

NATIONAL ARTIFICIAL INTELLIGENCE INSTITUTE (NAII)

AI TECH SPRINT HANDBOOK

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A Joint Initiative between the Department of Veterans Affairs' Office of Research and Development (ORD) and the Secretary's Center for Strategic Partnerships (SCSP)

OUTLINE

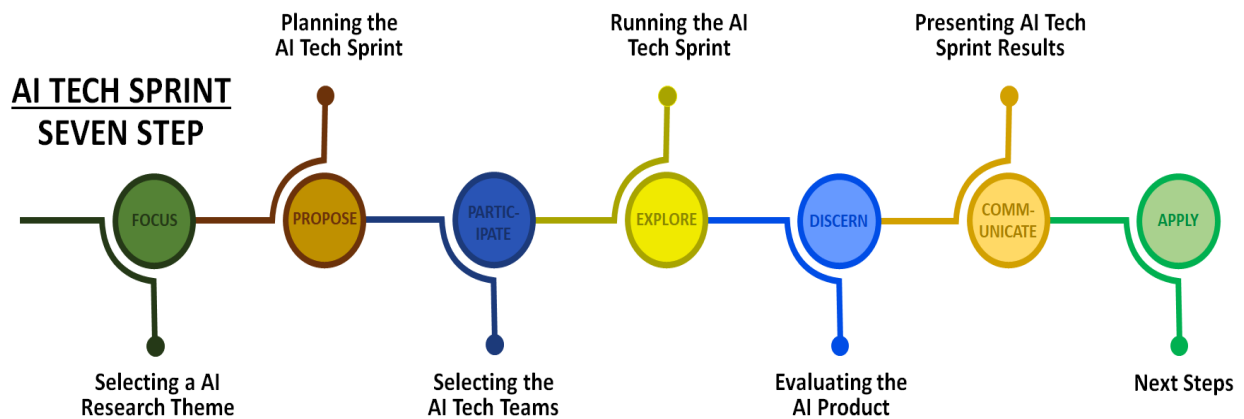
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EXECUTIVE SUMMARY

The federal government has a wide array of mechanisms at its disposal for encouraging and producing both basic and applied science. Motivated by continued interest in prize competitions and public-private partnerships (*PPPs*), this document introduces a new approach from the National Artificial Intelligence Institute (*NAII*) for rapid prototyping and deploying innovative solutions: AI Tech Sprints. Resembling prize competitions and *PPPs*, these tech sprints bring together the private sector, academia, and non-profits in collaboration with the government.

The AI Tech Sprints are founded on the Five Pillars for Parallel Pathways for Potential Partnerships: a robust incentive framework, flexible engagements tracks for different partners, consensus-based data use agreements, a cooperative ecosystem, and iterative data releases.

These pillars affect the implementation of a tech sprint and how to optimize its innovation potential. The steps involved in a tech sprint include: selecting a research theme, planning the tech sprint, selecting the tech teams, running the tech sprint, evaluating the product, presenting the results, and applying the lessons learned through a series of next steps.



Although we focus on Veterans as the primary end-user and beneficiary through AI discoveries and applications, the AI Tech Sprint process is applicable for any federal agency interested in driving innovation through partnership with the private sector, academia, and non-profits.

BACKGROUND

What Are Tech Sprints and Why Run Them?

There is an increasing recognition that public-private partnerships (PPPs) are an effective vehicle for producing innovation within society (*Faulkner and Senker, 1994*).ⁱ For example, some of the largest technological leaps have been driven by tactical government investments in the private sector (*National Academies, 2009*), most notably the development of infrastructure during the 1800s and the space race in the 1980s.ⁱⁱ Smart industrial policy has served Western democracies well, contributing substantially to economic growth and prosperity (*Criscuolo et al., 2019*).ⁱⁱⁱ

However, facilitating public-private partnerships is not easy for at least three reasons. First, the private sector and government organizational models are different, creating cultural differences among the personnel in coordination. Second, because government tends to be less agile, obtaining consensus around priorities and funding can be a lengthy and controversial process. Third, although the concept of PPPs is appealing, they often attract malicious and/or incompetent actors in the bidding process, making it challenging to separate noise from signal.^{iv}

The primary contribution of this document is to highlight the relevance and value of AI technology sprints (“*tech sprints*”) as an alternative to the classic PPP by the federal government as a vehicle for achieving tactical and expedient results to serve as a template for advancing larger aims. Tech sprints are designed to demonstrate an idea’s effectiveness in a contained environment; not to conquer a large problem all at once.

I’m always going to bet on the American innovation ecosystem... What has made the United States an engine or the home for the greatest technological innovation over the last 100 years? My answer to that is our R&D ecosystem. What is our ecosystem? It’s one part federal funding, one part private sector and one part academia.

– Michael Kratsios, United States Chief Technology Officer^v

Tech sprints are informal partnerships between government and an external entity with a narrowly defined scope and timeline. Building on the historical precedent and success that the government has had offering prizes (*Williams, 2012; CRS, 2020*),^{vi} there are five pillars of a tech sprint:

- The incentive framework – *create short and long run incentives to engage with the private sector in ways that simultaneously advance their goals*
- The track partner – *understand the type of partner and the incentives that are likely to be more effective at encouraging their participation and performance*
- Consensus-based data use agreements (DUAs) – *design data sharing agreements that facilitate the flow of information without jeopardizing security*
- A cooperative ecosystem – *allow for iterative and agile flows of communication between the federal agency and private sector counterpart*
- Iterative data release – *designate several waves of output that satisfy short run goals and provide enough content for meaningful feedback*

As we discuss in the document that follows, federal agencies are given significant flexibility to design tech sprints in a way that fits their needs and ecosystem. In particular, this document will explain the way that the National Artificial Intelligence Institute (NAII) thinks about pursuing tech sprints from within the Department of Veterans Affairs.

Tools for Driving Innovation

Before delving into the mechanics of how to run an AI Tech Sprint, it is important to understand the rationale for them and how they compare with other mechanisms the federal government has historically used to influence innovation outcomes.

The federal government has many tools at their disposal to drive innovation, ranging from the provision of research & development (*R&D*) grants to procurement to prizes to public-private partnerships and all their many variants.^{vii} The right tool depends on the objective. For example, R&D grants are best used for spurring long-run investment, whereas procurement is better when there is already a technology that simply needs a surge in demand (*e.g., potentially for national and economic security reasons*).

The NAII has introduced AI Tech Sprints as a unique permutation of public-private partnerships and prize competitions, drawing on the Five Pillars for Parallel Pathways for Potential Partnerships (*see Figure 1*), including: incentive framework, track partner by type, consensus-based data use agreements (*DUAs*), cooperative ecosystem, and iterative data release. We discuss these features in greater detail below.

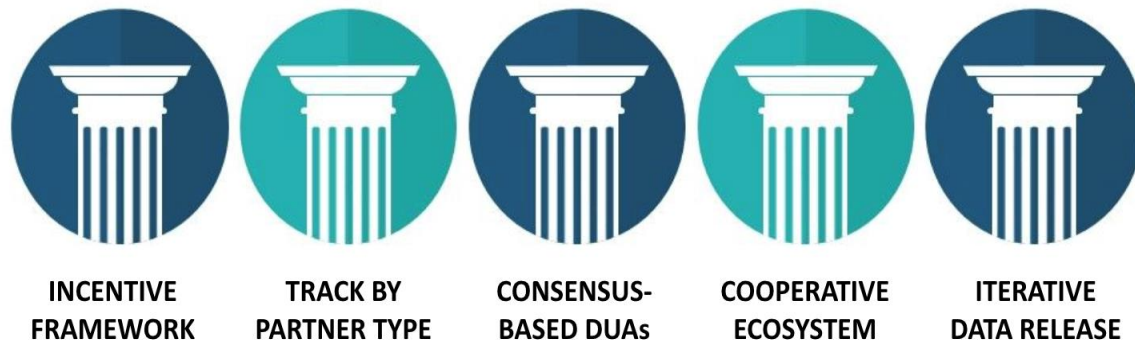


Figure 1: Five Pillars for Parallel Pathways

1. Incentive Framework

Incentives are especially necessary in collaborative relationships. When there are multiple actors participating in a project, different actors may be tempted to “free ride” on the contributions of others (*Holmstrom, 1979; 1982*).^{viii} Unless all parties are properly incentivized to contribute—that is, there is a way to monitor their contributions and tie rewards (*e.g., compensation*) to their productivity—then the overall outcomes and innovativeness of the project will suffer.

To create such incentives, we distinguish among several tiers that recognize differential firm performance in a tech sprint, ranging from bronze to diamond. While the naming of the tiers is not important, the presence of different tiers confers two benefits. First, the tiers allow the NAII to recognize different qualities of performance, which empower the participating company with the opportunity to publicly signal their engagement with the federal government on an innovation-driven project. Second, the tiers provide tangible benefits to participating organizations by allowing them the opportunity to potentially work with representative and large-scale data that is unique to the VA.

2. Tracks by Partner Type

Given that organizations enter partnerships with different interests, knowledge bases, and physical infrastructures, the NAII provides several different touch points to optimize engagement, including a gift track, a collaborative track, and a pilot track.

- a. Gift Track: *The Department of Veterans is uniquely allowed through a special authority to receive gifts from an organization that may want to advance the general mission of serving veterans and improving their quality of life.*
- b. Collaborative Track: *An organization may instead want to partner with the NAII to conduct R&D and show efficacy of a tool. This is common for artificial intelligence applications and machine learning since the effectiveness and ethical application of the algorithms hinge on having a representative dataset, particularly since veterans and their various health risks are not fully represented in standard datasets (National Academy of Medicine, 2019).^{ix}*
- c. Pilot Track: *An organization may have a new tool to pilot for enterprise integration or an initial assessment of its impact. Before an idea can go to scale, it needs to be successfully piloted in an isolated environment.*

3. Consensus-based Data Use Agreements (DUAs)

The proliferation of data and personally identifiable information (*PII*), particularly for vulnerable groups, creates important privacy and security considerations (*Acquisiti et al., 2016*).^x One way to set expectations, ensure accountability, and facilitate the secure transfer of data is by writing DUAs. These agreements have become standard in academia, government, and the private sector.

4. Cooperative Ecosystem

Rather than imposing competition among the participating organizations, the NAII encourages cooperation and specialization. While there is potential value behind competition and the presence of tournaments and prizes (e.g., see *Lazear and Rosen (1981)* and *Brunt et al. (2012)* for evidence in the context of organizations and innovation policy), we intentionally focus on cooperative arrangements to avoid duplication with the already existing infrastructure associated with challenge.gov.^{xi}

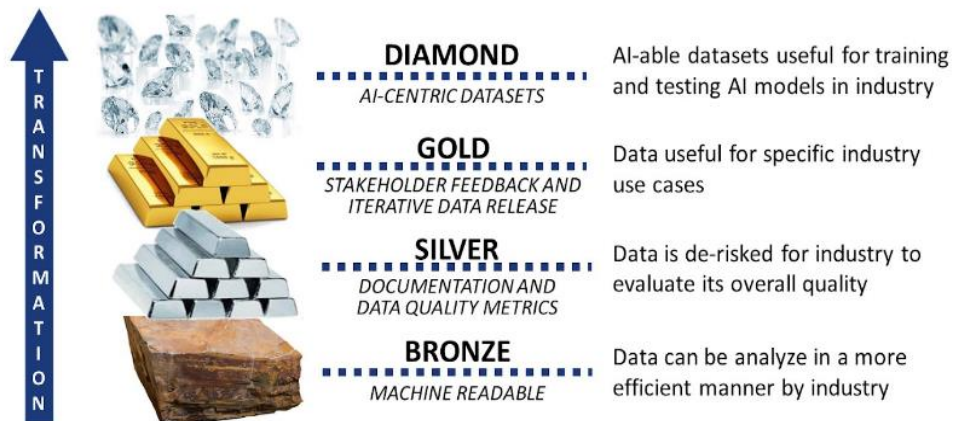
5. Iterative Data Release

Rather than requiring companies to produce one single wave of output for review and consideration, the NAII engages with companies throughout the process to provide feedback and optimize the overall contribution. Researchers in organizational behavior, for example, have long argued that rapid prototyping and the provision of feedback are essential for product innovation (*Eisenhardt and Tabrizi, 1995*).^{xii} Nonetheless, since some data may need to be withheld to ensure that model testing is done independently of training, tech sprints provide the opportunity to make rapid progress on specific and tactical issues before receiving feedback, adjusting milestones thereafter.

We introduce the concept of AI-able data, which refers to the concept of designing data so that it is possible to deploy AI for data-driven decision-making. While the concept may appear self-evident, recent work by *Brynjolfsson and McElheran (2016)* with the Census Bureau reveals that only 30% of their census of manufacturers uses data-driven decision-making.^{xiii} Creating AI-able data requires an ecosystem that integrates processes and models so that data can be used for concrete use cases.

Figure 2 explores the different tiers of usefulness associated with tech sprint contributions from the perspectives of a data steward and an AI/ML researcher. Starting with the bronze tier, machine readable data is a necessary, but not sufficient, condition for usefulness. If the data is not accessible or readable, the NAIL cannot use the data for subsequent work. The diamond tier, in contrast, contains AI-able data that can be mined and tested.

DATA'S CHOICE: What makes (*e.g. federal*) data also useful to non-federal entities to build tools, and how can this be potentially measured and incentivized?



AI's CHOICE: What makes AI/data results usable by others (*from federal to non-federal*), and how could this be potentially measured and incentivized?



Figure 2: Evaluating the Usefulness of Data Across Engagement Tiers

Getting Started with a Tech Sprint

Like every new process and endeavor, perfection requires deliberate practice. We partition the process of a tech sprint into 7 steps, displayed below in *Figure 3*.

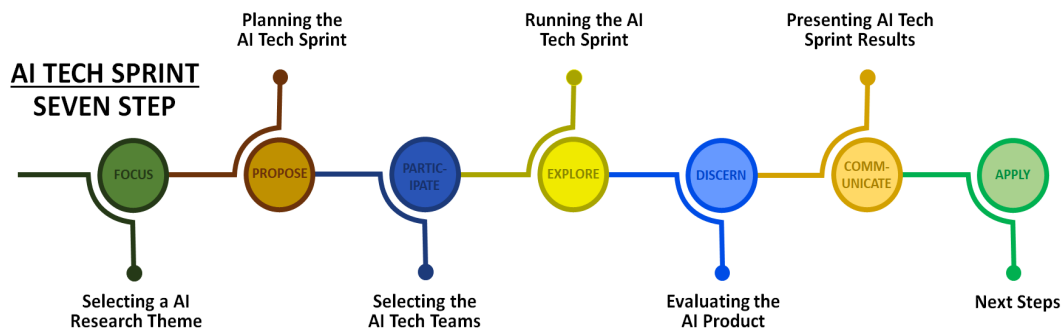


Figure 3: The 7 Steps of a Tech Sprint

Selecting a Research Theme

Decision-makers in the organization should gather input about the relevant priorities and converge upon a theme for the tech sprint. The NAII suggests that anchoring a theme around a policy or organizational challenge provides a useful starting point.

Drawing on the Lean Launchpad methodology, creating meaningful solutions requires understanding consumers' underlying pain point(s)—that is, obtaining the voice of the customer.^{xiv} *Figure 4* visualizes the two inputs that counterbalance the voice of the customer, namely organizational priorities and feasibility.

- Voice of the customer:** While this will vary for each organization, the primary purpose of the NAII is to serve veterans. We obtain VA input through a wide array of mechanisms, including: workshops, stakeholder interviews, dedicated focus groups, and nationally qualitative research surveys. One helpful way to understand the relevant pain points is by producing a “customer journey map,” which visualizes the process that a customer goes through to achieve a goal.
- Investigate:** Looking into the peaks and valleys involved in the journey map helps an organization can identify the opportunity to make their customer better off. Stakeholder interviews are on way to dive in depth on specific issues. Recognizing that they are time intensive, organizations should think through the major issues in advance before committing to many interviews. Focus groups, on the other hand, provide a more scalable alternative. For example, Veteran Engagement Boards comprise of 20-30 people that provide immediate feedback on an idea or initiative. Obtaining the feedback has a dual purpose: feedback simultaneously improves the quality of an idea and signals to the customer (e.g., Veterans) that their voice is valued.
- Organizational Priorities:** Every organization has its own priorities and mission. Because attention is scarce, priorities allow organizations to agree on tasks and coordinate over their completion (Dessein et al., 2016).^{xv} Motivated by reality that organizations have both short-term and long-term priorities, tech sprints can be designed to simultaneously produce rapid results and prepare for future work towards a longer-term goal. The goal of the tech sprint should fall clearly in line with the organization’s value proposition.
- Feasibility:** Admittedly, an organization may have many aspirations, but not all of them may be feasible to act upon right away. Feasibility constraints may range from the availability of data to human capital deficiencies. The feasibility of a project is especially important in tech sprints because of a greater requirement that the data is accessible, discoverable, and usable. Even if the data is not made public for privacy and security reasons, the public holds the government to a higher standard of stewardship because of its broader responsibilities.

One technique for increasing the feasibility of a project that might otherwise be constrained due to privacy and security of data sharing is to employ synthetic data, which is generated to represent authentic data. For example, the Census Bureau has released the Synthetic Longitudinal Business Database (*SynLBD*), which is an experimental data product collecting 21 million establishment records on payroll, employment, and other establishment information between 1976 and 2000.^{xvi}

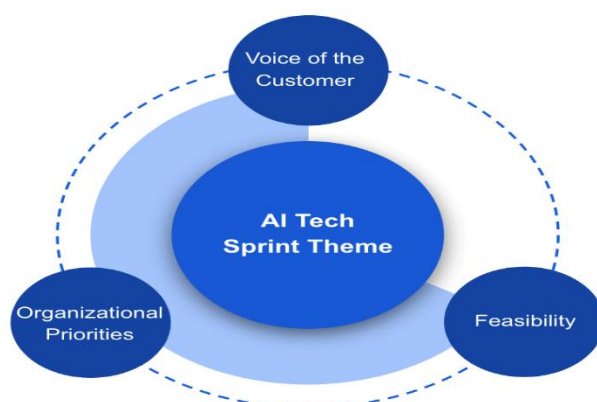


Figure 4: Three Components of an Effective and Inspiring Tech Sprint

Planning the AI Tech Sprint

The planning stage is important to ensure that every subsequent stage of the process is run as efficiently as possible and that the end product is useful for the organization and its end customers. We partition the planning stage into several categories: soliciting potential participants, selecting the relevant participants, programming the tech sprint, and kicking it off. Organizations should set realistic timelines, but also not get too caught up in having the perfect plan—ultimately, some details are best experimented upon.

To solicit participants, the organization can advertise via a combination of social media, external partners and affiliates, professional networks and associations, seminars, and more. Word of mouth tends to perform the best, but word of mouth is inherently constrained to internal networks and part of the process of a tech sprint involves soliciting diverse feedback that might be outside the usual channels.

Participants should be recruited in such a way that they align with the relevant tracks. For example, a startup might be better suited for a pilot, whereas a team of academics might be better suited for a collaboration. Attracting different types of partners may involve different channels of communication. For example, the VA Secretary's Center for Strategic Partnerships played an important role in gathering input in the AI tech sprint for the gift track. Participants can come from all parts of industry, academia, and even non-profits. The result was that in 2019 NAll AI Tech Sprint featured teams from the technology sector (*e.g., IBM Watson*), startups (*e.g., Composite Apps*), and a non-profit team of high school students (*e.g., Girls Computing League*).

Once the potential participants are identified, the organization should send out applications and host information sessions to answer questions. Importantly, the organization should not just focus on logistical information, but also the Five Pillars that are essential for a successful partnership. Teams should also be selected so that they collaborate effectively with each other both in terms of personalities and technical capabilities, which is part of the collaborative ecosystem pillar.

For example, the aforementioned Girls Computing League teamed up with Amazon Web Services to produce their Clinical Trials Selector product. Teams should think about and articulate their ideas for cooperation in their initial application and organizations should set aside dedicated time towards unifying efforts and understanding what different members are doing. For example, the NAll suggests that teams may spend 10 hours per week working on research, development, and testing and 2 hours for preparing and attending weekly meetings. However, these numbers may vary based on the project scope and partners.

To converge on the final team of participants, the NAII suggests that the following factors are taken into consideration: talent, equipment, degree of collaboration based on personalities and technical capabilities, potential solution to the problem, and any additional resources that might be required. The organization should ultimately decide how much time the participants should be allocated towards the sprint, but the number is best obtained in communication with the leadership of the partnered institutions.

Finally, before the onboarding process to the tech sprint, organizations should have each member sign the DUA. The DUA can be modified and iterated upon as the organization and its potential partners see fit. Once the DUA is written, the organization may choose to hold a unifying event that gathers all participants together to kick off the sprint and recap on major goals, the timeline, data access, and other relevant factors.

RUNNING THE SPRINT

The NAII suggests roughly 90 days for an AI Tech Sprint, partitioned into three phases of four weeks, consisting of research, prototype, and development (*Figure 5*). The timeline and structure should vary by organization and research theme. *Table 1* also provides a sample timeline based on the NAII's recent experience.

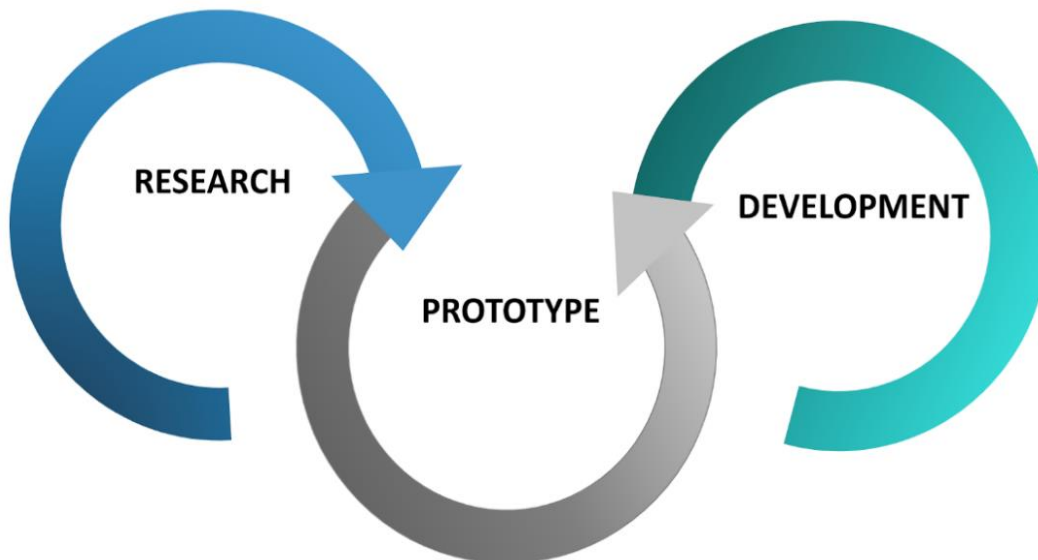


Figure 5: Three Phases of Running the AI Tech Sprint

Research

In the first phase, participants finalize their group development, complete the dataset access requirements, interact with the organization's subject matter experts (SMEs), engage in weekly meetings with other participants, and solicit feedback from stakeholders. Teams can coordinate internally to identify the most effective forms of communication among each other. They will also conduct user research and identify user-driven demand for their underlying product. Finally, organizations will release the initial dataset at the beginning of the sprint and solicit feedback on whether the format is appropriate and/or whether changes are needed to optimize the sprint.

After the first week of meetings, teams should submit weekly reports to the host organization (see the [Condensed Team Template](#)), which should include:

- a. *What is the target tier (bronze, silver, gold, diamond) and what is the target hierarchy (AI's Choice or the Data's Choice)?*
- b. *Are additional federal datasets or APIs required? How many different datasets are needed to produce the most effective product?*
- c. *What is the participant team planning on building or has already built? Participants should begin anchoring their ideas on specifics early on.*
- d. *What are the remaining questions for the next week's startup meetings? This provides the host organization time to prepare and answer questions, or potentially integrate guest speakers who can add perspective.*

Week	Description	Subtopic Example
1	Introduction/Start	Describe topic, goals, prize, timeline, etc.
2	Team updates & NCI and Cancer trial ecosystem	NCI and clinical trial eligibility/ecosystem and patients
3	Team updates & VA and data ecosystem 1	Precision oncology dataset description and process; patient advocate
4	Alpha demos	Ideas/wireframes/non-working prototypes
5	Team updates & VA and data ecosystem 2	Data formats and phenotype alg. for robustness
6	Team updates & CMS and data ecosystem 3	Enabling 9M+ Vets and 60M+ CMS beneficiaries to leverage their data
7	Team updates & ClinicalTrials.gov	ClinicalTrials.gov architecture
8	Beta demos	Prototypes
9	Team updates & next steps	Next steps and communication
10	Team updates	Collaborations and partnerships
11	Team updates	Updates
12	Team updates	Next steps
13	Final Demos	Final products

Table 1: Example Timeline for Running an AI Tech Sprint

Prototype

In the second phase, teams begin to draft their product, preparing a concept pitch to obtain feedback, conducting interviews with their end-use customer, and gathering information from SMEs and other relevant sources. Early demos of a minimum viable product (MVP) are also encouraged so that customers and the organization have a tangible product to react to and suggest improvements upon in the iterative process. The MVP with slides can be prepared and shared (see the [Beta Demos Template](#)).

Development

In the third phase, teams continue working towards their underlying product, incorporating feedback in the process and further exploring the data. Organizations should encourage another demo to allow teams an additional opportunity to present their product and incorporate a final round of input from all the participants. The organization may also consider providing the participating teams another, potentially smaller, dataset for validating and testing the AI product. This data should not be used in the “training” component of the AI, but rather for validation. The exercise is helpful for identifying whether tier that the team is likely to achieve. Teams should continue holding meetings and interactive user testing during the process, while simultaneously preparing a final presentation to share with users and stakeholders.

EVALUATING THE AI PRODUCT

To understand the effectiveness of the product, it is important for the teams to produce not only an MVP, but also an online version that helps everyone understand the product and its applications. This could include, for example, a combination of a demo and a data visualization. The organization should gather input around the product, including:

- *Who is the product designed for?*
- *What organizations can help share or scale the tool?*
- *Are there other teams in the AI Tech Sprint that could benefit?*
- *What are potential data sources that could feed into product improvement as time progresses?*
- *Who might be responsible for maintaining it if there is interest in adoption?*

Following the process for soliciting participants, the organization should reach out to relevant partners in its network to share the results of the product and potential uses. Stakeholders who were engaged earlier in the process would enjoy hearing updates and seeing how their feedback was incorporated, increasing the likelihood that the success will spread through word of mouth.

CULMINATING THE EVENT

At the end of the event, the organization can host a demo event for all participants and others to showcase the developed tools and/or products. The demo event is an opportunity to highlight the progress and discoveries that have been made. In the most recent AI Tech Sprint, the NAII collaborated with The Opportunity Project (*TOP*) at the U.S. Census Bureau for Demo Day 2019. The day featured the TOP Prize Challenge, which recognized the most promising and effective uses of open data. The Census Bureau, in coordination with the Office of Management and Budget and the Federal Chief Information Officer (*Suzette Kent*), announced the winning projects. Two of the NAII’s AI Tech Sprint teams were recognized. Besides verbal recognition, projects can also receive financial compensation. For example, one of the NAII participants, Composite Apps, was awarded \$20,000 in cash to assist in their product development.

Following the demo day—or any variant that the organization decides to have—the organization should create a feedback session that allows participants to speak openly about best practices, lessons learned, and set the stage for subsequent collaboration. Learning from these tech sprints is helpful for designing future collaborative endeavors so that teams can prototype more effectively and so that the organization can incorporate discoveries (e.g., knowledge or tools) into their infrastructure. Given that part of the goal behind the tech sprint is organizational transformation, third-party feedback is essential for point out what does and does not work.

Moreover, organizations that have successfully participated in the process can consider at least two paths forward. First, agency leadership can disseminate the success story and find additional advocates and resources for its implementation. For example, if one of the lessons learned was that the newly-developed product is better suited for another agency, then the organization can make the relevant introductions to facilitate impact elsewhere in the federal government. Second, the participating members can consider a full-scale pilot of the product. Following the NAI's AI Tech Sprint, one of the recognized participants began implementing a pilot at two of the VA Medical Centers. This was important for obtaining a more realistic experiment for the product.

However, pilots must ultimately demonstrate value to the organization and receive support from its members. Broadly speaking, the NAI uses the following four values for a potential pilot: Veteran benefit, VA benefit, NAI benefit, and pilot location benefit. Once the product pilot is completed, organizations should gather another round of feedback to identify and address the challenges that emerged before expanding to a larger population. Even if there are concrete benefits, the pilot should only be pursued if the benefits outweigh the costs.

If there is not internal support for a full-scale pilot, then even a useful and good technology might not succeed in a larger test environment. In those cases, the organization may consider suggesting alternative partners. For example, the NAI could recommend various IT professionals at the VA Central Office or at a VA Medical Center to provide expert opinions on the feasibility and usefulness of a larger scale pilot. The NAI has also identified clinicians and other individuals with first-hand experience.

AI Tech Sprints flexibility and agility drives innovative outcomes, but they are not a substitute for the other types of mechanisms that the federal government uses to encourage innovation. Organizations should take stock of the completed work and recognize participants for their time and substantive contributions and look for ways to continue the collaboration down the road.

There's no commitment, but it's an opportunity for a relationship to be built where you work with your industry partner and they come to understand your problem in a better way because you're closely working side by side."

- David Maron, A NAI Founder

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