NCHRP 20-68A – Domestic Scan Program

12-04: ADVANCES IN TRANSPORTATION AGENCY KNOWLEDGE MANAGEMENT

Significant Findings and Strategies for Advancement of KM Practice

Leni Oman, Knowledge Strategist
Washington State Department of Transportation

AASHTO Standing Committee on Highway Traffic Safety
April 16, 2015
CONTEXT & MOTIVATIONS

- Many state DOTs are seeking transformational change
- Loss of institutional knowledge upon which to build that transformation
- Retirements and employee movement
- Changing organizations
- Increased efficiency, accountability, access
- More mobile workforce
- Advances in technology bring new opportunities
- Emergence of the knowledge economy
- Need for proven strategies to negotiate these changes
A Roadmap to Transformation

10 Facets of KM

1. Knowledge Leadership and Strategy
2. Culture and Communication
3. Knowledge Assessment and Evaluation
4. Knowledge Operations
5. Knowledge Architecture
6. Knowledge Asset Management
7. Intellectual Capital Management
8. Communities and Collaboration
9. Organizational Learning
10. Knowledge Technologies
Why Implement KM?

Context

As a practice, the goal of knowledge management described by Bollinger and Smith is:

• [to] make the organisation act as intelligently as possible and realise the best value from its knowledge assets, i.e. create a learning organisation that is capable of measuring, storing and capitalising on the expertise of employees to create an organisation that is more than the sum of its parts”
Scan Overview

Objective: Document successful knowledge management (KM) practices, and identify additional needs to advance KM in transportation agencies.

- Scan meeting: November 19-21, 2013 – Baltimore, MD.
- Other presenters: Accenture, Kent State University, Kraft Foods, NASA, US DOT – FAA, FHWA, FTA.
- Scan Chair: John Halikowski, Director, Arizona DOT.
- Subject Matter Expert: Frances Harrison, Spy Pond Partners, LLC.
- Final report available May 2014.
Topic Areas for Scan

- **Succession Management**: Managing staff transitions to retain and acquire critical knowledge and minimize risk.

- **Employee Orientation, Learning and Development**: Facilitating new employee orientation and ensuring continued employee development and organizational learning.

- **Innovation and Knowledge Sharing**: Fostering innovation through collaboration and knowledge sharing.

- **Identification, Documentation and Dissemination of Processes, Practices and Expertise**: Identifying, capturing, storing and providing access to knowledge about business processes, practices and expertise.
**Knowledge** – exists within the brain, built over time from learning and experience, used for judgment, prediction, and decision-making

- Tacit knowledge – intuition and know-how, difficult to document
- Explicit knowledge – codified knowledge, e.g. rules

**Information** – data or facts organized and presented with the necessary context for use or application
Workforce Planning

- Workforce planning is a process for identifying and addressing gaps between the current workforce and existing future needs
- KM practices support workforce planning by:
  - Identifying critical skills that will be required to support the organization’s mission
  - Providing opportunities to nurture development of these skills
  - Providing awareness of existing knowledge resources, both internally and externally
  - Creating networks that facilitate placing people in the right position in the right place at the right time
  - Helping new and existing employees transition into new positions

KM Program Objective: Enable an informed and strategic approach to workforce planning
## Identifying critical knowledge at risk

Determined by business leaders using guiding principles

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mission Critical</td>
<td>• Needed to support current/future business strategies</td>
</tr>
<tr>
<td>Current Core Competency</td>
<td>• Drives competitive advantage</td>
</tr>
<tr>
<td>Not readily Accessible</td>
<td>• Difficult to find networks, little documentation</td>
</tr>
<tr>
<td>Rare or Unique</td>
<td>• Knowledge resides with one expert. Not available externally</td>
</tr>
</tbody>
</table>
Learning and Development

KM Program Objective: Support learning and mentoring across the organization to build and transfer critical knowledge

KM techniques include:

- Establish organizing framework of disciplines for learning, development, communities, workforce planning – e.g. bridge design, traffic engineering, procurement, etc.
- Provide guidance and templates for team learning – before, during and after a project or program initiative
- Build in time for individuals and teams to analyze what they are doing and how to make it better
- Support mentoring – keeping in mind that any person in the organization can have skills and experience to share with others
The FHWA Learning Highway

The FHWA Learning Highway is a system of learning opportunities in the Corporate, Leadership, and Professional competency areas. It is designed to help employees navigate a path of success in managing and overseeing FHWA progress in System Performance, Program Delivery, Corporate Capacity, and National Leadership.

**Corporate Competences**

To efficiently and effectively carry out FHWA’s mission, all employees are required to develop competencies that support FHWA corporate values focused on Public Service, Integrity, Respect, Family, Collaboration, and Personal Development.

- Working With Others
- Self Development
- Organizational Focus

**Potential Learning and Development Opportunities**

(Corporate L&D opportunities are open to all employees)

- Annual Compliance Training:
  - Ethics
  - No Fear
  - Privacy
  - Constitution
  - Prohibited Personnel Practices
  - Information System Security Awareness
  - Prevention of Sexual Harrassment
- Federal Aid/Federal Lands 101
- Highway Financing
- Funds Management for FHWA Employees
- Conducting Effective Program Reviews
- Project Mgmt. Certificate Program
- FHWA New Employee Orientation
- Effective Communications Courses
- Volunteer Work: civic, professional, etc.

**Leadership Competences**

FHWA encourages all employees to develop leadership competencies so that they can successfully manage projects, programs, and/or people.

- Managing Projects/Programs
- Leading People
- Leading Organization

**Potential Learning and Development Opportunities**

- Brookings (SES)
- Federal Executive Institute (SES)
- FAA Strategic Power of Vision (GS 14-15)
- AASHTO National Transportation Leadership Institute (GS 14-15)
- Leadership Decision Making Course (GS 14-15)
- AASHTO National Transportation Management Conferences (GS 13-15)
- OPM Advanced Supervisory Courses (GS 13-15)
- Building Foundations for Visionary Leadership (GS 13)
- Human Capital Mgmt. for Supervisors and Managers (all Team Leaders/Supervisors)
- Professional Development Program (PDP) Leadership Academy (GS 9-11)
- Professional Skills for Career Success (GS 9-11)
- Leadership Competencies Certificate Program (GS 2-13) (Employees with 12 months of FHWA service)
- Leadership Development Academy (all employees)
- Monthly Managers Web-Conference for team-leaders, managers, and supervisors (all employees)
- Local Office Leadership Programs (grades vary)
- Volunteer Work: civic, professional, etc. (all employees)

**Professional Competences**

FHWA employees are encouraged to strengthen and build professional competencies to effectively provide program oversight and stewardship and continue to serve as National leaders within the transportation community.

- Air Quality
- Civil Rights
- Construction/Project Mgmt.
- Design
- Environment
- Freight
- Administrative
- Communications/Marketing
- Legal
- Office Support

- Financial Mgmt.
- Generalist
- Geotechnical
- Hydraulics
- Operations
- Pavement/Materials
- Planning
- Policy
- Program Mgmt. Analysis

**Potential Learning and Development Opportunities**

- National Discipline Learning & Development Seminars (GS 11-13)
- Discipline Support System (all employees)
- Support Staff Certificate Dev. Programs (GS 4-7) (Employees with less than 18 months of Federal service)
- Support Staff Advanced Certificate Programs (Employees with more than 18 months of Federal service)
- Support Staff Videoconferences (all employees)
- National Highway Institute (NHI) courses (all employees)
- Resource Center Technical Courses (all employees)
- Just-in-Time Video/Web-based Seminars (all employees)
- Academic Study Program (all employees)
- Temporary Developmental Assignment Clearinghouse (all employees)
- Professional Association (all employees)

- Leadership is everyone’s business - Learning is everyone’s responsibility -
7 Critical Elements

- Discipline champion and teams
- Proactive discipline workforce management
- Networking and communication
  - Online CoPs, JIT learning, seminars
- Learning and development seminars
- Role and job expectations
- Discipline reference library for new entrants
  - Field guides, job expectations
- Strategic planning to develop the discipline
Succession Management

- Evaluate employee trends in conjunction with risk assessment

- Supportive practices:
  - Knowledge interviews/knowledge books
  - Mentoring, shadowing, rotational assignments, double filling
  - Communities of practice
  - Development assignments
  - On-boarding practice for the agency and the position

- Training:
  - mandatory and foundational, business unit focused, role/function focused, technical discipline focused

- After action reviews
Retention

- Competitive salaries
- Resources to do the work
- Environment for work: office, location, telework
- Degree of freedom/innovation
- Opportunities to network
- Opportunities for professional development
- Awards and recognition
  - Reward desired behaviors
  - Encourage peer recognition
  - Don’t wait: timely recognition
  - Understand motivations and design strategies with these in mind
Networks and Communities

- Networks are essential for an organization’s success
  - enable staff to access and share knowledge within and between work units
  - foster communication across geographically dispersed offices
- Communities of Practice are a proven KM element and should be considered as legitimate business functions
- Managers need to be aware of how policies impact informal networks in place – positively or negatively

KM Program Objective: Identify, support and nurture networks of people sharing information to benefit the organization
Fostering Communities & Collaboration

- Knowledge Mapping
- Communities of interest/practice
  - Formal
  - Informal
- Fostering collaboration
  - In person
  - Virtual

Lessons Learned

Organization Network Analysis
- A visual map that shows who talks to who and what role they play in a network or group
  - Can be used to gather information about leadership, knowledge transfer, and communication patterns to support succession planning and network needs
FAA vision for a culture of collaboration and continuous learning

Current State

- Legacy of micromanagement and strained relationships
- Lack of cohesion in “culture change” initiatives
- Language and behavior mismatch
- Parochial vs. big picture
- Cautious movement in the right direction but wary of commitment
- Initiatives are slowly taking root

Desired Future state

- Effective and productive working relationships
- Knowledge transfer and shared approaches to managing “culture change”
- Consistent language and behavior
- Common Outcomes
- Clear connection between the strategy and the day-to-day
- Initiatives have taken root and are being institutionalized by staff
## Communities at VDOT

<table>
<thead>
<tr>
<th>Community Type</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best Practice</td>
<td>Develop, validate, codify, index and disseminate proven practices</td>
</tr>
<tr>
<td>Helping</td>
<td>Facilitates informal knowledge sharing, Q&amp;A, mentoring</td>
</tr>
<tr>
<td>Knowledge Stewarding</td>
<td>Collect, select, update, organize, and distribute day-to-day knowledge</td>
</tr>
<tr>
<td>Innovation</td>
<td>Foster innovative ideas and practices</td>
</tr>
</tbody>
</table>
VDOT Network Types

**Strong Networks**
- Institutional
- Functional
- Technical
- Who to Call
- Who Knows What

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**Weak Networks**
- Institutional
- Functional
- Technical
- Who to Call
- Who Knows What

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**Isolation**
- By Choice
- Lack of Support by Management
- New to Organization
Capturing and Applying Knowledge

- Knowledge capture is a structured process of eliciting and documenting key insights, decision rules, methods, and lessons learned from experienced individuals.
  - High functioning organizations will consider knowledge capture from contractors and other working partners.
- Captured information is only valuable to an organization if it is applied:
  - Prioritize capture efforts based on value to be added
  - Capture in a manner that promote reuse
  - Ensure that potential users understand context and implications
  - Define and communicate expectations for using the information

✓ KM Program Objective: Support capture of critical knowledge so that it can be retained and applied
A variety of approaches are considered depending on resource availability, time constraints and complexity of the knowledge.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Description</th>
<th>Best Used When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Shadowing/Apprenticeship</td>
<td>Successor works on the job with expert</td>
<td>• Successor identified&lt;br&gt;• Time and resources can be freed up to work together for several months</td>
</tr>
<tr>
<td>Short Term Assignment</td>
<td>Successor spends 2-4 weeks intensively doing work w/expert</td>
<td>• Successor identified&lt;br&gt;• Clarity on knowledge areas to focus</td>
</tr>
<tr>
<td>Knowledge Books</td>
<td>Modeling of knowledge from in depth interviews. Champion actively socializes the book.</td>
<td>• Champion clearly identified&lt;br&gt;• Little documentation on critical knowledge exists</td>
</tr>
<tr>
<td>Job &amp; Knowledge Mapping</td>
<td>Detailed mapping of job responsibilities and knowledge needed to complete tasks/role</td>
<td>• Successor identified to review map with SME&lt;br&gt;• Successor has some existing knowledge</td>
</tr>
<tr>
<td>Documentation</td>
<td>Required Tech Reports identified for documentation.</td>
<td>• Deep understanding of knowledge not required&lt;br&gt;• Experts remaining with some knowledge and experience on the topic with existing docs avail</td>
</tr>
</tbody>
</table>
Tacit Knowledge Capture

MASK Method

(\textbf{M}ethod for \textbf{A}nalyzing and \textbf{S}tructuring \textbf{K}nowledge)

- Technique for representing a field of knowledge through models
- Models are created by eliciting knowledge through interviews
- Originally developed by Jean Louis Ermine at the French Commission de l’énergie Atomique (CEA)
The Result: Knowledge Books

Collection of Models
- Navigated through a Table of Contents
- Links guide the reader through the knowledge
- Mirrors thought patterns of the expert in their voice

Advantages
- Aggregates core know how in a single place
- Approachable PowerPoint format
- Used by both the expert and newcomers
MASK Modeling Fundamentals

A Body of Knowledge can be reflected in 6 points of view
Improving Access to Information

- KM contributes to and is supported by effective information management
- Organizations seeking to improve information access will benefit from an overall blueprint for information organization that considers multiple sources, content types and needs
  - A strategic architecture allows for a decentralized approach to information collection and use
  - A place for everything, and everything in its place
- Management of policies and procedures using a common language across organizational silos, with governance on updates is a successful practice.

KM Program Objective: Ensure employees and working partners can conveniently share and access information needed to operate effectively.
A guide to help you determine where to store your electronic business related and personal content.

Do you need help deciding the right storage for your content?

Company Computer
SharePoint (Team Sites)
Shared Network Drive
Kraft Video/Audio Library

MediaBin
Enterprise Archive
Outlook
BYOC/Contractor Computer

Virtual Storage
Detached Storage Devices
Siemens R&D Suite
Other

Eliminated Options
SharePoint is an online collaborative document management system where employees can easily share, search, and collaborate with active content or ideas. Employees can upload, check out, control versions of content from anywhere at anytime.

SharePoint is the most popular and widely used collaborative tool, but it is not free. Regions and Business Units incur a yearly charge for content stored on SharePoint. Do not let this distract you, because the benefits outweigh costs.

SharePoint is only to be used for active/relevant company content. No personal content should ever be placed in SharePoint.

**Types of content to store on SharePoint:**

- Active Microsoft Office documents (Excel, Word, PowerPoint, Access, Visio, Project, OneNote, etc.)
- Adobe Files (.pdf, .ai, Captivate files)
- Photoshop files
- Company related images (non-marketing related, safety images, logos, company photos, team outing photos)
- Flash files
- HTML

**Rule:** If it should be shared, it should be on SharePoint.

**When to save content here:**
- Content that changes or updates on regular basis (e.g., agendas, timelines, status updates, vendor presentations)
- Collaborating on draft documents
- Saving "original" document versions
- When others need to use/access your document
- Non project/technical related content (e.g., Org excellence, safety, mentoring, etc.)
- Frequently used reference materials (e.g., manuals, training modules, audits, etc.)
- If you have confidential information, ensure access is restricted to individuals on a "Need to Know" basis and utilize document encryption

**When to not save content here:**
- When content contains personal identifiable information (PII)
- Content that does not need to be retained for business or legal purposes. See Record Retention Guidelines
- R&D & O Only: Content that is already or should be in Siemens R&D Suite
- R&D & O Only: Contracts and agreements should be moved to the R&D Agreements Document Library

**Pros:**
- Numerous SharePoint Site Type options to fit your need (Click to learn about site types)
- Document versioning and workflow routing capabilities
- Excellent search capabilities using Enterprise Search
- Tag content for improved findability
- Security and permission controls to grant and limit access
- Access anywhere and from any device
Information Sharing and Collaboration

- Lack of information sharing and collaboration increases risk of failures
- A high functioning organization supports collaboration internally and externally
- One of the most effective ways to establish the trust needed for collaboration is face to face interaction
- Timely and meaningful employee recognition is an easy way to encourage information sharing and collaboration
- Collaboration across organizational silos often requires facilitation to establish a common language
What’s in a Knowledge Repository?

Example from FAA

• The business **Context** in which the learning occurred
• Key **Learnings** and insights in the form of FAQs, guidelines, checklists, best practices and stories – both local and common
• Guidance on what needs to be addressed at each stage of the **Process**
• Links to **People** who have the experience to contribute
• A reference **Library** of documents that might save you time
• A **Network** to manage, validate and renew the asset content
• **Feedback** from the end user to keep it relevant and alive
Content Management by Topic/Subject

R&N Capabilities Table

(What is it?)
For each topic/technology area identify resources

<table>
<thead>
<tr>
<th>Tools, Resources, Assets</th>
<th>Technical Material Experts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Manuals, Data</td>
</tr>
<tr>
<td></td>
<td>Computer applications</td>
</tr>
</tbody>
</table>

Training Courses

Helpful Resources

Such as external groups or documents

Key Contacts
• KM can add value to any organization by building a culture of learning, innovation and collaboration.

• KM practices seek to overcome the many factors that can work against learning, innovation and collaboration:
  • Lack of organizational commitment and alignment
  • Stretched resources
  • Information hoarding and silos
  • Resistance to change
  • Low tolerance for risk taking

• Organizations can work culture change into leadership messaging, recruiting, hiring, onboarding, and performance evaluation.

• Culture shift is difficult and time consuming, but can provide long-lasting results.
<table>
<thead>
<tr>
<th>EXCELLENCE</th>
<th>SAFETY</th>
</tr>
</thead>
<tbody>
<tr>
<td>did not explore all technical possibilities (e.g., images)</td>
<td>did not empower safety organization to serve as a “check”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEAMWORK</th>
<th>INTEGRITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>did not communicate effectively across org. boundaries</td>
<td>did not speak up when something was wrong</td>
</tr>
</tbody>
</table>

**FAILURE OF VALUES**
Expression of Values

<table>
<thead>
<tr>
<th>EXCELLENCE</th>
<th>SAFETY</th>
</tr>
</thead>
<tbody>
<tr>
<td>developed new techniques during investigation</td>
<td>only said “go” once it was safe</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEAMWORK</th>
<th>INTEGRITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000+ people working at facilities across the country</td>
<td>all opinions welcomed and heard</td>
</tr>
</tbody>
</table>
# Steps to Changing the Culture

<table>
<thead>
<tr>
<th>Responses to Failures</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standards and policies</td>
<td>Revised procedures and requirements for project management; revised governance model</td>
</tr>
<tr>
<td>Communications</td>
<td>Procedures to encourage dissenting opinions; case studies on lessons learned; senior leadership focus on communications</td>
</tr>
<tr>
<td>Training and development</td>
<td>NASA Academy (individual training, team support, organizational learning)</td>
</tr>
<tr>
<td>Technical excellence</td>
<td>NASA Engineering and Safety Center; NASA Safety Center; technical authority</td>
</tr>
</tbody>
</table>
Maturity Ladder

- Limited scale
- Part time staff
- Independent initiatives

- Formal responsibilities
- Leadership
- KM activities across silos
- Improved value to business functions

- Corporate strategy
- Lead staff and senior management
- Dedicated funding
- Value across the organization
- Platform for credibility and innovation
Integrating Knowledge Management

- KM is about intent and strategy to manage the ecosystem of knowledge in an organization
- KM should be connected to business outcomes
  - Link to the organization’s mission
  - Address critical “pain points” and/or serves the needs of major projects or initiatives
  - Solve “wicked” problems requiring cross-functional collaboration
- KM techniques should be aligned with business goals and embedded into business practices
- Metrics showing value of KM for business are critical to demonstrate program success
- Policies and procedures, and employee performance criteria should reflect the organization’s values for learning and knowledge sharing
Resourcing KM

• Every worker in an organization is developing and managing knowledge
• Establishing a KM lead ensures that knowledge is retained and leveraged for strategic use
• KM works best if the KM lead is a member of the senior leadership team
• Organizations must dedicate resources to KM in order to make progress; but this does not necessarily mean hiring new staff
• Start where you are. What are your critical needs?
• Sustainability of KM depends on it being institutionalized in the organization and delivering clear benefits
• Organizations can demonstrate a commitment to KM by including it in their strategic plan, and defining specific implementation steps
Cultivating Knowledge Management

- Advances in Transportation Agency Knowledge Management [NCHRP 20-68A,12-04], May 2014
- TRB KM Task Force (TRBKM.org)
- NCHRP Study 20-98 (KM Guidance Doc).
  - Report anticipated Fall 2015.
- AASHTO Special Committee on Workforce Planning & Development – Resolution approved by BOD in 2011

Begin where you are.
Scan Team Members

For more information, please contact:

- **John Halikowski** (Chair), Arizona DOT  
  jhalikowski@azdot.gov

- **Anne Ellis**, Arizona DOT  
  AEllis@azdot.gov

- **Lee Wilkinson**, Iowa DOT  
  Lee.Wilkinson@dot.iowa.gov

- **Becky Burk**, Maryland SHA  
  BBurk@sha.state.md.us

- **Leni Oman**, Washington State DOT  
  OmanL@wsdot.wa.gov

- **Thomas Elliott**, FHWA-NHI  
  Thomas.Elliott@dot.gov

- **Arthur "Turo" Dexter**, USDOT-FTA  
  arthur.dexter@dot.gov

- **Maureen Hammer**, Virginia DOT  
  Maureen.Hammer@VDOT.virginia.gov

- **Frances Harrison**, Spy Pond Partners, LLC (SME)  
  fharrison@spypondpartners.com
Additional information for consideration
DOT Recommendations

Leadership

- DOT CEOs should request and obtain a briefing on knowledge management from a KM expert or a peer agency with an established KM program.
- DOT CEOs and other senior managers should demonstrate engagement and commitment to KM principles.
- DOT CEOs should provide documented direction to ensure that their organizations follow established successful practices for managing corporate information.
DOT Recommendations

Leadership

• DOTs should establish metrics for KM linked to critical business outcomes. The agency performance management function should be involved in developing a framework for KM metrics.

• DOTs should consider integrating organizational learning, collaboration and information sharing values into leadership training.

• Managers and supervisors should engage their work groups to establish the level of trust needed for productive collaboration.
DOT Recommendations
Human Resources and Intellectual Capital

- DOTs should develop a briefing book describing the different organizational functions and who the key people are within each of these functions. This can be used for orienting new employees (including new CEOs).
- As employees progress through their careers, DOTs should track training provided and skill sets acquired in order to make best use of available talent.
- DOTs should integrate KM-related criteria into their employee performance evaluations.
- DOTs should assign new employees a “buddy” to assist with their orientation to the agency.
DOT Recommendations

Recognition for Collaboration and Information Sharing

• DOT hiring practices and position descriptions should support the agency’s values for collaboration and information sharing.

• Senior management should provide Human Resources, hiring managers and selection panels with a clear understanding of the qualities the organization seeks.

• DOTs should consider establishing an award for employees and teams that model exemplary collaboration behavior.

• DOTs should consider developing a program for new and existing employees to communicate organizational values and desired behaviors.
DOT Recommendations
Fostering Networks and Communities of Practice

• DOTs should develop and make available searchable expertise directories.
• DOTs should establish communities of practice that enable employees to exchange information and share knowledge.
• DOTs should identify and document existing formal and informal networks or communities that are in place and make this information widely accessible, especially for new employees.
• DOTs should develop policies for incorporating employees into networks based on their primary discipline. DOTs should encourage and reward employee participation in communities of practice.
DOT Recommendations
Knowledge Capture and Application

• DOTs should develop and support processes to ensure available knowledge is applied, teams learn from experience and key lessons are captured for future use.

• These processes should occur:
  • peer reviews (before a project or initiative),
  • action reviews (during a project or initiative), and
  • retrospective reviews (after a project or initiative) to ensure that available knowledge is applied, teams learn from experience, and key lessons are captured for future use.

• DOTs should capture stories and perspectives of technical experts and leaders
  • Internal and external to the organization
  • Invite individuals to spread and create podcasts or videos that can be shared across the organization.
DOT Recommendations

Knowledge Capture and Application

• DOTs should capture institutional knowledge by
  • looking at significant events in their history,
  • examining and discussing what led up to these events and how they were handled, and
  • making this information available for future use.

• DOTs should establish criteria to prioritize what information and knowledge is to be captured and shared.

• DOTs should develop standard contract language to ensure that information and knowledge is captured from contractors and other working partners.
DOT Recommendations

Information Management and Dissemination

• DOTs should institute information management practices to ensure that important information can be found in a timely and reliable manner.

• DOTs should develop a blueprint for information organization that considers multiple sources, content types and needs.

• DOTs should engage their business units in developing and maintaining common terminology and definitions.

• DOTs should review their policies and procedures to eliminate duplication and inconsistencies, and utilize a common language.
<table>
<thead>
<tr>
<th>Knowledge Management Competency</th>
<th>Possible Maturity Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Strategy &amp; Leadership</td>
<td>✓ KM program development and planning; ✓ Knowledge policies and procedures; ✓ KM business plans and strategies; ✓ KM program implementation; ✓ Complex project management; ✓ KM Team leadership; ✓ Secure and manage KM funding; ✓ Manage KM interventions</td>
</tr>
<tr>
<td>Knowledge Assessment &amp; Evaluation</td>
<td>✓ Conducts knowledge quality assessments ✓ Performs knowledge audits ✓ Generates knowledge maps and organizational knowledge inventories ✓ Supports the peer review and provenance tracking of knowledge ✓ Conducts knowledge management maturity assessments ✓ Supports construction of individual, group and organizational knowledge portfolios</td>
</tr>
<tr>
<td>Knowledge Management Competency</td>
<td>Specific Competency Indicators</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------</td>
</tr>
</tbody>
</table>
| Intellectual Capital Management | ✓ Identification of intellectual capital attributes important to the organization  
✓ Development of IC assets through individual learning, group learning, and organization learning programs and events  
✓ Creation and support of individual knowledge portfolios for organization’s staff  
✓ Nurturing and development of subject expertise  
✓ Tracking and valuation of organization’s intellectual assets  
✓ Workforce and talent planning and forecasting  
✓ Competency management at the organization level |
| Knowledge Operations            | ✓ Promotes the use of knowledge in decision making and operational processes  
✓ Ensures that knowledge is integrated into business rules  
✓ Monitors the quality of knowledge  
✓ Ensures that wherever knowledge and intelligence exist they are available in the business operation context  
✓ Ensure that tacit procedural knowledge is accessible wherever the process is performed  
✓ Ensure that procedural knowledge is accessible to any staff performing the process |
<table>
<thead>
<tr>
<th>Knowledge Management Competency</th>
<th>Skills and Indicators Referenced</th>
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| Organizational Culture and Communication | ✓ KM training  
✓ Promote adoption of KM activities  
✓ KM outreach and awareness programs  
✓ KM standards alignment  
✓ KM liaison with external communities  
✓ KM related rewards and recognition programs  
✓ KM stories and business narrative promotion  
✓ KM publicity and |
| Collaboration and Communities | ✓ Supports communities of practice  
✓ Helps to establish and nourish networks  
✓ Relationship building with professional societies, partners, clients, and stakeholders  
✓ Promotes the flow of knowledge across networks  
✓ Encourages the creation of new and relevant knowledge in CoPs  
✓ Fosters adoption and use of social collaboration tools  
✓ Facilitates knowledge sharing and trust building in multicultural communities |
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| **Organizational Learning**   | ✓ Identifies and develops learning events to ensure availability of internal competencies when and where they are needed by the organization  
|                                | ✓ Ensures appropriate learning in the onboarding process of new employees  
|                                | ✓ Promotes an effective learning environment  
|                                | ✓ Promotes the use of informal and formal learning methods  
|                                | ✓ Promotes learning opportunities for individuals, groups and the organization  
|                                | ✓ Advises on instructional design for internal learning events and external capacity building  
|                                | ✓ Promotes development of extended learning networks |
| **Knowledge Technologies**     | ✓ Building applications and delivering technology solutions  
|                                | ✓ Seamless integration of knowledge technologies into the business context  
|                                | ✓ Configuration of virtual environments and applications to support knowledge workers wherever they are working  
<p>|                                | ✓ Development of technologies to support knowledge creation, capture, exchange, discovery and preservation |</p>
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| Knowledge Asset Management      | ✓ Creation and capture of knowledge and information assets;  
ex. Ensures that knowledge is accessible wherever and whenever it is needed  
ex. Enforces knowledge asset management life cycle, from knowledge elicitation and codification through knowledge retention  
ex. Support development and maintenance of knowledge organization systems |
| Knowledge Architecture          | ✓ Designs working environments – physical and virtual – to support knowledge work  
ex. Ensures free flow or knowledge across sources  
ex. Ensures open access to knowledge resources  
ex. Promotes access to knowledge and experts throughout and beyond the organization  
ex. Designs effective knowledge discovery tools and methods |