NASA LaRC Knowledge Strategy and Progress

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Outline

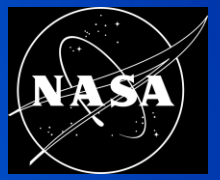
Strategy (May 2015)

- **Approach used**
  - Goals and Objectives
  - Center-Wide Team and Consultant
- **Overall Assessment**
  - Current and Desired State
  - Main enhancements identified
- **Strategy and Plan by Four Key Areas**
  - Knowledge Systems
  - Projects Best Practices and Lessons learned
  - Experts and Retirees Knowledge
  - Culture
- **Moving Forward Plan**

Progress being made (Sep 2015-)

Strategy Purpose and Importance

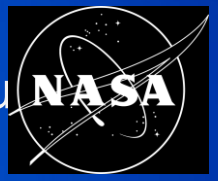
- NASA creates and applies knowledge for mission success
- Knowledge is one of our critical assets and focusing on its flow, capture, access, and use is important for organizational success
- This plan can help to bring focus to the key strengths and gaps to help leaders and employees to pay attention to the key areas
- Centers are requested to develop a plan by Agency CKO/OCE

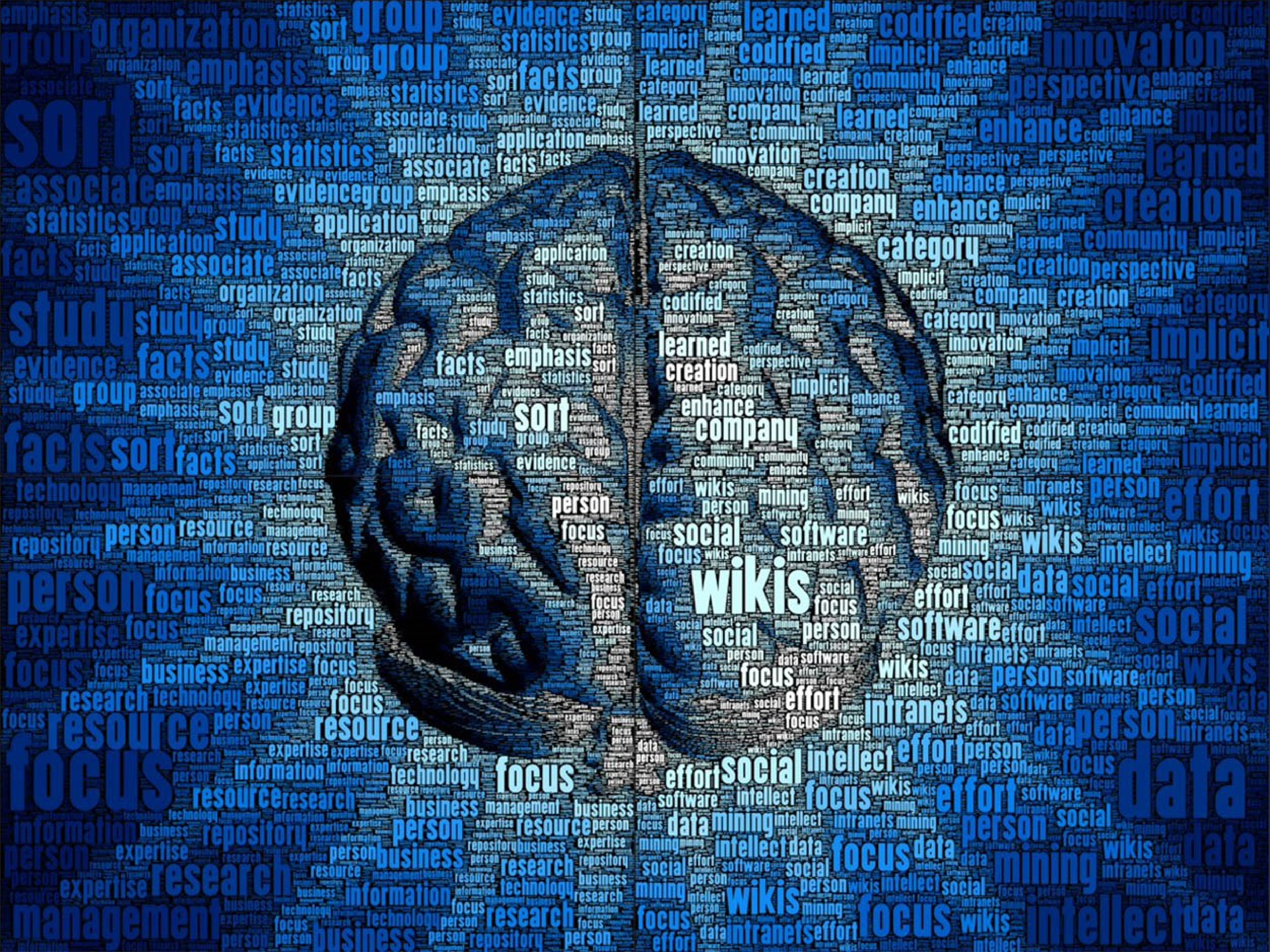


Goal and Objectives

Develop a knowledge strategy and plan to leverage and utilize our collective organizational knowledge and thinking for mission success (3-5 years)

1. Maximize the utilization of our current knowledge services and systems
2. Enhance the knowledge sharing culture (it is everyone's responsibility)
3. Improve mentoring, and expert and retiree knowledge transfer, retention and use
4. Actively identify critical knowledge and enhance its capture and findability
5. Identify current best practices and ways to propagate their u





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facts
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perspective
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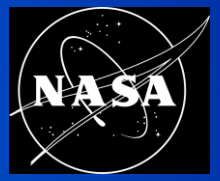
creation
wikis
social
software
mining
effort
intranets
intellect
data
focus
person
technology
management
repository
resource
information
business
research
expertise

Approach Used for Strategy

- Engaged the Center organizations
  - 27 representatives from multiple organizations participated
- Utilized Knowledge Management expert expertise and experience - Dr. Jay Liebowitz, Professor at Harrisburg University
- Workshop I: Focused on current state, critical needs, gaps, and possible solutions - November , 2014
- Core team and Consultant developed a draft strategy and recommendations - Jan., 2015
- Workshop II: Shared the draft plan, finalized recommendations, and identified priority actions - March, 2015.
- Presented to Center Leadership Council : May, 2015
- Presented to NASA CKO Community: June and Dec. 2015



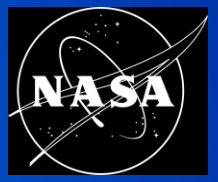
Knowledge Strategy Team

- Larry Leavitt, OCE
- Walt Engelund, OCE
- Bob Hodson, OCE
- Bart Singer, OCE
- Manjula Ambur, OCIO
- Kay Costulis, OCIO
- Ed McLarney, OCIO
- Donna Phillips, OHCM
- Lisa Etheridge, OHCM
- Pete Mount, OSACB
- Duane Pettit, SMAD
- Christina Guldin, SMAD
- Jay Leibowitz,
  Professor, Harrisburg University
- Damodar Ambur, RD
- Bill Winfree, RD
- Jonathan Rathsam, RD
- Richard Silcox, RD
- Rob Scott, RD
- Christie Funk, RD
- Dan Yuchnovicz, NESC
- Bob Estes, FPD
- Melissa Ashe, FFD
- Jeff Cerro, SACD
- Frank Gern, SACD
- Pamela Rinsland, SD
- Jessica Taylor, SD
- Richard Foss, ED
- Trevor Grondin, ED

Overall Assessment

Current State

- We do OK job of knowledge sharing; it is mostly adhoc and not systematic and integrated
- Younger generation feels that they aren't being mentored as effectively as needed; Older generation feels their expertise might be lost
- Project budgets are established without explicit consideration of knowledge capture and transfer
- Difficult to find the right person, relevant information, and critical knowledge quickly at LaRC; primarily done adhoc way by who you know
- Time and Resources is a big challenge

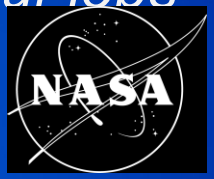


Desired State

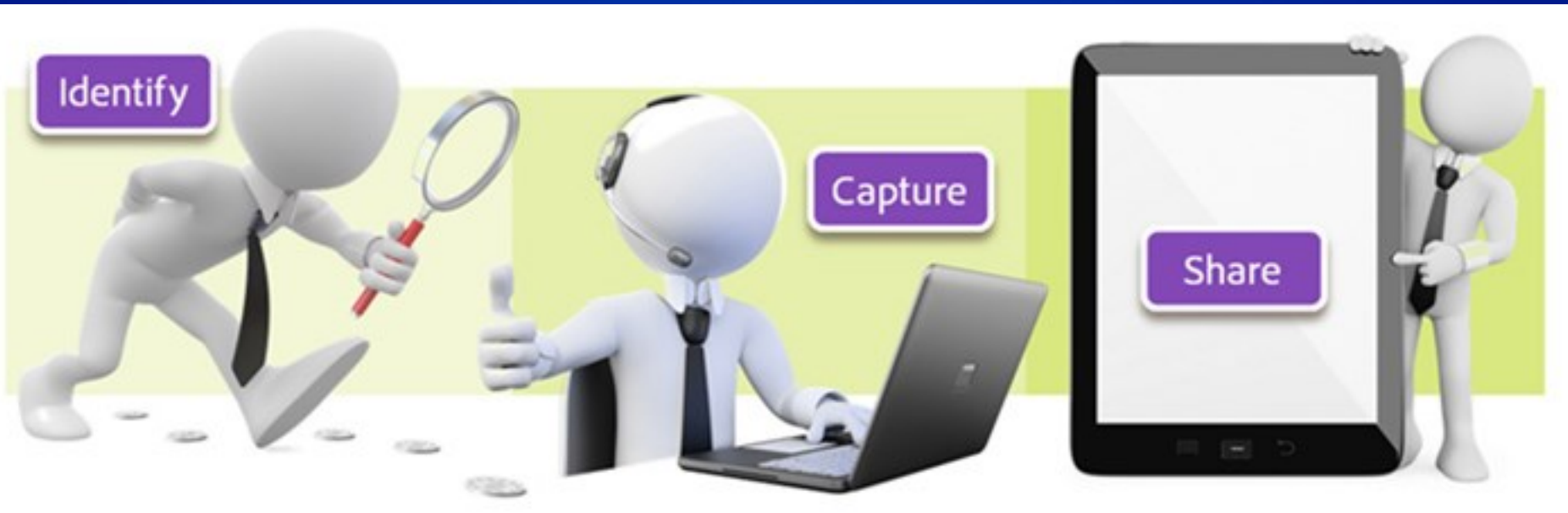
- Systematic approach to knowledge capture and sharing
  - Acquainting people with its benefits & integrating it into everyone's job
  - People sharing knowledge across organizational boundaries
- Sharing the message that with creativity comes failure
  - We all benefit from talking about our successes and our failures
- Educating people about what types of knowledge are valuable and how they can be shared, accessed and used
- Recognition and reward system that promotes learning and knowledge sharing behaviors
- Have the technology that works for people, not vice versa
- Providing the time and resources to do this well

Main Enhancements Identified

- Improve access, content, and user education of current LaRC knowledge systems and services
- Improve project knowledge sharing and capture to enhance the sharing and findability of critical knowledge
- Focus on the challenge of expertise loss of retirees and have a systematic initiatives to help address this strategically
- Increase awareness and usage of lessons learned in order to further learning from others
- Improve the knowledge sharing culture - *it is part of all of our jobs*

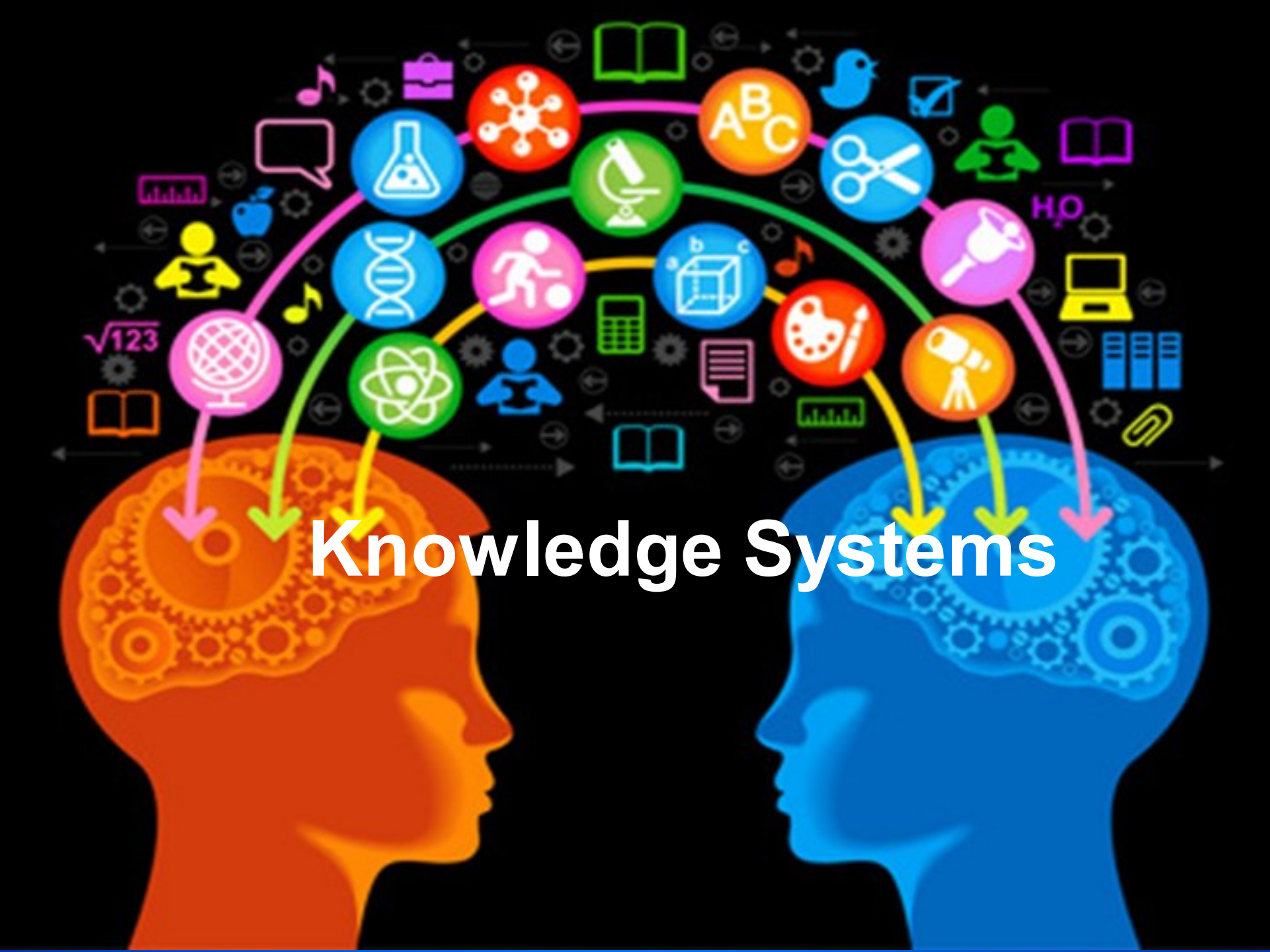


Strategy and Plan



Strategy and Plan

- **Four Key Areas of Knowledge Strategy Identified**
  - Knowledge Systems
  - Projects best practices and lessons learned
  - Expert/Retirees knowledge transfer
  - Culture
- **For Each Area Above identified**
  - Current state and Gaps
  - Recommendations
  - High priority Recommendations to start*
- **Approach**
  - Low/no cost and high impact recommendations
  - Distributed responsibility
  - Start small and build momentum


Knowledge Systems

Knowledge Systems

- **Current State**
  - LaRC Google search; Phone Book for people, services and expertise
  - NX Document Management; LaRC Digital Repository for Projects
  - TPSAS Publications system; NTRS :NASA Technical Reports for Research
  - NASA Engineering Network; Communities of Practice; Watson Analytics and Data archive Pilots

- **Gaps**
  - **Systems**
    - Systems need to be more simple, intuitive, and have online instructions
    - Need to educate on how best to use them
    - Lots of systems - do not know best places to look for needed information
  - **Content**
    - People - difficult to find the right person and expertise
    - NX documents not searchable via Langley Google
    - Current systems do not have access to all needed content

Knowledge Systems - Recommendations

- ***Knowledge Portal: Single web site connecting to all the Langley and NASA systems and processes; link from @LaRC**
- ***Develop 'Expertise Locator/Experts Directory': leverage LinkedIn and Phone Book information**
- User education with on line short videos & chat
- Develop Watson Analytics capability as a service
- Develop fully Langley Data Archive capability for all critical Projects

- Leverage, Use, and enhance NEN Communities of Practice
- Develop Product Life cycle management capability - start with a pilot
- ' NASA Watson' like capability Prototypes in aerospace domains

Leads/Champions – OICO: CKO and IMB Head

Projects Best Practices

Projects Best Practices and Lessons Learned

Current State

- Projects conduct lessons learned activities on ad-hoc basis
- Lessons often do not get propagated beyond the Project
- Sharing: Ask PM CoP; e-mails; anecdotal discussions with peers; NEN; Contact PIs; Mostly people-to-people transfer

Gaps

- Not clear where Projects go for help in sharing lessons learned
- Knowledge sharing across LaRC Projects is not a norm or automatic
- Lessons capture throughout Project lifecycle is not a standard practice
- No one place to go for Best Practices/Lessons in each project/areas

Projects Best Practices and Lessons Learned - Recommendations

- *Lessons learned & Used discussions as part of Project Reviews, and Pause and Learn as part of Project/Org. meetings
- *Better capture of Projects knowledge - Incorporate as part of Project Planning ; Broaden Lessons Learned Plan to include Knowledge management; Digital repository of 'good examples'
- *Case Studies and Stories
  - model after JPL and Goddard
- Systematic Courses and Workshops
  - model after Goddard
- Online communities with active facilitators to foster relationships and cross fertilize knowledge - model after NEN
- Regular seminars and focus groups on sharing best practices

Leads/Champions:

OCE (Lessons Learned Lead) and Flight Projects Directorate

Experts and Retirees Knowledge

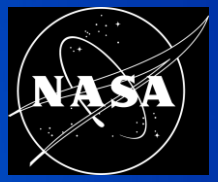
Experts and Retirees Knowledge Retention and Transfer

Current State

- Impending retirement of many experts and technical leaders, and loss of deep technical expertise
- Very little mentoring and job rotations
- Succession Planning initiative underway

Gaps

- No focused and systematic effort to address expertise loss of experts/ retirees (both explicit and tacit)
- Capturing knowledge for the next generation is critical; Younger generation feels they are not being mentored effectively
- Critical Projects Data with its provenance is not being captured; multi-center projects pose more challenges
- No institutional processes and resources to capture key knowledge



Experts and Retirees Knowledge Retention and Transfer - Recommendations

- ***Leverage avenues to retain and transfer experts knowledge - Pilot and evaluate**
  - **3-6 month shadowing or mentoring pilots**
  - **Facilitate Retirees as DRAs to help with knowledge capture and sharing**
  - **Phased Retirement and Succession Planning**
- *** Propagate Knowledge Capture and Sharing activities**
  - **Short Courses and Seminars by experts**
  - **Pilot knowledge capture of a few experts:**
    Explicit by digitization, and tacit by video interview
- Identify critical areas and experts likely to leave
  - Take Branch Heads help
- Exit Interviews and Checklists
  - Exit Interviews of identified experts by Professionals to capture nuggets
  - Develop a key checklist to help leaving experts; Include as part of checkout process
- Develop and use a formal mentoring, shadowing and job rotations program
- Effective succession planning for identified experts/expertise
- New hires having an official mentor (not supervisor) for ~2 years

Leads/Champions: OHCM, CRUDs/RD and OCE (Chief Engineer)


Culture
Culture
Culture

Culture

Current State

- In general, employees see the value and want to do the right thing
- Do not have enough time, and no institutional processes and resources available
- Chief Knowledge Officer, Chief Engineer and Lessons Learned Lead are facilitating this - Their time to do this is very limited

Gaps

- Time constraints and lack of resources & processes seem to be big challenges
- Explicit Senior Leadership buy in and championship
- Lack ways to show that lessons shared enhance projects execution
- Though benefits are intuitive, they are very difficult to measure/capture

Culture - Recommendations

- *Knowledge Stewards at Branch and Directorate level (no extra resources needed)
  - Communicators, Connectors and Facilitators; People with passion and are networked well
  - Formal designation could help
  - Could start with the knowledge strategy workshop attendees
- *Expert seminars; Brown bag lunch sessions
  - Chief Engineers and Branch heads can help
  - Senior leaders/managers encourage; attend to help with recognition and attendance
- Director message to all employees - importance of knowledge sharing with a few good examples and link to 'Knowledge Portal'
  - Can be propagated and emphasized by OUMs and Branch Heads
- Conduct Knowledge Audit via a web based survey
  - Identify 'knowledge gaps' and 'At Risk' critical knowledge areas
- Formal Rewards and Recognition process and program
- Have a few key metrics to measure value - Quality/Timely delivery; Innovations; New technologies; ….

Leads/Champions: OUMs, CE, CKO, and FIRST TEAM

Moving Forward Plan

Moving Forward

<u>Work towards an environment where knowledge sharing is emphasized, recognized, rewarded, and permeates NASA Langley</u>

- Organizational Leaders engagement and buy-in is critical.

- Start with low cost and high impact/priority actions and build the momentum

Moving Forward

- Resources
  - Chief Knowledge Officer/CKO as a catalyst and facilitator
  - Leads/Champions work the plans to implement them
  - Engage and work with the respective OUMS
  - Engage Projects/Programs for buy-in and funds

- Leverage other Centers expertise/experiences - GSFC; JPL; JSC…

- Have a quarterly status and discussion as part of Lessons Learned Meeting, and Update CLC annually

- Communicate successes for a broad based buy-in and to build momentum

Progress Being Made

(Sep. 2015-)

Progress Being Made

- Knowledge Systems – (OCIO)

  - Knowledge Portal : Help technical community to find and use critical knowledge from many current systems (Lara Anderson/Hope Venus)

  - Knowledge Analytics: Deep analytics capability to quickly make sense of and identify trends and patterns of internal and global knowledge (Manjula Ambur/Ted Sidehamer)

- Lessons Learned reviews for Projects (OCE)

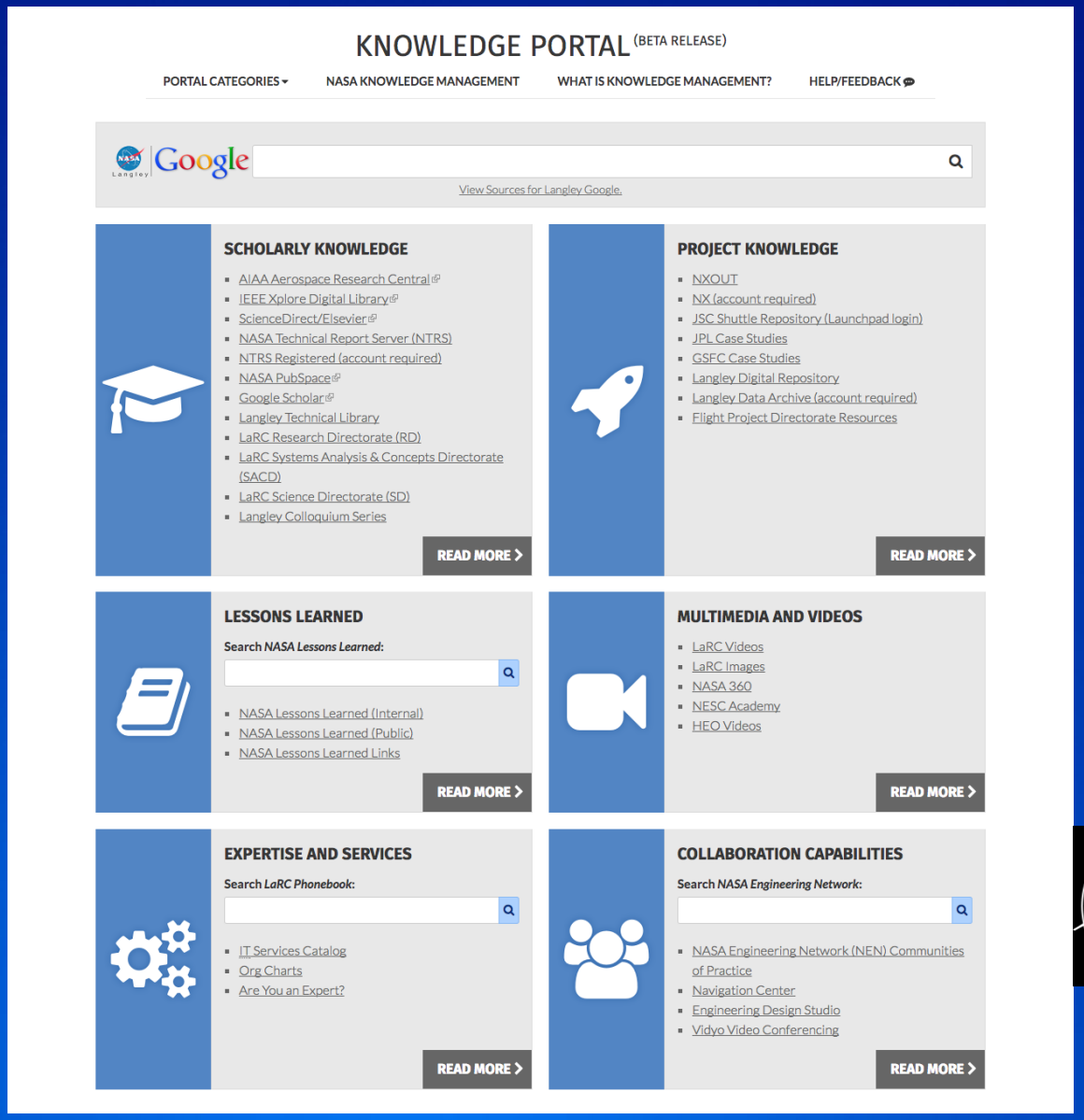
  - Make them more effective and usable and help projects to seek them (Bart Singer/Bob Estes)

- Experts/Retirees knowledge capture (RD)

  - Pilot to capture both explicit and tacit knowledge to help leverage deep wisdom and knowledge, and mentor younger generation (Jennifer Frost)

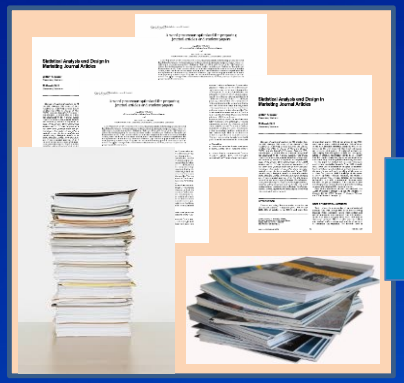
Knowledge Portal (Office of CIO)

Will be launched to the Center along with new @LaRC in ~ Jan/Feb 2017

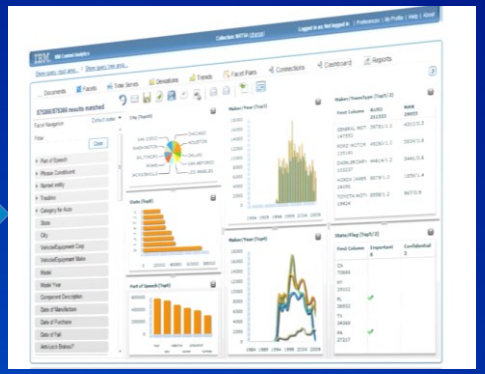


Knowledge Analytics Projects
Office of CIO

Analyzing and digesting large volumes of available information is an impossible task for scientists and engineers



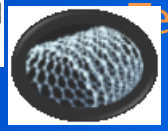
Deep Content Analytics



Watson Content Analytics Software

Key Collections Analyzed:

- Space Radiation
- Aerospace Vehicle Design
- Carbon Nanotubes
- Autonomous Flight
- NASA Lessons Learned
- Uncertainty Quantification
- Model Based Engineering
- Human-Machine Teaming



Key Capabilities Provided:

- Digest and analyze thousands of articles without reading
- Rapidly identify trends
- Identify expert connections
- Technology gap exploration
- Identify cross-domain research
- Saving SME time

Lessons Learned Improvements
(Office of Chief Engineer)

- Lessons Learned success criteria for major projects in formulation
  - Significant Visibility of criteria; proactive infusion
  - Test Run with a major Project – Challenges and success is slowly happening ; Time constrains are major hurdle

- Proactive Engagement with Major projects
  - Face to face meetings to understand critical knowledge needs
  - Identify sources to help and share with the team
  - Many interactions with Projects; X Planes and CLARREO in 2017

- Lessons Learned Manager and Committee taking an active role
  - Helped one project with finding information to a specific question

Experts Knowledge Capture
(Research Directorate)

- Tacit Knowledge capture using video interviews
  - 12 Retirees interviewed using our video studio
  - Group interview with retirees from Hypersonic Air Breathing area
  - Working to edit and disseminate them via NESC Video Academy
  - Slower progress than anticipated ; Resources challenge
- Interviews captured:
  - Career highlights; rewarding accomplishments;
  - Lessons learned; advice to next person in their position

- Explicit knowledge capture using digitization of unique documents
  - Digital Librarians to decide uniqueness and criticality
  - Digitized collections are made available via Langley Digital Re

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