conditions worsen. In addition, the hospital is no longer at risk of penalties imposed by CMS for sites that have high numbers of patients who leave without being seen. Emergency department staff documented a decline in patients who have left without being seen from 20% to 12%.

4. Additional Resources

- Video from the project lead, Marliza Rivera; M. Rivera, “Indian Health Service (IHS) Hospital Check-In Redesign,” HHS IDEALab, YouTube video, July 25, 2016, <https://www.youtube.com/watch?v=qFPiNuUJKWc>.
- How HCD and Lean Startup are being infused into HHS; J. Shueh, “IDEA Lab Injects Entrepreneurial Tactics into Federal Health Services,” *Government Technology*, <http://www.govtech.com/health/IDEA-Lab-Injects-Entrepreneurial-Tactics-in-Federal-Health-Services.html>.

C. Helping Americans Get Better Paying Jobs: How the Department of Labor (DOL) Is Applying Human-Centered Design⁷⁰

1. Background

The DOL actively promoted innovation within the public workforce system by inspiring the use of HCD as a problem-solving method. The DOL has used HCD to generate and create new approaches for workforce development. These efforts garnered enthusiasm among state and local governments for HCD and encouraged the smart investment of government funds into HCD-based projects.

2. How It Works

In July 2015, the DOL’s Employment and Training Administration (ETA) announced the Customer-Centered Design Challenge (CCDC), encouraging workforce development professionals to develop innovative strategies for improving the public workforce system.⁷¹ This team-based initiative brought together a broad range of individuals, created teams dedicated to

⁶⁹ Ibid.

⁷⁰ Information derived from V. Hamilton, Department of Labor Regional Administrator, email communication, January 7, 2017.

⁷¹ U.S. Department of Labor, Employment and Training Administration, “The Customer-Centered Service Delivery Design Initiative,” *Workforce GPS*, https://ion.workforcegps.org/resources/2015/09/02/17/11/Customer-Centered_Service_Design_Initiative.

tackling workforce-related challenges, and provided opportunities for participants to learn how to develop, prototype, and implement HCD.

Prior to the CCDC, ETA did not experiment with HCD on a massive scale. Instead, HCD was promoted as a problem-solving tool at the grassroots level. Previously, one of ETA's regional offices engaged the firm, IDEO, in a training for state and local governments on the use of HCD as a tool to address jobseeker and worker needs.⁷² Despite this limited scope, state and local workforce agencies were able to achieve a number of successes and demonstrated the potential and promise of HCD. Leveraging the increased awareness and use of HCD among individuals and states to improve workforce development strategies, ETA created CCDC to establish a nationwide initiative designed to promote further innovation within the public workforce system.

Each design team that participated in the CCDC took a seven-week online course taught by Acumen⁷³ and IDEO,⁷⁴ where they learned the design process; explored the main human-centered design concepts; and received technical assistance from DOL contractors to put those tools into action. Afterwards, each design team spent five weeks applying the ideas they generated and the insights gained during the online course. An event summary offers more information about the Challenge's five phases.⁷⁵

3. Key Accomplishments

Initially, 80 HCD teams—each of which consisted of four to eight individuals and represented over 40 states—volunteered to explore how they could improve the customer experience in a variety of work-force topics. Projects focused on improving one-stop centers (currently branded as American Job Centers), further integration of employers in sector strategies and career pathways, and development of services and programs for out-of-school youth. Eleven teams presented their projects at a White House event in February 2016.⁷⁶

Based on the high level of participation and interest, the DOL announced Round 2 of the CCDC in March 2016, providing the opportunity for participants to tackle questions previously not

⁷² U.S. Department of Labor, Employment and Training Administration, "Regional Offices," https://www.doleta.gov/regions/regoffices/Pages/eta_default.cfm?CFID=837475024&CFTOKEN=47617638.

⁷³ IDEO, "Design Kit: The Human-Centered Design Toolkit," IDEO, <https://www.ideo.com/post/design-kit>.

⁷⁴ Acumen, "Design Kit: The Course for Human-Centered Design," <https://course.novoed.com/hcd-acumen>.

⁷⁵ U.S. Department of Labor, Employment and Training Administration, "Customer-Centered Design Challenge," https://events-na2.adobeconnect.com/content/connect/c1/14339732/en/events/event/shared/920721773/event_landing.html?sco-id=920694443.

⁷⁶ U.S. Department of Labor, "How WOIA is Inspiring Innovation Locally," February 18, 2016, <https://blog.dol.gov/2016/02/18/how-wioa-is-inspiring-innovation-locally>.

covered under Round 1.⁷⁷ As of May 2016, roughly 500 workforce professionals, composing 120 teams, volunteered to participate, and 15 teams came to the White House for a learning exchange and celebration. As a result of these projects, recognizing HCD as an innovative, problem-solving tool, states are promoting best practices within local workforce development organizations by providing grants to select HCD teams. For example, the State of California allocated up to \$330,000 to test and refine design prototypes during Round 1 and allocated another \$250,000 during Round 2. Using HCD, the State of Washington has redesigned the system that helps people on Unemployment Insurance get the help they need to find work.

As of October 2017, two more rounds of teams have participated in this initiative, and DOL is now starting to measure outcomes as a result of using Human Centered Design to redesign services for people looking for work, and businesses looking for talent.

4. Additional Resources

- Innovation and Opportunity Network at the DOL; WorkforceGPS, “The New Customer-Centered Design Approach to Service Delivery,” <https://ion.workforcegps.org/>.
- DOL Customer-Centered Design webinar; WorkforceGPS, “Webinar Series Act Now: Customer Centered Design,” July 28, 2015, https://www.workforcegps.org/events/2015/11/18/10/41/Webinar_Series_Act_Now_Customer_Centered_Design.

D. United States Department of Agriculture (USDA) and Office of Personnel Management (OPM)—Lunch Money: Inter-Agency Collaboration for Innovation⁷⁸

1. Background

From May 2014 through April 2015, the USDA’s Food and Nutrition Service (FNS) partnered with the OPM Innovation Lab to solve enrollment issues with the National School Lunch Program. The National School Lunch Program provides healthy, reduced-cost, and free meals to over 30 million children each school day. Previously, those interested in participating in the program struggled to accurately complete the application forms. This led to improper payments, including under- and overpayments totaling approximately \$1.9 billion in 2015. Hoping to improve the enrollment process and eliminate many of the costs associated with improper payments, the FNS turned to the Innovation Lab and HCD approaches.

⁷⁷ U.S. Department of Labor, Employment and Training Administration, “The Customer-Centered Design Challenge Launch,” *Workforce GPS*, https://www.workforcegps.org/events/2016/04/15/12/37/The_Customer_Centered_Design_Challenge_Launch.

⁷⁸ Information derived from A. Miller, OPM Innovation Lab, email communication.

2. How It Works

Since the improper payments plaguing the FNS were often the result of human (in this case, parent) error, the FNS and Innovation Lab needed an approach that considered the experience of the human completing the program's application form. Because HCD starts with the human, and builds solutions based on the human's experience and needs, it was a perfect fit for the FNS. By partnering with the Innovation Lab's HCD experts to solve the program's enrollment issues, the FNS was able to identify the root causes of human error and specifically address those issues to improve outcomes.

The OPM Innovation Lab trained and collaborated with the FNS to conduct research, make in-depth observations, and interview people who participate in the school lunch program, including families and school officials. The team determined that small, yet important factors were hindering parents' completion of the application form. The team designed a new program application form that was one-page long, provided more space for the parents to write their children's names, and that was more simple and intuitive. Before releasing the form to school officials for approval, the form was tested with parents to ensure that the changes would positively impact the parents' experience and that forms would be accurately completed. Finally, the form was approved by school officials and launched by the USDA in 2015.

In addition, the FNS found that in school districts where the poverty level rose above 90%, it was actually more fiscally responsible to approve all students within the district for the school lunch program than to correct the average number of improper payments. Blanket approval eliminates the risk of human error in the application process so the FNS can be confident that the district will not be awarded an "improper" amount, which would require reimbursement.

3. Key Accomplishments

The FNS believes that the newly improved National School Lunch Program will reduce human error, which costs the USDA billions of dollars in over- and underpayments each year. With more accurately completed application forms, the FNS will correctly calculate reimbursement payments to schools for the meals that they provide. In addition, blanket approvals in seriously impoverished school districts will save the USDA millions of dollars in overhead costs associated with correcting improper payments.

The FNS has set a goal to reduce the error rate among completed school lunch program applications from 15.8% in 2015 to less than 10% by the 2019–2020 school year. The FNS and the OPM's Innovation Lab are confident that the improvements made through HCD will help the FNS meet their goal.

4. Additional Resources

- Lab at OPM on Twitter; (@ LABopm), Twitter, <https://twitter.com/LABopm>.

- P. L. Brown, “Human-Centered Design in the US Federal Government,” Government Innovators Network, blog, <https://www.innovations.harvard.edu/blog/human-centered-design-us-federal-government>.
- USDA press release reporting on progress; USDA, “USDA Announces Progress in Reducing Improper Payments in School Meals,” Press Release No. FNS 0005-15, May 4, 2015, <http://www.fns.usda.gov/pressrelease/2015/fns-0005-15>.

E. Department of Veterans Affairs (VA), Veterans Affairs Center for Innovation⁷⁹

1. Background

On May 7, 2016, the U.S. Department of Veterans Affairs (VA) Center for Innovation (VACI) brought together designers, developers, and veterans to spend a Saturday working on a HCD challenge—to redesign mental health intake forms that are used by veterans to request access to VA services. Although the event took place in both Boston, Massachusetts, and Atlanta, Georgia, this case study provides an overview of the Boston event. The event was a “hack-a-thon”: a time-constrained event in which individuals and groups are invited to participate and co-design a solution. Participating teams comprised people with many different backgrounds and expertise. The event involved designers from Mad*pow (the design firm that hosted the event), designers and developers from the Boston community, veterans, staff members from the Veterans Benefits Association, and VACI staff members, totaling 21 people. The attendees were split into three teams and were tasked with developing prototypes using an HCD processes.

2. How It Works

Previous HCD work by VACI focused on understanding veterans’ experiences related to accessing mental health services.⁸⁰ The team learned that the mental health intake forms are a barrier to access and could re-elicite trauma. For example, intake forms for veterans suffering from Post-Traumatic Stress Disorder (PTSD) required the veterans to recount the experiences that caused their PTSD. VACI wanted to ensure that the first step to accessing services was as straightforward and thorough as possible without causing unneeded trauma. To redesign the forms, a #hacktheforms event was planned. The #hacktheforms event was branded as a hack-a-thon (or, as VACI describes it, a “design-a-thon”) to encourage all members of the community to collaboratively improve veterans’ access to health services through co-design. Because the problem was complex and involved many different perspectives and experiences, the open #hacktheforms event continued the HCD process to design and prototype new intake forms based on an understanding of and empathy with veterans’ experiences. HCD was well suited for this

⁷⁹ Information derived from Sarah Brooks, Amber Schleuning and Andrea Ippolito, VACI staff; and Saurabha Bhatnagar, VA Innovators Network @ Boston.

⁸⁰ VA Center for Innovation and the Public Policy Lab, “Veteran Access to Mental Health Services,” 2016, <https://www.innovation.va.gov/docs/VeteranAccessToMentalHealthServices.pdf>.

challenge, because the previous intake forms⁸¹ were not designed in a user-friendly way, not designed with a veteran in mind, and not designed with the VA process in mind.

The day began with an objective: “Use this event as a starting point for a larger conversation on barriers to mental health services” and continued with collaborative co-design activities to create new intake forms. Co-design activities involved iterative prototypes on paper, poster sheets, whiteboards, and computers, based on examples of intake forms as well as personas for VA mental healthcare. The personas had been developed previously in a 2014 HCD report entitled “Voices of Veterans”⁸² as well as Appendix 2 of the 2016 Veteran Access to Mental Health Services report.⁸³

3. Key Accomplishments

Final proofs-of-concept focused on improving privacy, allowing veterans to know what steps were next in the process, making the forms more inviting by beginning with warmer words such as “thank you for your service” or “PTSD is normal,” and making the title clearer and shorter. The following excerpt from further explains the success of the event:⁸⁴

Across both Atlanta and Boston, there were common design features in response to Veterans’ insights: recognizing Veterans’ service and highlighting that these forms are to ensure that Veterans’ receive the care they earned and seek; clearer and cleaner design that is accessible to all and not a struggle to understand; and clear explanations about the privacy of the information and details provided. Veterans who participated in hackathons were impressed by the new design prototypes, and even more so, by how powerful these forms could be for providing a better initial impression for Veterans embarking on the journey to seek mental health care in the VA.

4. Additional Resources

- Peruse the #Hacktheforms resource guide, <https://github.com/departments-of-veterans-affairs/hacktheforms>.
- VACI’s other efforts in HCD, <https://www.innovation.va.gov/hcd.asp>.
- “Designing for Veterans: A Toolkit for Human-Centered Design,” <https://www.vets.gov/playbook/downloads/vaci-project-toolkit.pdf>, a VACI resource guide for applying HCD within an agency, and more on its interagency collaboration.

⁸¹ See, for example, VA Form 21-0781, <https://github.com/departments-of-veterans-affairs/hacktheforms/blob/master/VBA-21-0781-ARE.pdf>.

⁸² VA, “Voices of Veterans,” November 2014, https://www.innovation.va.gov/docs/Voices_of_Veterans_11_12_4.pdf.

⁸³ VA Center for Innovation and the Public Policy Lab, “Veteran Access to Mental Health Services,” 2016, <https://www.innovation.va.gov/docs/VeteranAccessToMentalHealthServices.pdf>.

⁸⁴ McBee, M., S. Bhatnagar, and J. Dadamo “Re-Designing the First Impression: Hacking VA Intake Forms,” VA Innovation, <https://medium.com/vainnovation/re-designing-the-first-impression-hacking-va-intake-forms-16b94be0a415>.

F. U.S. Agency for International Development (USAID) Sparking Desire for HIV Prevention Methods: Applying Human-Centered Design to USAID’s Global Health Goals⁸⁵

1. Background

HIV/AIDS is the leading cause of death for women of reproductive age in low-resource settings. A 2016 UNAIDS report shows that the ages between 15 and 24 years are an incredibly dangerous time for young women. In 2015, around 7,500 young women became newly infected with HIV every week, the vast majority in southern Africa. Between 2010 and 2015, new infections among females aged 15–24 years declined by only 6%. Significant investments have been made to develop new and discreet female-controlled microbicides like vaginal rings or gels that can help women protect themselves from HIV. However, while clinical trials are demonstrating the efficacy of these products, there is also evidence of very inconsistent use, especially among younger women. Clinical trials have shown adherence rates below 30%, a problem that may have contributed to fluctuating efficacy rates. Without regular usage, these products cannot help lower HIV infection rates; worse, adherence rates are generally lowest among the most at-risk group of young women.

A better and more discreet HIV prevention product that is more likely to be used consistently and correctly required a design that accounted for the target group’s values, needs, and lifestyle. USAID’s Center for Accelerating Innovation and Impact and its implementing partners IDEO and CONRAD sought to better understand the daily lives of at-risk young women using an HCD approach. The goal was to encourage these women to adopt and make a habit of using microbicides and to generate excitement or desire for the product.

2. How It Works

Through an iterative co-creation process with users in South Africa, this project explored underlying motivators and barriers to product usage and turned insights into design prototypes that fit women’s values, needs, and lifestyles. These prototypes were meant to spark desire and encourage usage and adherence in young women. The HCD methodology used consists of four phases: (1) research & inspiration, (2) synthesis & strategy, (3) design & iterate, and (4) refine & roadmap.

The design process began with a *research & inspiration phase*, interviewing over 100 women who represented a range of demographic characteristics and sexual behaviors. Interviewees also included important influencers of the women’s behavior, such as male partners, health care providers, and traditional healers. Given the sensitive nature of discussing sex and the stigma around HIV, it was important to approach the interviews delicately. Interviewers were careful to

⁸⁵ Information derived from J. Hum, USAID Center for Accelerating Innovation and Impact Market Access Advisor, email communication, January 13, 2017.

build trust with interviewees, to provide a respectful environment for the conversations, and to protect confidentiality where needed.

During the *synthesis & strategy phase*, researchers reflected on interview experiences to identify end users' key needs and motivators, barriers, and encouragers to use. Across the many insights that emerged from this iterative research and design process, some of the most important takeaways for designing outputs included the lack of knowledge about the female anatomy, importance of discretion for any product related to sex and HIV, positive role of novelty, and pervasive fear of loss (to HIV as well as other causes). Six design principles were created based on synthesis of these research insights: (1) be discreet and provide cover; (2) provide different ways in; (3) get literal; (4) make the habit your own; (5) make it rumor-worthy; and (6) spark confidence and build trust.

During the *design & iterate phase*, the project team used the six design principles to create different versions of messaging, packaging, and form factors that would appeal to women along each step of the user journey. These prototypes were tested and iterated on through another set of end-user interviews in a second phase of in-country research. Researchers observed how women interacted with the prototypes to better understand immediate reactions and associations. Interview topics explored how a woman might use the product, where she would store it, whether or how she would tell her partner about it, and any questions she might have. Throughout this process, co-creation activities were used to tap into end-user experiences, ideas, and suggestions.

The final phase, *refine & roadmap*, is currently still underway. In this phase, researchers are gathering more feedback on the mid-fidelity prototypes in order to iterate and bring the designs to a higher fidelity level. Cost projections and live prototyping are also part of this phase.

3. Key Accomplishments

Using the aforementioned design principles as a guide, the project created three distinct brand directions (complete with color palette, sample packaging, and marketing copy) to test messages of intimacy, empowerment, and hygiene. To accompany these brands, the project developed clear visual instructional inserts as well as a video that walked users through the details of how a microbicide product could be used, including usage scenarios and “sex-positive” sex education tips. The project also engineered various applicator models to insert the product, attractive carrying cases with discreet compartments, and storage systems with refill reminders.

Together, these deliverables illustrated how design principles could inform the market launch of HIV prevention products. Since this was only an initial, exploratory project, the outcomes formed the basis of ongoing work that will further refine these outputs for microbicide products, expand the design ideas to additional delivery forms, and strengthen their cost-effectiveness and quantitatively test them for low- and middle-income country settings. In addition, the project helped establish a broader interest among microbicide sector stakeholders to use design to develop HIV prevention products and experiences that reflect the needs and lives of young women at risk.

G. Veterans Experience Office—Using Design to Help Veterans Navigate Post-Military Life and Services Offered through VA⁸⁶

1. Background

The Veterans Experience Office (EO) works to understand how veterans and their families perceive and interact with the VA. The EO has used HCD in partnership with leaders and staff at the VA to make government work harder and smarter for veterans. One of the EO's key projects involved designing clear, concise ways to introduce veterans to the VA and help them get started by applying for relevant services from the VA. The EO staff wanted to improve this particular area of communications between the VA and veterans because veterans typically receive information about the VA in a fragmented way.

2. How It Works

To help veterans answer the question “What can the VA do for me?” the EO explored new ways to direct veterans to VA benefits and services. The process began by interviewing, co-designing, and testing the value proposition of potential tools. Over two weeks, the EO conducted a mix of in-depth and intercept interviews with veterans in Denver, Colorado, and New York, New York.⁸⁷ During interviews, veterans were asked to share their story. The EO also invited them to participate in a card-sorting activity to test the value proposition of a low-fidelity prototype.

To test and refine these initial concepts, the EO followed an iterative testing and design process. During testing cycles in five key states, EO staff presented in-progress prototypes to a mix of veterans who had recently separated from military life, long-time veterans, and re-engaging veterans. In between rounds of testing, the EO integrated feedback into revised versions of the prototypes.

Among the materials tested were a welcome letter and other communication materials that give veterans a broad overview of when and how VA might be useful at different stages of their lives. The EO included resources and contact information for each service to help veterans get their questions answered online, over the phone, and in person. Finally, the EO field tested step-by-step checklists for veterans that explain how to access a particular benefit or service.

During field testing of materials, the EO heard feedback that veterans want:

- A manageable, yet broad view of what VA offers so that they could identify programs and services that might apply to them;
- Clear information about how long it will take—and what documents are required—to apply for different services; and

⁸⁶ Information derived from S. Hughes, VA Communications Designer, email communication, January 18, 2017.

⁸⁷ Second Muse, “Intercept Interviews,” <http://internetfreedom.secondmuse.com/framework-elements/intercept-interviews>.

- Simple, direct information in digestible amounts that will enable them to begin the process of applying for the relevant services.

3. Key Accomplishments

After extensive effort field testing communication materials with veterans, the EO created a communication package that includes:

- A one-page letter that welcomes veterans to the VA and lets them know someone cares;
- A booklet introducing veterans to what the VA has to offer, where and when the VA can help throughout their lives, and the first steps to getting started with the VA;
- Several quick-start guides in the form of front and back one-pagers providing simple, step-by-step information to help veterans apply for or get started with specific services; and
- A one-page template allowing VE district field officers to create a comprehensive and personalized list of local people and places to help along the way.

4. Additional Resources

- Tips on how to interview citizens about government service in a way that spurs new insights into that service; S. Brooks and M. Ruskin, “Getting to Know Your Users: Tips and Tricks from Veterans Affairs,” Digital.gov, <https://www.digitalgov.gov/2015/05/29/getting-to-know-your-users-tips-and-tricks-from-veterans-affairs/>.
- The veterans Journey Map created to shed light on key moments and phases of Veterans’ lives; Journeys of Veterans Map, Innovation.ed.gov, <https://innovation.ed.gov/files/2016/08/journeysofveteransmap.pdf>.
- Highlights from the ongoing work to use veterans’ insights to improve and redesign customer service; S. Brooks and J. Kim, “SDGC15 Saturday Morning Keynote 1,” YouTube video, November 1, 2015, https://www.youtube.com/watch?v=M6lRF_Z3VeY.

Appendix D. Additional Resources

A. Communities of Practice

- CIO Council Accessibility Community of Practice (ACOP): The Accessibility Committee serves as the principal interagency forum to improve the federal government's implementation of Section 508. Section 508 is perceived as a barrier to iteration. They held a pilot workshop to discuss the Technology Accessibility Playbook and help federal agencies create their own Section 508 program action plan. (<http://www.CIO.gov>)
- Federal Community of Practice for Change Management: Established and managed by Association of Change Management Professionals, Washington, DC, Chapter. (https://aocmpdc.wildapricot.org/?page_id=26)
- Federal User Experience Community: This community unites people who want to create successful government products and services through the practice of user-centered design. Using customer feedback should be required for all government services, and is a key element for fiscal responsibility and product effectiveness. We cast a broad tent and include people in the user experience, customer experience, service design, innovation, behavioral design, and other fields. (<https://www.digitalgov.gov/communities/federal-user-experience-community-of-practice/>)
- Government Customer Experience: A community that helps increase awareness across government of the importance of customer experience; improve customer satisfaction with government services; change public perception of government's ability to deliver information and services; educate agencies on how to measure and act on customer feedback; build a self-supporting community of customer experience practitioners across government; and integrate customer experience best practices across all delivery channels. There are over 700 members across more than 140 federal, state, and local government agencies and offices. (<https://www.digitalgov.gov/communities/customer-experience-community/>)
- Hack-the-red tape: Listserv on hacking red tape for innovators in government. (<https://list.nih.gov/cgi-bin/wa.exe?SUBED1=HACK-RED-TAPE&A=1>)
- Human Centered Design and User Experience: This is a LinkedIn Group with 245 members. An innovation design firm that runs on the ideals of and promotes the use of human-centered design created this group to form a place to share and hear thoughts on

how this transformative process can deliver solutions to promote meaningful engagement between people and organizations. Members can connect to read helpful articles, meet fascinating people, and explore the worlds of human-centered design and user experience. (<https://www.linkedin.com/groups/8190884/profile>)

- I-Corps Internal COP: A community of practice for I-Corps and Lean LaunchPad program managers. (Point of contact, Kenneth Wright Kenneth_D_Wright@ostp.eop.gov)
- Ideation Community of Practice (ICOP): This is an interagency group that promotes innovation and design thinking within the federal workplace. Members seek to infuse creative problem solving into government programs and practices. The group is open to all government employees who generally come from diverse backgrounds. The group meets regularly to discuss ideation tools and collaboration. (Twitter: @ideationCOP)
- Lean Startup Circle: “The Largest Community of Practice Around the Lean Startup,” founded by Rich Collins, the list has thousands of entrepreneurs sharing tips, resources, and stories everyday. (<http://www.leanstartupcircle.com/>)
- National Innovation Network: Works with NSF to advance the discoveries of university researchers to the marketplace. (<https://venturewell.org/i-corps/nin/>)
- Practical Service Design: This mission of this group is to have safe, low-barrier-to-entry space for people to talk about all sorts of things related to service design and to help each other grow as service designers. (<http://www.practicalservicedesign.com/community>)
- Science of Science Policy: Science of Science Policy listserv that is developing tools aimed at establishing a more scientific, empirical evidence basis for science and technology policymaking (Send “subscribe SCISIP” to listserv@listserv.nsf.gov)
- Virtual/Augmented Reality Community: This community researches and develops virtual and augmented reality programs to improve the citizen experience of public services and resources. (<https://www.digitalgov.gov/2016/10/26/gsa-launches-new-ai-virtual-reality-and-authentication-programs/>)

B. Points of Contact

Federal employees interested in learning more about communities of practice or how to integrate user-focused innovation into programs may reach out to these federal contacts:

Virginia Hamilton

Agency: Department of Labor (DOL)

Role: Regional Administrator

Email: hamilton.virginia@dol.gov

Joshua Marcuse

Agency: Department of Defense (DOD)

Role: Office of the Secretary of Defense, Defense Innovation Board

Email: joshua.j.marcuse.civ@mail.mil

Kenneth Wright

Office: Office of Science and Technology Policy (OSTP)

Role: Innovation / I-Corps Community of Practice

Email: Kenneth_D_Wright@ostp.eop.gov

Marc Wynne

Agency: Department of Health and Human Services (DHHS)

Role: Centers for Medicare and Medicaid Services

Email: marc.wynne@cms.hhs.gov

C. Resources

1. Skill Building Resources and Courses

- 18F, “Agile Principles & Practices” (<https://agile.18f.gov/>) describes the core commonalities to different agile methodologies, which also emphasize experimentation, validation, and iteration.
- 18F, “Build Empathy with Stakeholder Interviews.”
 - Part 1: Preparation (<https://18f.gsa.gov/2016/06/20/build-empathy-with-stakeholder-interviews-part-1-preparation/>).
 - Part 2: Conversation (<https://18f.gsa.gov/2016/07/22/building-empathy-with-stakeholder-interviews-part-2-conversation/>).
 - “Foster the People,” presentation, by Andrew Maier (<https://speakerdeck.com/andrewmaier/foster-the-people-building-empathy-with-stakeholder-interviews>).
- 18F, “Lean Product Design” details the principles and process for “working in an iterative way while staying grounded in user outcomes.”
- Acumen and IDEO Online offer a course and toolkit called Introduction to Human-Centered Design (<http://www.plusacumen.org/courses/introduction-human-centered-design>).

- Acumen and IDEO Online also offer a course and toolkit called Facilitator’s Guide to Human-Centered Design (<http://www.plusacumen.org/courses/facilitator%E2%80%99s-guide-human-centered-design>).
- DesignThinkers Academy (<http://www.designthinkersacademy.com/>) offers HCD bootcamps and courses.
- Design Thinking Blog (<http://www.designthinkingblog.com/>) covers trends and best practices from leaders in design thinking.
- Designing for Veterans, version 1.0, October 2015, (<https://www.vets.gov/playbook/downloads/vaci-project-toolkit.pdf>) is a toolkit for human-centered design from Department of Veterans Affairs Center for Innovation.
- Digital Services Playbook (<https://playbook.cio.gov/>) offers private sector best practices to help agencies successfully deliver digital services.
- Engage HCD (<http://www.engagehcd.com/>) is a web resource developed by USAID’s Center for Accelerating Innovation and Impact and Dalberg’s Design Impact Group to use HCD across the Bureau for Global Health’s work.
- IDEO’s second edition of Human Centered Design Toolkit (https://yali.state.gov/wp-content/uploads/sites/4/2015/07/IDEO_HCD_ToolKit.pdf) was developed as a method for guiding innovation and design for people living under \$2/day.
- LUMA Institute’s products and services (<https://www.luma-institute.com/products-and-services/>) include courses for both amateur and experienced practitioners of HCD.
- Stanford University’s Institute of Design offers a virtual crash course in design thinking (<https://dschool.stanford.edu/resources-collections/a-virtual-crash-course-in-design-thinking>).
- TechFAR Playbook (<https://playbook.cio.gov/techfar/>) highlights flexibilities in the Federal Acquisition Regulation (FAR) to help agencies working with contractors in an iterative, customer-driven software development process.
- University of Maryland’s Academy for Innovation and Entrepreneurship (<http://innovation.umd.edu/about/design-thinking/>) offers HCD training courses.

2. Articles and Books

- Acumen, “10 Tips for Customer Discovery in the Social Impact Sector,” July 30, 2015, <http://www.plusacumen.org/journal/10-tips-customer-discovery-social-impact-sector>. Offers concrete tips applicable to federal customer discovery work

- University of Maryland Academy for Innovation and Entrepreneurship and Stanford University Institute for Design, “An Introduction to Design Thinking,” 2015, <https://umd.app.box.com/s/4im7fuaig5fyw6xcqdx3r9i290i3spi>.
- National Research Council, Assessing the Impacts of Changes in the Information Technology R&D Ecosystem: Retaining Leadership in an Increasingly Global Environment, National Academies Press, 2009, <https://www.nap.edu/catalog/12174/assessing-the-impacts-of-changes-in-the-information-technology-rd-ecosystem>. Chapter 1 describes the innovation ecosystem for the information technology sector.
- Battarbee, K., J. F. Suri, and S. G. Howard, “Empathy on the Edge: Scaling and Sustaining the HCD Approach,” IDEO, http://5a5f89b8e10a225a44ac-ccbcd124c38c4f7a3066210c073e7d55.r9.cf1.rackcdn.com/files/pdfs/news/Empathy_on_the_Edge.pdf. Harvard Business Review case study of using “deep empathy” for more effective design.
- Beckman, S., and Barry M., “Innovation as a Learning Process: Embedding Design Thinking,” *California Management Review* 50 (Fall 2007): 25–26, <http://journals.sagepub.com/doi/pdf/10.2307/41166415>. Outlines a model for human-centered innovation with a focus on team make-up and noting possible pitfalls in the innovation process.
- Bennet, K., and J. Liedka, “Design Thinking: Creating a Better Understanding of Today to Get to a Better Tomorrow,” *Forbes*, August 29, 2013, <https://www.forbes.com/sites/darden/2013/08/29/design-thinking-creating-a-better-understanding-of-today-to-get-to-a-better-tomorrow/#35f6def61a99>. Discusses how design-thinking focuses on the starting point and uses ethnographic tools to determine the path forward.
- Blank, S., *The Four Steps to the Epiphany: Successful Strategies for Products that Win*, second edition, K&S Ranch, Inc., 2013. Describes each stage of the customer development process.
- Blank, S., “Startup Tools,” <https://steveblank.com/tools-and-blogs-for-entrepreneurs/>.
- Blank, S., “Why the Lean Start-Up Changes Everything,” *Harvard Business Review*, May 2013, <https://hbr.org/2013/05/why-the-lean-start-up-changes-everything>. Seminal article describes the I-Corps/Lean LaunchPad/Hacking For X methodology.
- Blank, S., and B. Dorf, *The Startup Owner’s Manual: The Step-By-Step Guide for Building a Great Company*, K&S Ranch Press, 2012. Provides step-by-step strategy for any new company or product.
- Brown, P. L., “Human-Centered Design in the US Federal Government,” Harvard Kennedy School, March 2016, <https://www.innovations.harvard.edu/blog/human->

[centered-design-us-federal-government](#). Discusses the Office of Personnel Management's Innovation Lab and seven key takeaways.

- Brown, T., "Design Thinking," *Harvard Business Review*, June 2008, <https://hbr.org/2008/06/design-thinking>. The CEO of innovation and design firm IDEO illustrates several examples of design thinking at work.
- Chopra, A., "Project Innovation," *GovExec*, May 2015, <http://www.govexec.com/magazine/features/2014/05/project-innovation/84115/>. Describes several federal efforts to apply Lean Startup methodology, including HHS' Entrepreneurs-in-Residence program and CFPB.
- Constable, G., and F. Rimalovski, *Talking to Humans: Success Starts with Understanding Your Customers*, 2014, <https://s3.amazonaws.com/TalkingtoHumans/Talking+to+Humans.pdf>. Book exploring how to engage with customers/users.
- Constable, G., "12 Tips for Customer Development Interviews" (revision 3), December 6, 2012, <http://giffconstable.com/2011/07/12-tips-for-customer-development-interviews-revised/>. Covers how to conduct meaningful interviews and understand the feedback given.
- DelVecchio, J., F. White, and S. E. Phelan, "Tools for Innovation Management: A Comparison of Lean Startup and the Stage Gate System," December 2, 2013, https://papers.ssrn.com/sol3/Papers.cfm?abstract_id=2534138.
- "Design Thinking vs Lean Startup—Which to Use, and When," OXC Design + Strategy, April 2014, https://www.slideshare.net/bradplogsted/design-thinking-vs-lean-startup/24-D_E_S_I_G. Another comparison of design thinking and Lean Startup.
- Duxbury, T. "Improvising Entrepreneurship," *Technology Innovation Management Review*, July 2014: 22–26, <https://timreview.ca/article/809>.
- Accelerate Change, "Funding Radical Experimentation: A Toolkit for Funders Who Want to Catalyze Transformative Social Change," http://acceleratechange.org/wp-content/uploads/2015/04/2afcae_0f193ec4692841248d6d1d6acab405ea.pdf. Geared towards funders in the nonprofit sphere; offers detailed advice relevant for grant-making program officers.
- Harms, R., "Self-Regulated Learning, Team Learning and Project Performance In Entrepreneurship Education: Learning in a Lean Startup Environment," *Technological Forecasting and Social Change*, 100, November 2015: 21–28.
- Lean Launchpad, "How To Build a Startup." The original open-source lectures for the Lean LaunchPad initiative found through Udacity, <https://www.udacity.com/course/how-to-build-a-startup--ep245>.

- Kalil, T. “Using Human-Centered Design to Make Government Work Better and Cost Less,” White House Blog, September 4, 2015, <https://obamawhitehouse.archives.gov/blog/2015/09/04/using-human-centered-design-make-government-work-better-and-cost-less>. A case study examining how the USDA is using human-centered design to improve the National School Lunch Program as an example for other agencies.
- Kim, W. C., and R. Mauborgne, *Blue Ocean Strategy: How to Create Uncontested market Space and make the Competition Irrelevant*, Harvard Business School Publishing, 2005. Reviews how to create and capture untapped markets.
- Lane, K., “How Human Centered Design Can Help Your Agency,” GovLoop, September 2016, <https://www.govloop.com/how-human-centered-design-can-help-your-agency/>. A case study and lessons from human-centered design in use by the National Geo-spatial Agency.
- Livingston, J., *Founders at Work: Stories of Startups’ Early Days*, Springer-Verlag, 2007. Through interviews with founders of famous technology companies, this book demonstrates what makes a startup successful.
- Martin, R., “The Innovation Catalysts,” *Harvard Business Review*, June 2011, <https://hbr.org/2011/06/the-innovation-catalysts>. How Intuit built itself on an alternative model of innovation based on participatory design.
- Murray, P., and S. Ma, “The Promise of Lean Experimentation,” *Stanford Social Innovation Review*, Summer 2015, https://ssir.org/articles/entry/the_promise_of_lean_experimentation. How nonprofits can adopt an innovation model used in the business world.
- Osterwalder, A., and Y. Pigneur, *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*, Strategyzer Series, 2010. Discusses how to create, examine, refine, and implement successful business models.
- Pincus, M., “Quick and Frequent Product Testing and Assessment,” October 2009, <http://ecorner.stanford.edu/videos/2313/Quick-and-Frequent-Product-Testing-and-Assessment>. Overview of how to conduct rapid product testing and assessment to gauge consumer interest and to test and improve multiple products simultaneously.
- Rauth I., L. Carlgren, and M. Elmqu, “Making It Happen: Legitimizing Design Thinking in Large Organizations,” *Design Management Journal*, October 2014, https://www.researchgate.net/publication/274141871_Making_It_Happen_Legitimizing_Design_Thinking_in_Large_Organizations. How and why design thinking has gained ground in large organization and companies in recent years.
- Ries, E. “The Lean Startup: Doing More With Less (Government 2.0 Edition),” Startup Lessons Learned, September

2009, <https://www.slideshare.net/startuplessonslearned/2009-09-08-the-lean-startup-gov-20-summit-edition>. Presentation from Eric Ries on Lean Gov 2.0.

- Ries, E., *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*, Crown Business Publishing, 2011.
- Robinson, A., and D. Schroeder, *The Idea-Driven Organization: Unlocking the Power in Bottom-Up Ideas*, Berrett-Koehler Publishers, 2014. A book describing how to put together a management team open to grassroots innovation.
- Vermeulen, R., "Design Thinking and Lean Startup," May 2014, <https://www.slideshare.net/IxDABarcelona/design-thinking-lean-startup-35205536>. Useful comparison of the similarities and differences between design thinking and Lean Startup principles.
- Voosen, P. "To Win Funds, Scientists Pursue Sweeping Solutions to Social Ills," *Chronicle of Higher Education*, February 9, 2015, <http://www.chronicle.com/article/To-Win-Funds-Scientists/151717/>. Illustrates the trend toward funding mission-driving research.
- York, J. "Customer Development, Innovation, and Decision-Making Biases in the Lean Startup," *Journal of Small Business Strategy*, October 2014: 21–39.

3. Watch and Listen

- Gerdes, J. C., "Government at the Speed of Silicon Valley," video, Department of Transportation, October 6, 2016, <https://www.volpe.dot.gov/event/us-dot-chief-innovation-officer-chris-gerdes>.
- Office of Management and Budget (OPM), "LAB OPM: Improving Government with Human-Centered Design," presentation on how to implement human-centered design in federal agencies, https://www.naswa.org/assets/utilities/serve.cfm?gid=99C966CA-3EAF-434E-AAAE-BE3B7F9C8C1A&save=1&dsp_meta=0.
- Stanford Social Innovation Review, "Lean Experimentation for the Social Sector: Build Smart to Learn Fast," podcast, August 22, 2016. The 55-minute podcast features Steven Blank, Giff Constable, Chase Adam, and Alethea Hannemann.
- Stanford eCorner offers over 2,000 free videos and podcasts featuring entrepreneurship and innovation thought leaders.
- Blank, S., "Business Model Design For Mission Driven Organizations," webinar, June 30, 2016. An hour-long webinar from Steve Blank.
- Hamilton, V., "Design as the Great Disrupter," Code for America Summit presentation, YouTube, November 8, 2016, https://www.youtube.com/watch?v=N3U_mRry-

[4A&feature=youtu.be](#). Brief (7-minute) video presentation using examples that illustrate human-centered design.

- Kelley, D., “Human-Centered Design,” TED Talk, February 2002, https://www.ted.com/talks/david_kelley_on_human_centered_design. This 17-minute talk explains the value of HCD.
- Tsai, M., “Design & Thinking,” 2012. Award-winning documentary film on the ideas of design thinking; trailer available at <http://www.designthinkingmovie.com/>.
- Zenios, S., “Design Thinking Is About Doing,” Stanford University Institute of Design, March 18, 2015. Short video in which Stefanos Zenios explains how design thinking can take a big idea from a rough sketch to a real world product.