Knowledge Management Model for Improving Communication Among Facilities and with NSF

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Large Facilities Workshop

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Background

- **NAPA Recommendation**: NSF should formally establish communities of practice (CoP) to share best practices and implement a "lessons learned" requirement for all MREFC projects.
- NSF Advisory Committee for Business and Operations (BOAC) – Fall 2016
  - Supported the recommendation from NAPA
  - Recommended a **pull not a push knowledge sharing model**.
- 2017 Large Facilities Workshop Roundtable Session - Creating a Successful Lessons Learned Approach: People, Process, Culture
  - Facilitated by Ed Hoffman, former NASA Chief Knowledge Officer
- **Working Group** – June 2017 to January 2018

Development of a Knowledge Management program began with the NAPA recommendation for a lessons learned requirement for all MREFC projects. We struggle with the concept of a program applied across all Large Facilities because "lessons learned" are traditionally an organizational asset and the diverse research communities involved with NSF Major Facilities. We consulted with the BOAC committee, they endorsed the NAPA recommendation and advised to use a pull knowledge sharing model versus push.
During last year's Large Facility Workshop, Ed Hoffman, a knowledge management expert, discussed successful approaches to sharing lessons learned and facilitated initial feedback from the community on such a program. Volunteers from this session were formed into a Working Group that met every two weeks over the next 7 months. The recommendations from this Working Group is the framework for the NSF Major Facilities Knowledge Management (KM) program.

Working Group (WG)

Members:

- Ellen (Ellie) Baptiste Carpenter, Battelle (NEON)
- Laura Lockledge, National Radio Astronomy Observatory (NRAO)
- Subhashree (Shree) Mishra, NSF Directorate of Geosciences (GEO/AGS)
- Virginia (Gina) Taberski, University Corporation for Atmospheric Research (NCAR)
- Rebecca Yasky, NSF Large Facilities Office (LFO)
- Dan Zehner, Purdue University, Natural Hazards Engineering Research Infrastructure (NHERI) Coordination Office

Facilitation and Support:

- Ed Hoffman, former Chief Knowledge Officer at the NASA
- Ruairi Macdonald led a team from Lux Consulting Group, Inc.

Members of the working group represented facilities from 4 of the 5 Directorates with major facilities.
Ed Hoffman continued involvement with facilitation of the Working Group's meetings and provided expertise for the group.
Lux Consulting provided technical research, writing, and graphic development services.

Why have a Knowledge Management program?

- Efficiency and effectiveness
- Implementation of best practices
- **Foster a learning culture**

Guiding Principles established by the Working Group (WG)

- Responsive and Adaptive
- Efficient
- Agile

Take credit for existing practices and enhance existing tools.

The Working Group discussed reasons why there should be a knowledge management program. For a program to be successful, participants would need to find value in it to themselves and/or their organizations. The group established three reasons:

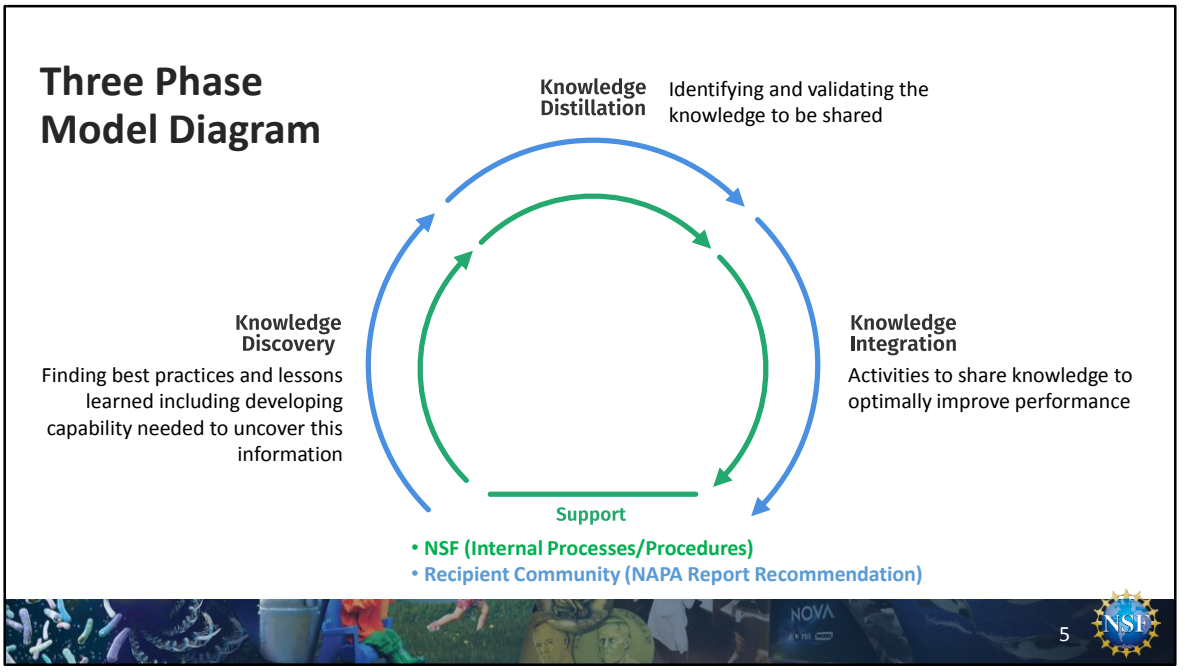
- Efficiency and effectiveness – share solutions to common challenges
- Implementation of best practices – minimize "re-inventing the wheel"
- Foster a learning culture – improve communications

To ensure recommendations were appropriate to the culture and context of NSF, the Working Group agreed on three guiding principles:

- Response & Adaptive – needs to meet the NAPA recommendation while remaining adaptable due to the wide range of research communities.
- Efficient – with limited budgets, the program needs to be a "light touch" and build existing practices where possible.
- Agile – progressive development and sufficiently flexible to adapt to feedback

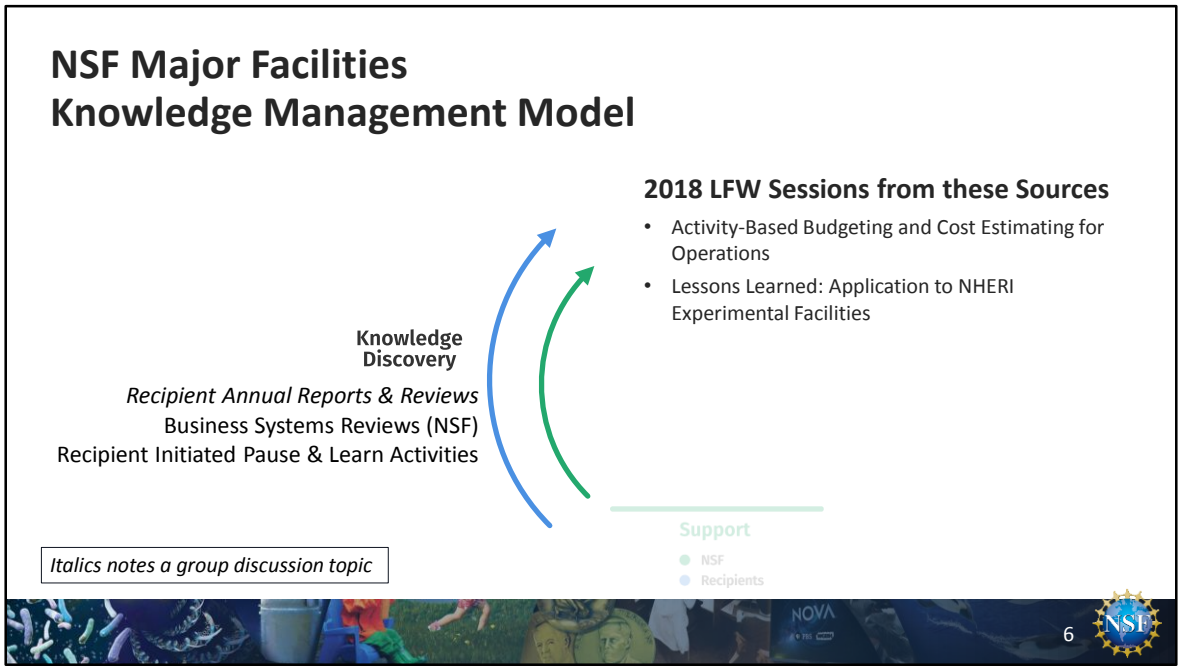
The Working Group used these principals as touchstones when evaluated various program elements and to establish their recommendations.

As shown in the next few slides, the Knowledge Management program takes credit for current practices already in place and enhances existing tools to foster a learning culture.



The Knowledge Management model has three cyclical phases. The first phase, Knowledge Discovery, is the processes and identified best practices and lessoned learned. The second phase, Knowledge Distillation, takes the complied list best practices and lessons learned from the first phase and "filters" them for knowledge that is applicable to the wider community. In the last phase, Knowledge Integration, the filtered knowledge is shared and made available for others use.

The two different colored circles represent internal NSF processes and procedures and the Recipient community. The Recipient circle is the response to the NAPA recommendation and the sharing of knowledge between Facilities. It does not represent knowledge management activities within an individual Recipient organization. Graphically, these are shown as two separate programs but in practice knowledge is discovered and transfer between NSF and Recipients.



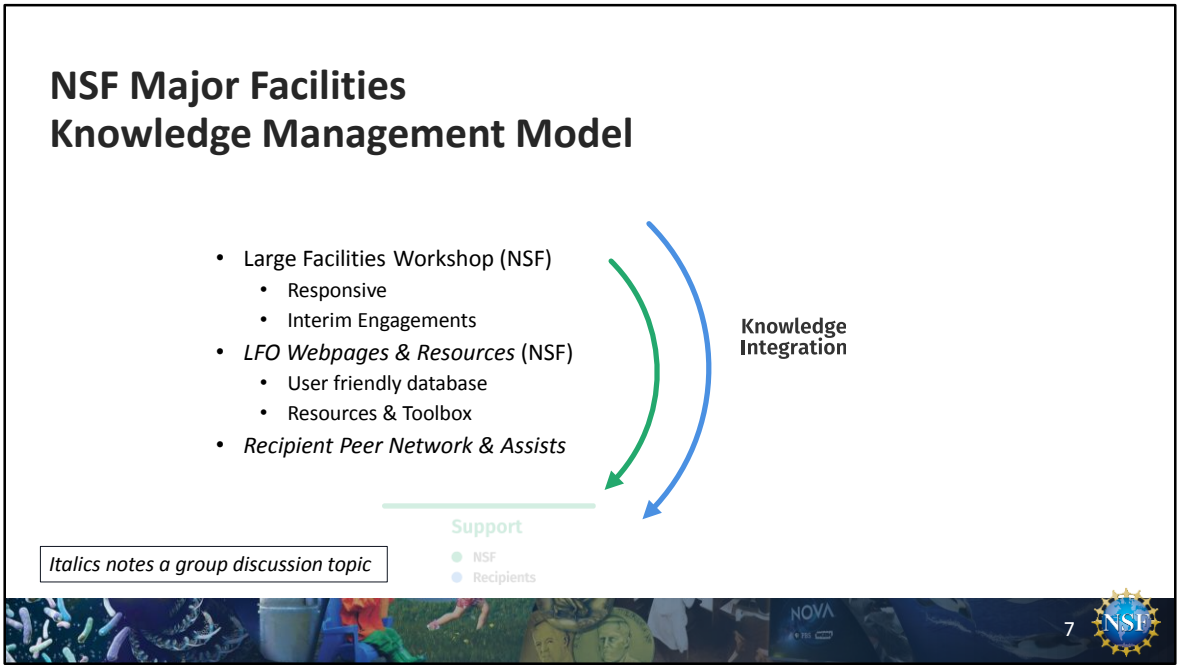
The Working Group identified three sources for Knowledge Discovery for the Recipient cycle:

- Annual Reports and Reviews,
- BSR's, and
- Recipient lesson learned activities.

There are two sessions in this year's Workshop that were identified through these sources and "filtered" through Distillation phase. During a review, activity based budgeting was identified as a best practice. This session also includes guidance on development of a cost estimating plan and templates for basis of estimates to comply with the Large Facilities Manual and GAO Cost Guide.

NHERI, a distributed facility, has developed a lessons learned program for sharing among their community of facilities. In a panel discussion, they will be sharing some outcomes from their lessons learned activities.

One of the group discussions will be on how to increase knowledge discovery from the annual reports and reviews.



The Working Group identified three activities for Knowledge Integration:

- For the Large Facilities Workshop, there was discussion on improvements to the agenda to be more response to the Recipient inputs and more sharing of lessons learned.
- Enhance the LFO webpage as central repository for knowledge management resources including best practices and lessons learned.
- Establishment a Peer Network and facilitation of peer assists.

The other two group discussions topics are Peer Networks and Assists and LFO Webpage & Resources.

Group Discussions – one KM Topic per Table

Topics

1. Knowledge Discovery from Annual Reports and Reviews
2. Recipient Peer Network & Assists
3. LFO Webpage Resources & Tool Box (needs internet access)

Discussion Points

- Suggestions on methods to implement?
- How can Recipient organizations support implementation?

Guiding Principles: Responsive & Adaptive, Efficient, & Agile

In small group discussions, development of suggestions for NSF Knowledge Management program elements aligned to the guiding principles. Each group to report suggestions for assigned topic and how Recipients can support the suggestions.

Closing

- Questions & Comments
- Working Group Report Available
  - Provide me your business card, or
  - Email me at ryasky@nsf.gov
- Complete Workshop Surveys!
  - Key component for measuring and monitoring of the Knowledge Management Program

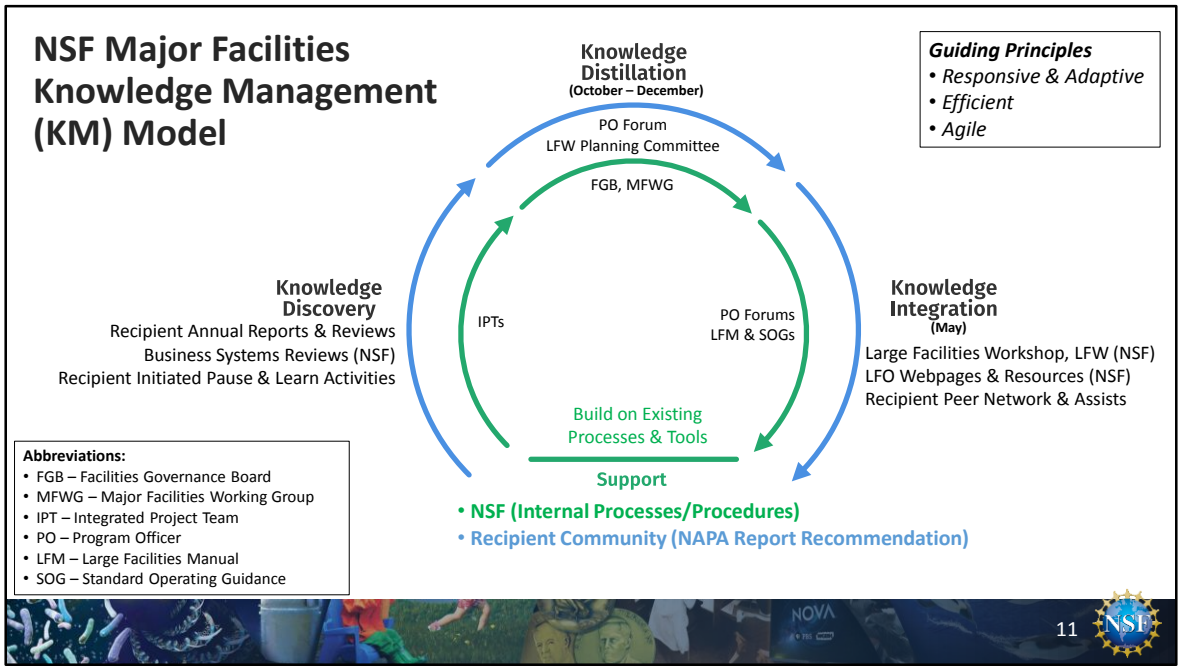
Copies of the Working Group's final report is available on request.

Please complete the Large Facilities Workshop survey. This is a measurement tool of the Knowledge Management program towards the objective and value of the program.

Knowledge Management Backup Slides

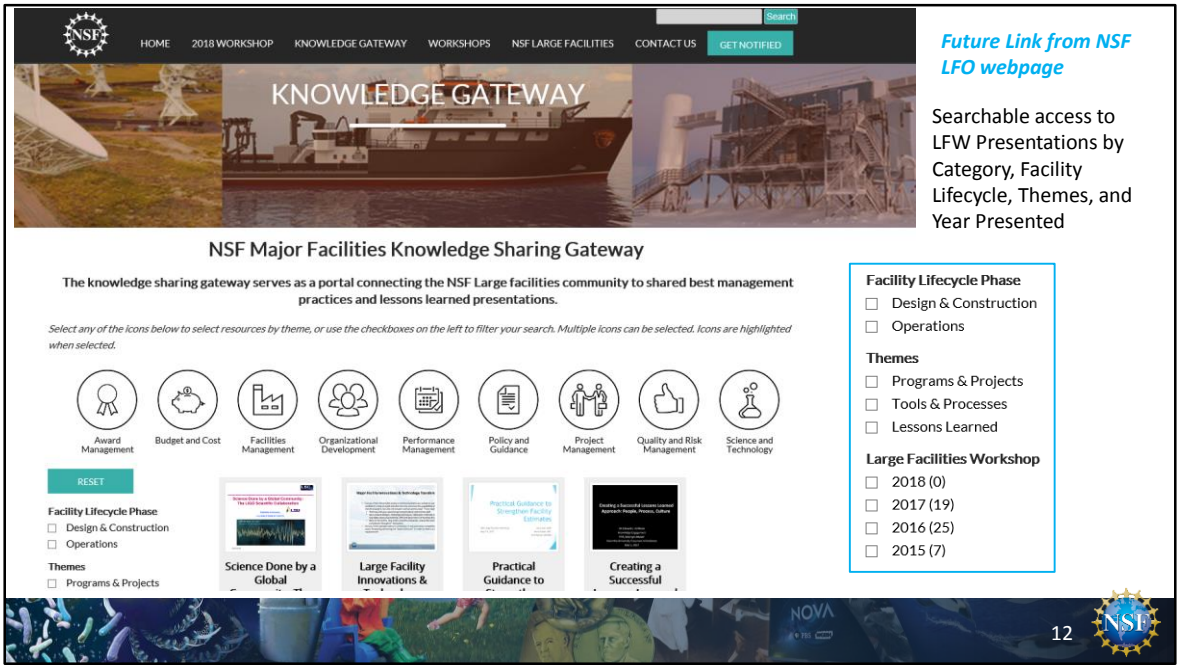
- NSF Major Facilities Knowledge Management Model
- Knowledge Management Sharing Gateway
- Knowledge Map Concept
- NASA Knowledge Transfer Article

Additional information on NSF Knowledge Management program elements and the concepts of knowledge transfer.



NSF Major Facilities Knowledge Management (KM) Model with identification of processes, tools, and people for implementation. The Recipient Community is a continuous annual cycle with identification of best practices and lessons learned from reviews and presentation on select topics at the Large Facilities Workshop, typically in May.

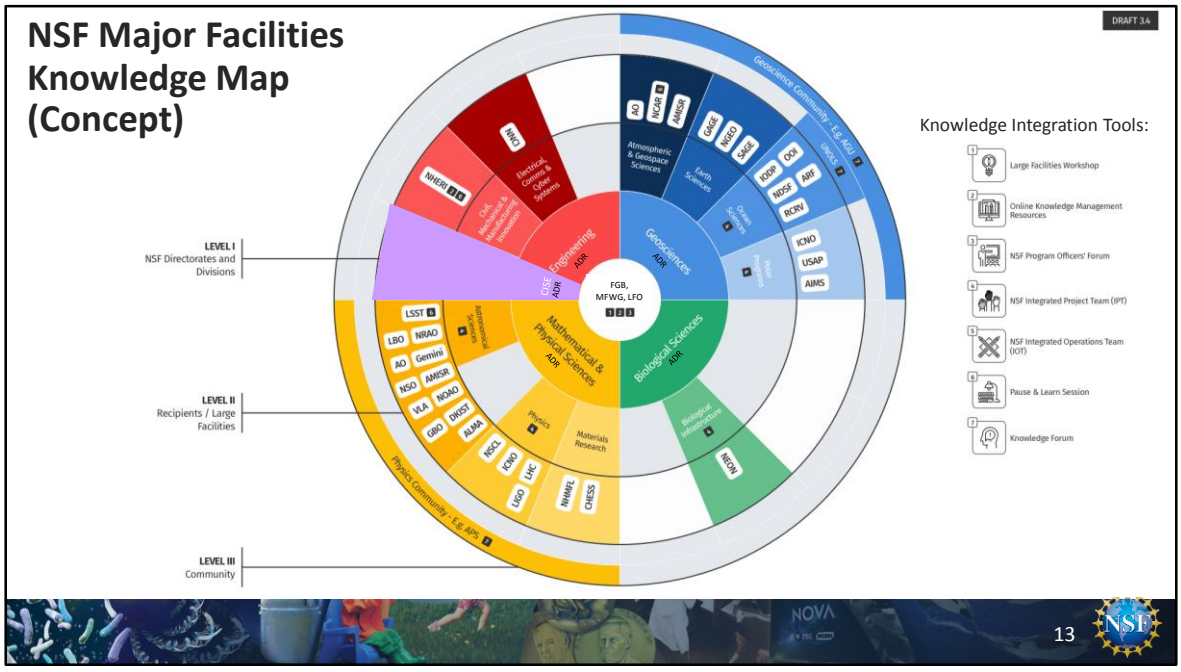
The NSF cycle is continuous with best practices being codified in the Large Facilities Manual (LFM) and internal standard operating guidance (SOG).



Future Link from NSF LFO webpage

Searchable access to LFW Presentations by Category, Facility Lifecycle, Themes, and Year Presented

In response to the Working Group recommendation, Large Facilities Workshop (LFW) presentations are available in a searchable database by subject category, facility lifecycle, theme, and year presented at LFW. Multiple levels of filters can be used to enable focused "pulls" of information.



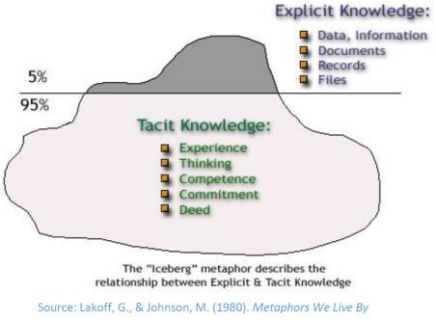
A knowledge map would illustrate the various knowledge sharing activities throughout the NSF Major Facilities. Documenting these activities to take credit for the multiple knowledge sharing practices and provide guidance on sources of knowledge.

This concept map illustrates knowledge integration activities at three different levels:

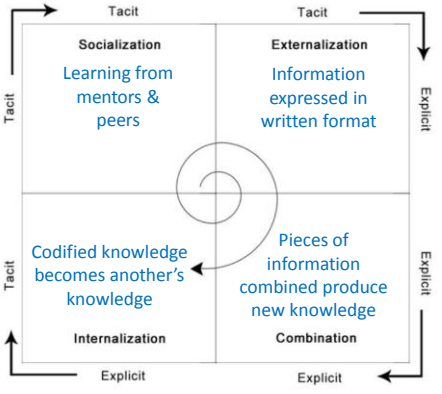
- Within different Directorates and Division of NSF
- Within the each individual Major Facility
- Within the different research communities

NASA Article - Knowledge Transfer

(https://appel.nasa.gov/wp-content/uploads/sites/3/2015/11/Knowledge-Transfer.pdf)



Source: Lakoff, G., & Johnson, M. (1980). *Metaphors We Live By*



Source: Nonaka & Takeuchi, 1995

- Tacit knowledge is most difficult to transfer.
- Can be unleashed and shared by connecting people.

In order for effective knowledge transfer to occur, collaboration must be supported across the organization.

Knowledge has two basic forms, tacit and explicit. Explicit knowledge is the knowledge that has been articulated and can be readily transferred to others. Tacit is the most difficult knowledge to transfer. An organization's knowledge transfer strategy should provide approaches to capture and codify knowledge that is tacit and make it collective.

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