Cross Agency Priority Goal
Modernize IT to Increase Productivity and Security

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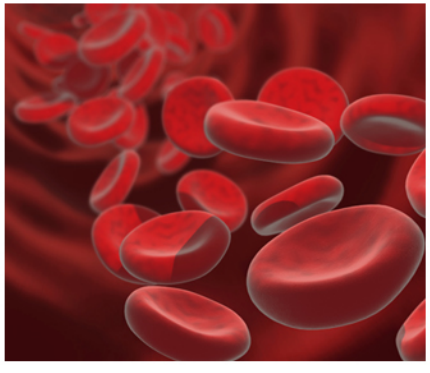



Agenda

- NSF progress on modernization of IT tools and lessons learned to-date.
- Discuss expanded use of artificial intelligence tools at NSF.
- Committee feedback on where to deploy new IT tools.
- What does success look like?

NSF Progress on Modernization of IT tools

Modernize the stack and modernize legacy systems

- Upgrading to Oracle 12C
- Moving from Glassfish to Tomcat
- Moving from Solaris to Redhat Enterprise Linux and X86
- Server virtualization
- Completed upgrade to Windows 10 v1709
- Upgrading to Sierra
- Implemented new IT Security Tools
- Moving off of internal client/server grants management systems
- New Proposal Preparation and Submission System
- New Account Management functionality for external community
- Agile software development

Modernize the Stack
Lessons-learned

- Balance modernizing the stack with rolling out customer-facing enhancements!
- Plan and coordinate modernization efforts across the IT organization!
- Don’t give up! Keep going!

NSF Progress on Modernization of IT tools

- Embrace Cloud Solutions!
  - External SharePoint in 2012.
  - Moved to Cloud email in 2013.
  - Storage of all backups in 2017.
  - Moving internal SharePoint to the cloud this September.
  - Many other things are in the cloud including WebEx, OneDrive, Office 365, ServiceNow, Mobile Device Management (AirWatch), FireEye Email Threat Protection, Application Performance Monitoring (AppDynamics), file storage, and more…
  - Looking to move grants management systems to the cloud in a few years.

Embrace the Cloud
Lessons-learned

- Balance moving to the cloud with rolling out customer-facing enhancements
- Go to the cloud at the right time for you.
- You need to get ready before going to the cloud.
- Email and collaboration tools are a good start.
- Cloud is getting more mature.
- You may not save money.

Expanding use of Artificial Intelligence at NSF

Now What?

Now What?

is no ordinary question.
It is a question about the future.
A state of mind. A curiosity.
An impatience. The restless
pursuit of what can be.
A promise to always
push beyond what is.
To challenge convention.
To constantly ask
"now what"
of ourselves and our clients.

www.nowwhat.com

STEP towards organizational change

- S pace, stop!
- T rue purpose
- E xperiment, explore
- P ut into practice

February 15 presentation to Dr. Ferrini-Mundy

NSF'S SMART TOOL PILOT

Hypothesis

- Computers can (and will…and do already) help people make important decisions.
- Innovative tools can help NSF …

Answer tactical questions:

- Who's the best set of reviewers for this proposal?
- What's the best grouping of proposals?
- How many panels?

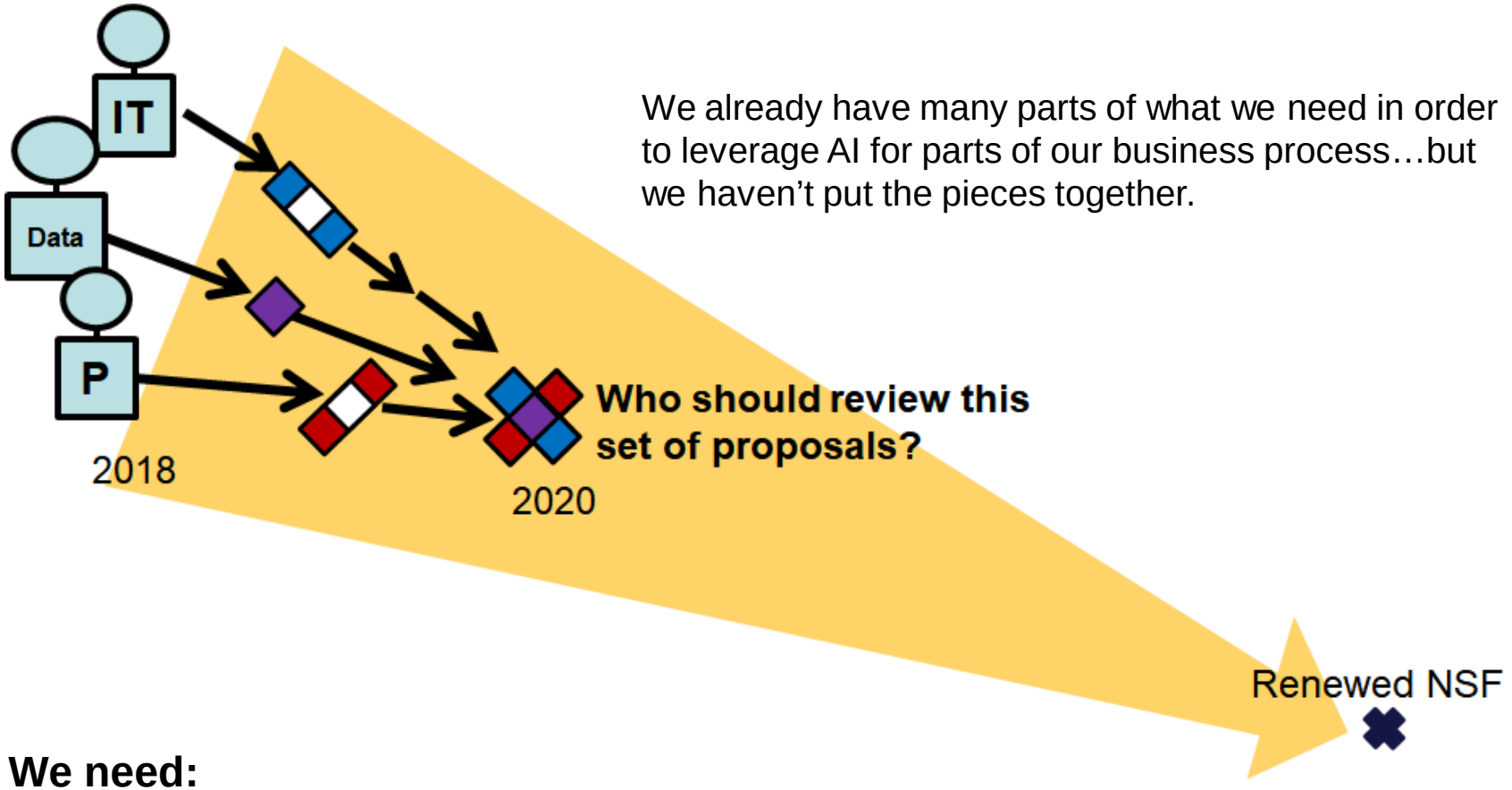
Answer more strategic questions:

- What's the portfolio of staff that I've got?
- How should I change my solicitation?

Model options:

- If I spend money here, what will happen 5 years from now?
- What if?

Let's prove it…



We already have many parts of what we need in order to leverage AI for parts of our business process…but we haven't put the pieces together.

We need:

- **IT** – tools to access data and make suggestions to people based on algorithms
- **Data** – accurate information, policy pertaining to it's use and dissemination
- **P**eople – who understand the business, the flow of information, and who ask and answer questions

Agile approach to Innovation

- Pilot one part of the process
  - Start today → Develop pilot, engage and train stakeholders
  - August 2018 → Kick off six month “production” pilot with one or two divisions
  - February 2019 → Assess and refine pilot, add more divisions
  - August 2019 → Continue to tune and prepare to expand NSF-wide
  - February 2020 → Implement NSF-wide

- Learn from that and select another process

Implement Vertically

Sustainable Innovation

- *Data driven program management and portfolio analysis, integrated data collection/analytics/reporting*
- *Automate proposal processing (Artificial Intelligence, Machine Learning, etc.)*
- *Support evidence-based policy-making, strategic planning, and human capital management*

1. Recommend Reviewers

5. Identify Potential Conflicts

Tools

- *Analytics*
- *Portal (Repository, Reporting)*
- *Collaboration tools*

Infrastructure

- *Secure*
- *Scalable*
- *Accessible*

People

- *Training & Education*
- *Workforce Planning & Development*

Data

- *NSF Administrative Data*
- *External data*
- *Social media*

Innovation Management and Measurement

Leadership and Governance (Vision, Objectives & Goals, Alignment to NSF strategic priorities)

Results of Feb 15 Meeting

- Dr. Ferrini-Mundy approved the 6-month pilot to:
  - Focus on suggesting reviewers for NSF proposals
  - Leverage existing capabilities and a data product called “Reviewer Recommendation” developed by OIA

The Smart Tool Pilot was born!

The Smart Tool Pilot Objectives

- Insert Technology
- Improve Data Management
- Engage and Develop People
- Create a Repeatable Process

OIA’s Reviewer recommendation tool

NSF’S SMART TOOL PILOT

How to use OIA's Reviewer Recommendation Tool

- NSF staff sends an NSF email with 1 or more proposal numbers to an NSF account (Proposal@nsf.gov)
- The tool returns a list of recommended reviewers with:
  - ReviewerID, FirstName, LastName, Institution, Gender, Ethnicity, Race, ActualReviews, ConnectedProposalCount, AveSimilarityScore, AveWordsInReview, MostSimilarPriorProposal, MostSimilarPriorProposalPI, Google_URL

Example of Tool Output

MP

Thu 3/29/2018 1:04 PM

MPS Proposal Check

1830723 Auto-generated reviewer2 results

To McRey, Robyne

1830723_reviewer_results_rev2.csv
14 KB

Rev 2 Reviewer suggestions for proposal:
1830723 - "EAGER: Development of the cyanotoxins cylindrospermopsin and microcystin as paleolimnological tools"

Proposal, ReviewerID, FirstName, LastName, Institution, Gender, Ethnicity, Race, ActualReviews, ConnectedProposalCount, AveSimilarityScore, AveWordsInReview, MostSimilarPriorProposal, MostSimilarPriorProposalPI, Google_URL

1830723, PS0731974, Darrell , Kaufman , Northern Arizona University , M, U, Unknown, 5, 5, 132.66, 568.00, 1203841, Huang Yongsong, http://www.google.com/search?q=Darrell%20+Kaufman%20+Northern%20Arizona%20University

1830723, HP0977532, Allison , Rober , Ball State University , F, U, White, 3, 3, 356.06, 611.67, 1750841, Waters Matthew N., http://www.google.com/search?q=Allison%20+Rober%20+Ball%20State%20University

OIA's Reviewer Recommendation Tool Process

NSF Staff sends email
- Email includes proposal(s) numbers
- Option to include filtering criteria

1

→

AutoIT Script
- Process the email and sends clustering request to Lingo4G

2

→

Lingo4G and SOLR
- Fetches the proposal(s) XML
- Clusters terms and multi word labels
- Identifies a list of similar proposals

3

↓

RPTSQL
- Retrieves review and reviewer data for similar proposals

4

→

R Script
- Generates a list of suggested reviewers

5

→

AutoIT Script
- Sends an email with the results to the requestor

6

OIA Reviewer Rec Tool

- Built using 2 **capabilities**:
  1. Enterprise text management (DIS managed)
     - Document text to machine readable text
     - Stored and integrated machine readable text
  2. Text search and clustering (OIA managed)

- It's a **data product**, generated through an algorithm, using NSF capabilities and NSF data

Approach to the Pilot and Current Status

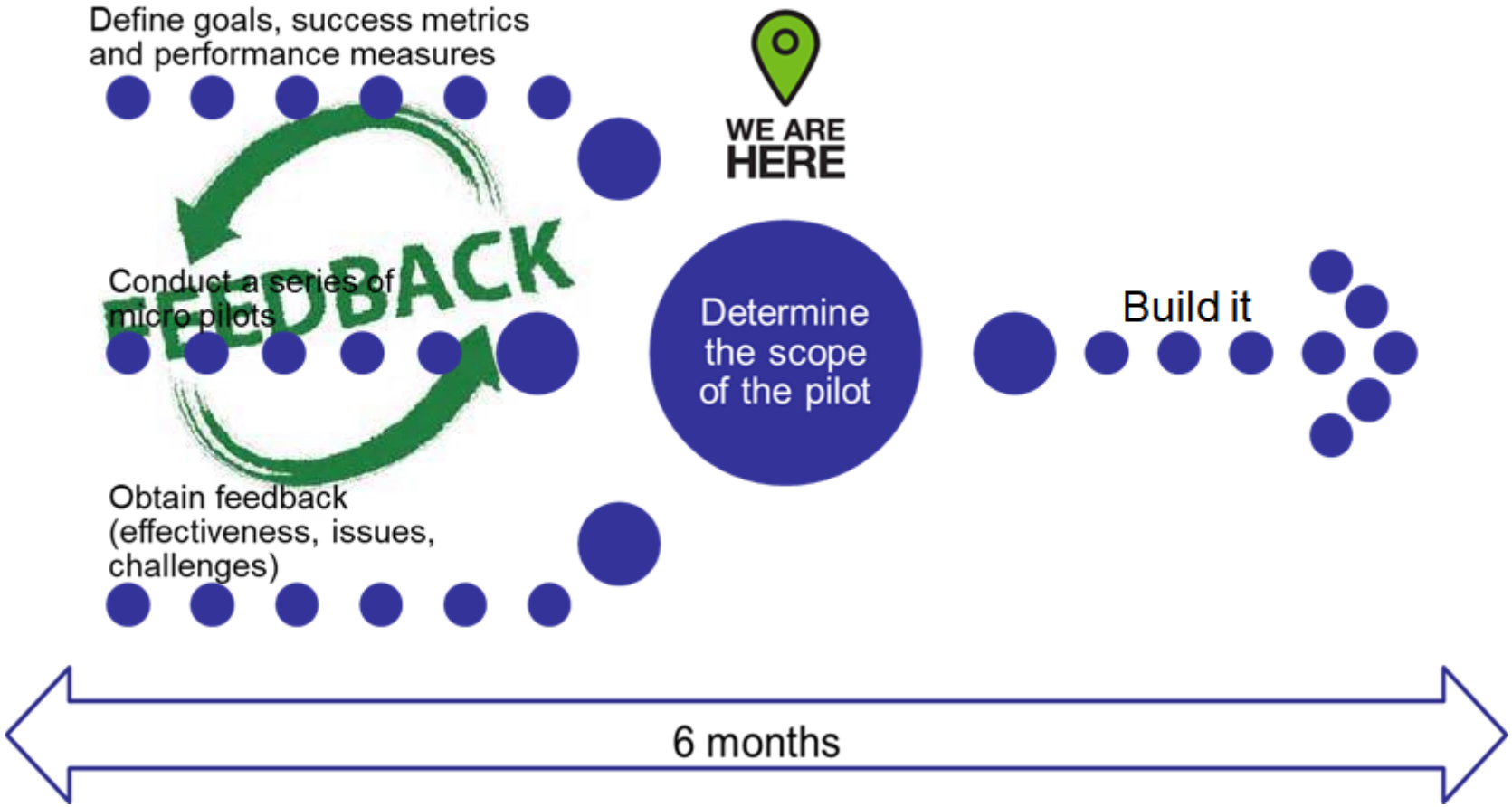
THE SMART TOOL PILOT

The Smart Tool Pilot Team

Dorothy Aronson, CIO (Chair)
Stephen Meacham (OIA)
Paul Morris (OIA)
Jolaina Jeff-Cartier (OIA)
Anand Desai (OIA/EAC)
Nicholas Daly (OIA/EAC)
Linda Blevins (ENG)
Grace Yuan (ENG)
Alan Tessier (BIO)
Brent Miller (BIO)
Thyagarajan Nandagopal (CISE/CCF)

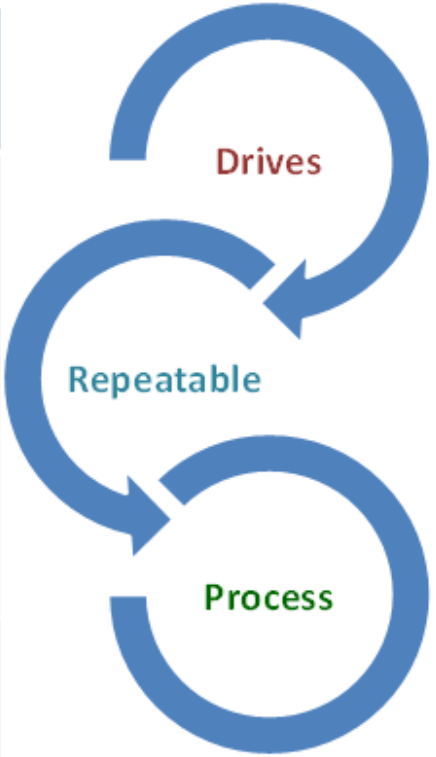
Tie Luo (MPS/DMS)
Tamera Schneider (SBE/BCS)
Peggy Gartner (OIRM/DAS)
Robyne McRey (OIRM/DIS)
Chezian Sivagnanam (OIRM/DIS)
Robyn Rees (OIRM/DIS)
Teresa Guillot (OIRM/DIS)
Priya Jayaraman (OIRM/DIS)
Jorge Linares (OIRM/DIS)
Carylynn Larson (OIRM/HRM)
Bala Erungar Ramamurthy (OIRM/DIS)
Michael Groban (OIRM/DIS)

Approach


Define goals, success metrics and performance measures
WE ARE HERE
FEEDBACK
Conduct a series of micro pilots
Obtain feedback (effectiveness, issues, challenges)
Determine the scope of the pilot
Build it
6 months

A Template to Evaluate Success

Success Measure	Data	People	Infrastructure	Tools
Adoption Rate	▪Is the available data trustable/available/ good?	▪# of Users ▪Do people trust the tool?	▪Availability (is the tool available when the user needs it? Hours/ SLA kind of metrics for discussions)	▪Ease of Use
Scalable	▪Future sources	▪Training needs ▪Workforce Impact	▪Robustness	▪Can it accommodate the needs and use of more? ▪O&M requirements
Business Value/Make IT Work for You	▪Does it provide access to new/improved data?	▪Workforce implications ▪Organizational impact	▪Compatibility – OS (Mac, Windows) and device	▪Does it foster new ideas
Technology Insertion	▪Real-time data? ▪Less time preparing data	▪	▪Secure ▪Reliable/Smooth operations	▪Faster delivery of tools



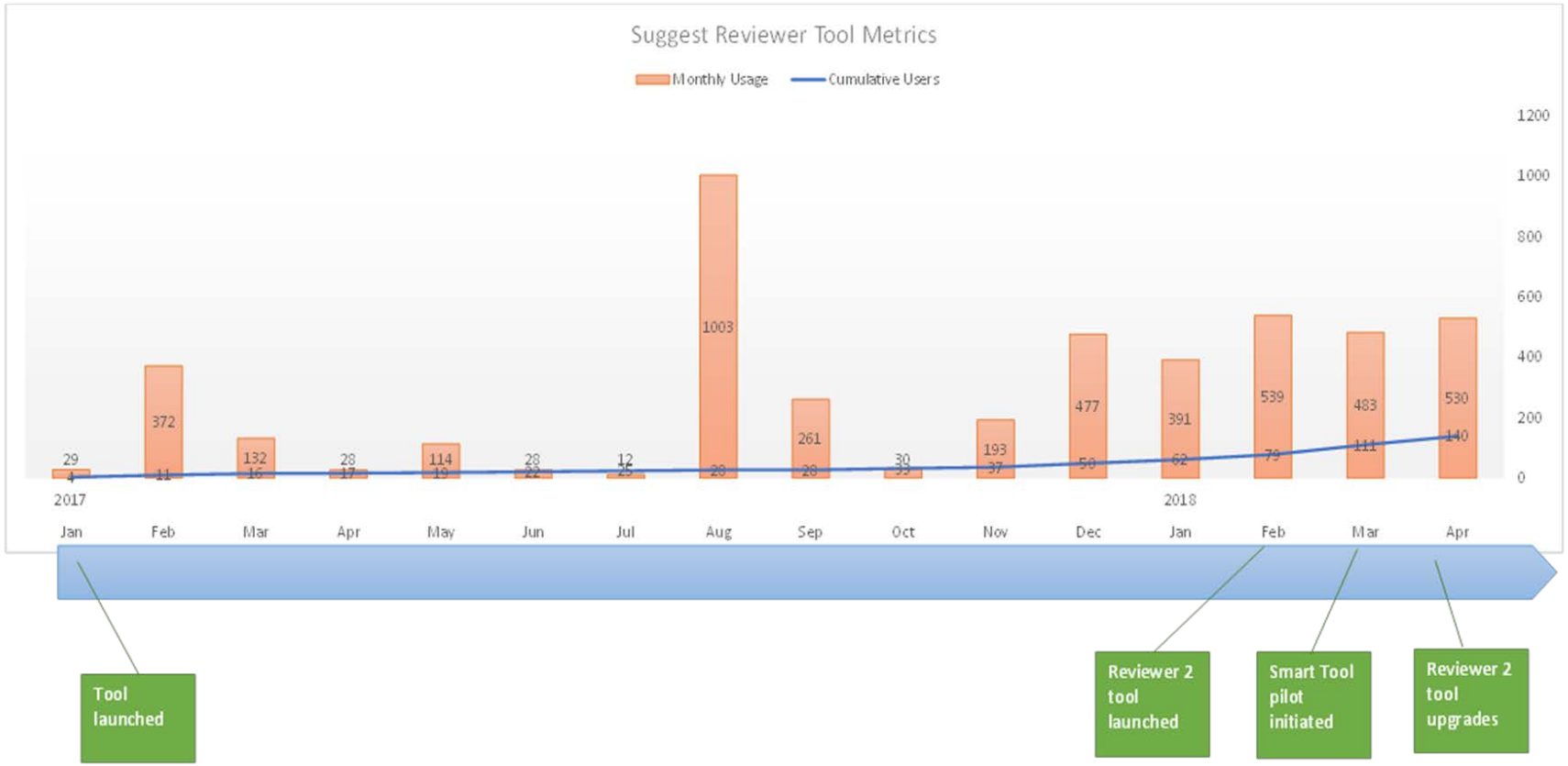
Micro-pilots

- Each micro-pilot documents a series of questions that evaluates each component (data, process, technology, and people), that serves to evolve the end state of a larger project.
- We ran the following micro-pilots:
  - Active panels, both for standard solicitation and for unsolicited proposals, in which panels are being formed
  - Retrospective view
  - Support for the Big Ideas
  - Evaluate tool effectiveness/User experience

Preliminary Finding #1

The Reviewer Recommendation data product adds value. But it takes some work to effectively leverage the output.

Usage Statistics



Preliminary Finding #2

Finding reviewers is part of the larger process of constructing/staffing the panel. Need to consider the entire process (such as COI) to maximize benefits.

Preliminary Finding #3

It needs to be integrated into our merit review systems and managed by DIS to maximize effectiveness.

Preliminary Finding #4

In order to expand adoption, the tool should be easier to use, and it should have functionality to manipulate and visualize the results.

Preliminary Finding #5

People use it differently, some widely different than others. Some divisions have different arrangements, such as science assistants and contractors, than others who do it themselves.

Preliminary Finding #6

POs begin looking for potential reviewers even before the proposals are submitted in the cases of Dear Colleague Letter and Letter of Intent. The solution set currently works based on documents received as proposals.

It's no Silver Bullet, but ….

"Models are not right or wrong; they're always wrong. They're always approximations. The question you have to ask is whether a model tells you more information than you have had otherwise. If it does, it's skillful."

-Gavin Schmidt

The Road to August

- Develop options
- Align with success measures/ metrics
- Finalize scope
- Build the pilot and prepare for roll out

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