

Linking Knowledge Management Practices to NPP Organizational Performance

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Outline

1. Findings from the Literature (KM Basics)
2. Importance of KM in the NPP Context
3. KM Links to Organizational Performance
4. Research Question and Approach
5. Summary



Findings from the Literature (KM Basics)



Many Definitions of Knowledge

- '*...information that is contextual, relevant and actionable...*' (Soliman and Youssef, 2003)
- '*...what the firm knows in terms of best practices...*' (Szulanski, 1996)
- '*...mix of experience, values, contextual information, and expert insight...*' (Davenport and Prusak, 1998)
- '**capacity for effective action**'



Types of Knowledge

- Knowledge as a resource and a process (Assudani, 2005)

Knowledge as a resource that can be possessed by firm

Knowledge as a process of leveraging resources – *'what the firm does and how it does it'*

Knowledge as an asset that can be created by the firm

- Knowledge at the individual, group or organization level (Hedlund, 1994)
- Tacit vs. explicit knowledge (Nonaka and Takeuchi, 1995)
- Factual, conceptual, procedural and metacognitive knowledge (Anderson et al., 1998)



Characteristics of Knowledge

- Knowledge is contextual and it can be re-used
- Benefits of knowledge obtained only if it is applied
- The value of knowledge may change over time
- Knowledge as to be renewed or maintained
- It can be difficult to transfer, capture, distribute
- It is developed through learning processes
 - depends on memory, past experience, expertise, knowledge transfer mechanisms, opportunities
- Facilitates effectiveness and “sense-making”
- Knowledge enables higher learning
- Creation and utilization enhanced with technology

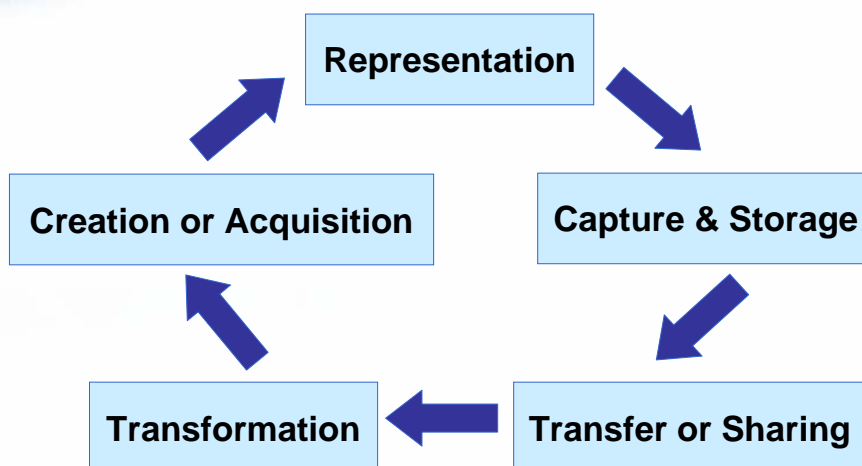


Knowledge Management Definitions

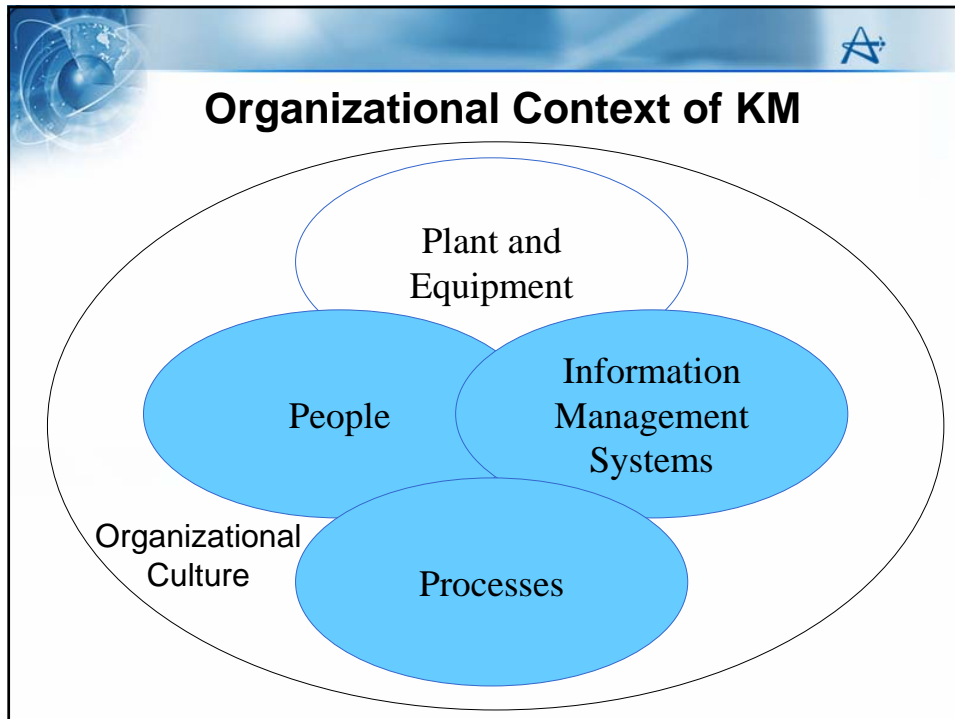
- *'...the processes that govern the creation, dissemination, and utilization of knowledge...'* (Newman, 1992)
- *'...managing the organization's knowledge by creating, structuring, dissemination and applying it to enhance organizational performance...'* (O'Leary, 1998)
- *'...process to acquire, organize, and communicate knowledge of employees so others may be more effective in their work...'* (Alavi and Leidner, 1999)
- ***'...organizing and optimizing K-processes'*** (Andriessen, 2004)




Knowledge Management Processes



Hedlund (1996)



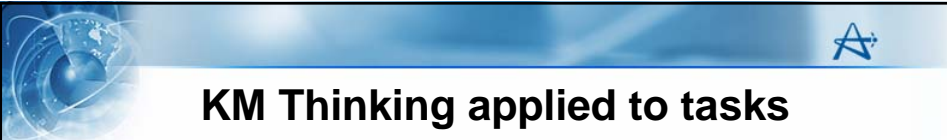
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- The diagram, titled "Knowledge Management Benefits", lists six key advantages of KM. It features a large outer oval labeled "Organizational Culture" on the left. Inside this oval are four overlapping light blue ovals: "Plant and Equipment" at the top, "People" on the left, "Information Management Systems" on the right, and "Processes" at the bottom. A small blue star icon is in the top right corner of the slide header.
- Promote creating new knowledge and innovation
 - Reduce costs of being effective and increase innovation
 - Preserve existing knowledge
 - Increase collaboration and K-sharing to enhance the skills
 - Increase productivity by making knowledge accessible
 - Enable a "pro-active learning and decision culture"
 - helps staff do the right things, and do them right!



KM as an integrative theory...


KM has elements of:

- Information Systems and Information Theory
- Business Process Re-engineering
- Quality Management Principles
- Organizational Behavior Theory
- System Engineering Principles
- Human Resource Management
- Intellectual Capital Theory
- Innovation Management
- Communications Theory
- Organizational Learning Theory
- Human Psychology and Cognitive Process Theory
- Transaction Cost Theory

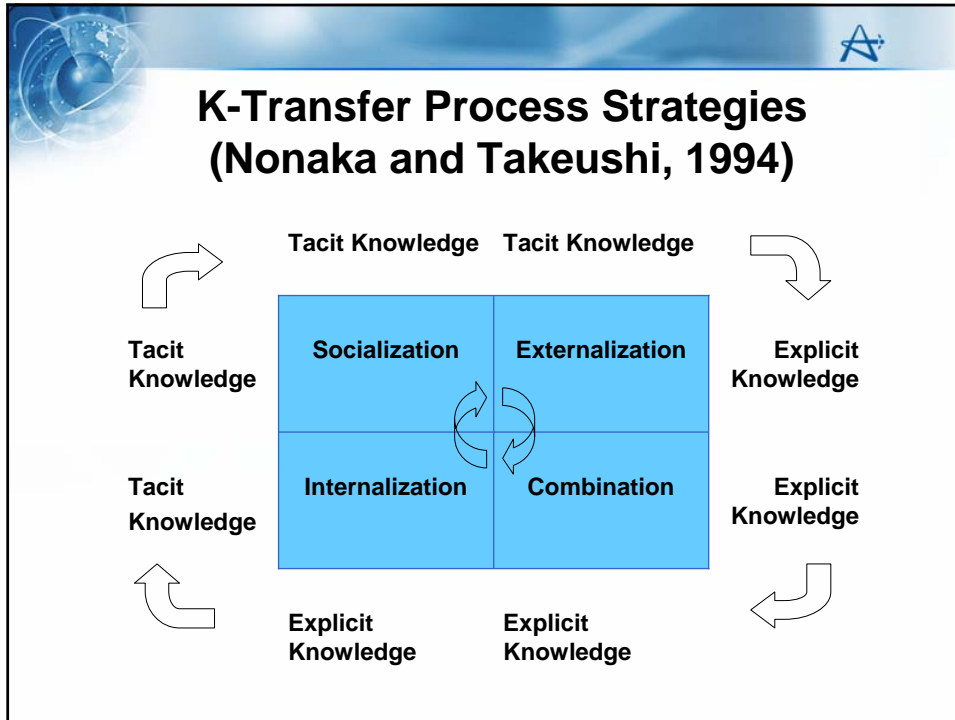


KM Thinking applied to tasks

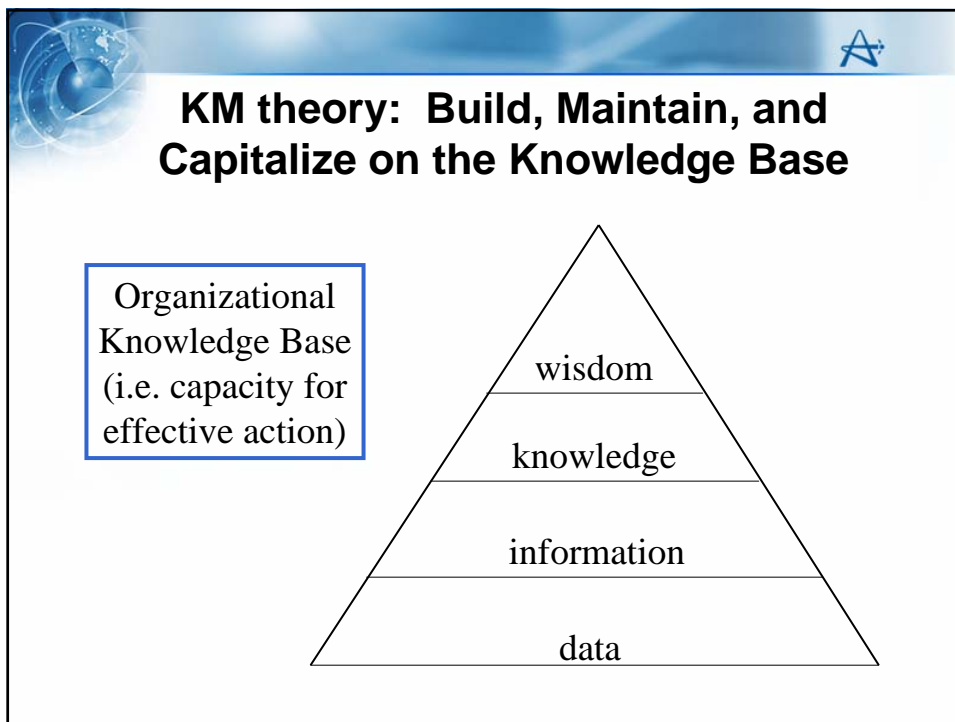
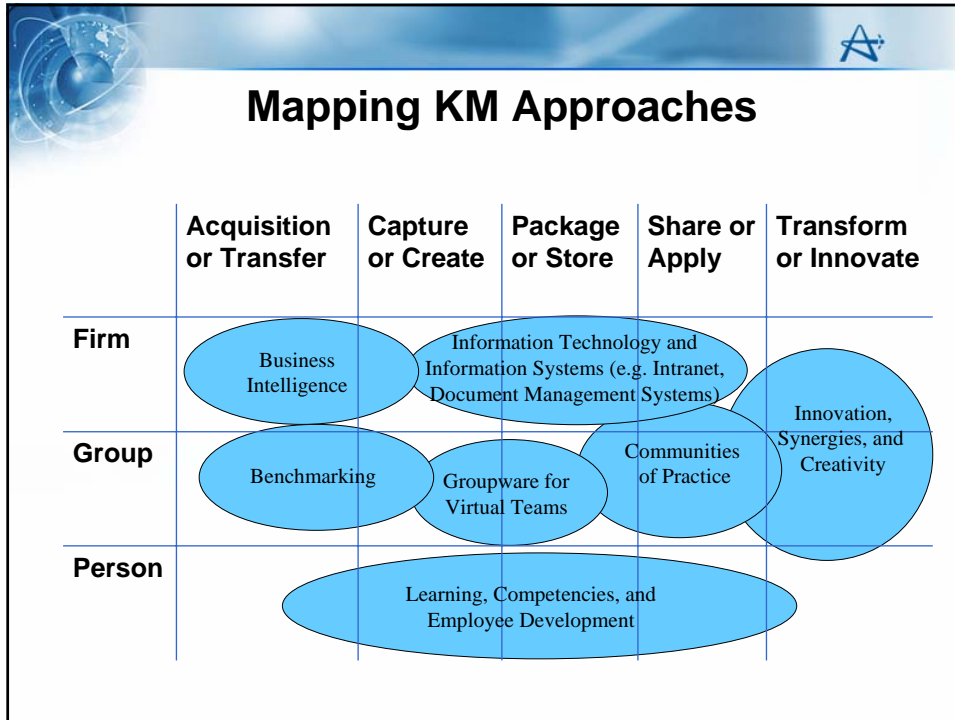
- What are the critical K-processes?
- What are the characteristics of the relevant knowledge needed?
- Who has or should have this knowledge?
- What mechanisms are needed for the generation and utilization of this knowledge?
- What organizational conditions, processes, and changes are needed to make it work? (structure, incentives, culture etc.)

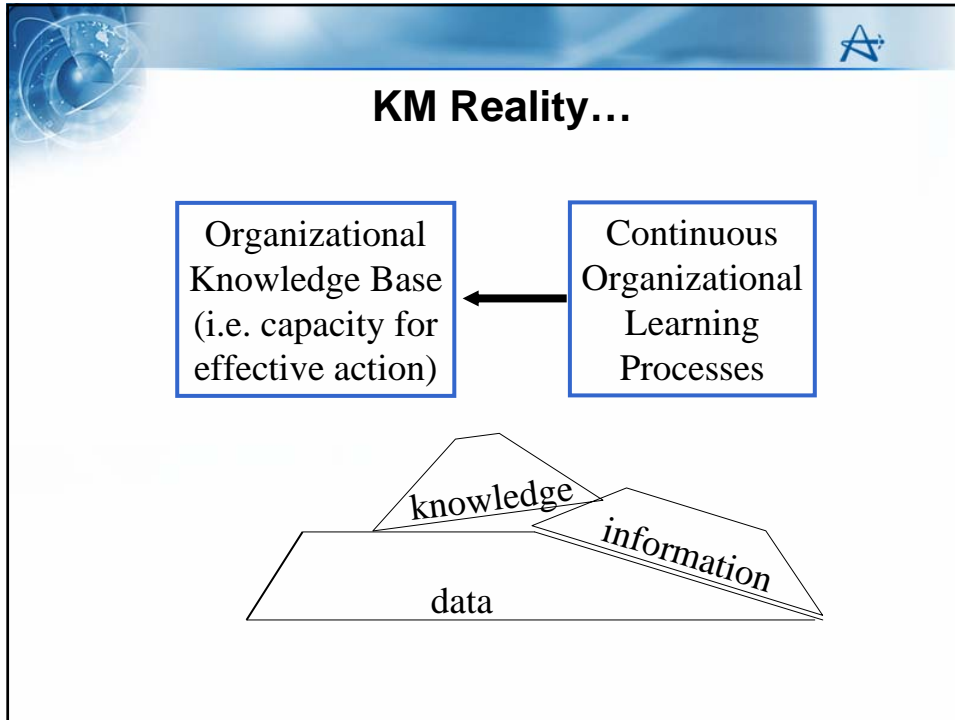


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graph TD; expertise[expertise] --> work_activity[work activity]; information[information] --> work_activity; participants[participants] --> work_activity; processes[processes] --> work_activity;
```




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- Examples of KM Initiatives**
- Knowledge retention/sharing:**
 - e.g. the use of intranets for online access to documents, manuals, or procedures
 - Knowledge transfer via technology licensing:**
 - e.g. implementation of a new enterprise application software (EAS) system
 - Methods to assess or retain core skill-sets:**
 - e.g. programs to manage the loss of key skills due to attrition
 - Initiatives focused on knowledge transformation**
 - e.g. codification of safety, quality, work procedures, or training material






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- Examples of KM Shortcomings**
- HR does not understand “core competencies” needed in engineering
 - IT not aware of the strategic business value of specific files/records (information assets)
 - Responsibility for updating work procedures not clear
 - Information produced without understanding why (for who, how used)
 - Experts are too busy to mentor junior staff
 - Same information maintained in many places
 - Data captured but not in a form it can be used
 - IT/IS Systems won't shared data
- The slide features a decorative blue header with a globe icon on the left and a stylized 'A+' logo on the right.



The solution: Implement a Knowledge Management System

What is a KMS?

- an integrated and coordinated approach to affect the management of knowledge (Davenport et al. 1998)



Importance and Context of KM in NPPs



NPPs have had KM for a long time...

- **Equipment reliability programs**
- **Systematic approach to training**
- **Configuration management of design basis information**
- **Documented operational procedures**
- **Plant work management systems**
- **Outage planning systems**
- **Pre-job briefing**
- **Document management systems**
- **Etc.**



Why KM is a “Hot Issue” for NPPs

Maturing industry:

- Attrition has highlighted vulnerability to loss of tacit knowledge (knowledge retention needed)
- Concern over the “pipeline” of new NPP k-workers



Aging fleet of plants and need for refurbishment:

- Design basis information critical (must be up to date)

Need for the next level of productivity gains:



- deregulation and competition
- rising operating costs
- move towards “lean” operations and maintenance
- opportunities arising from new technology

Awareness that other industries doing more and benefiting

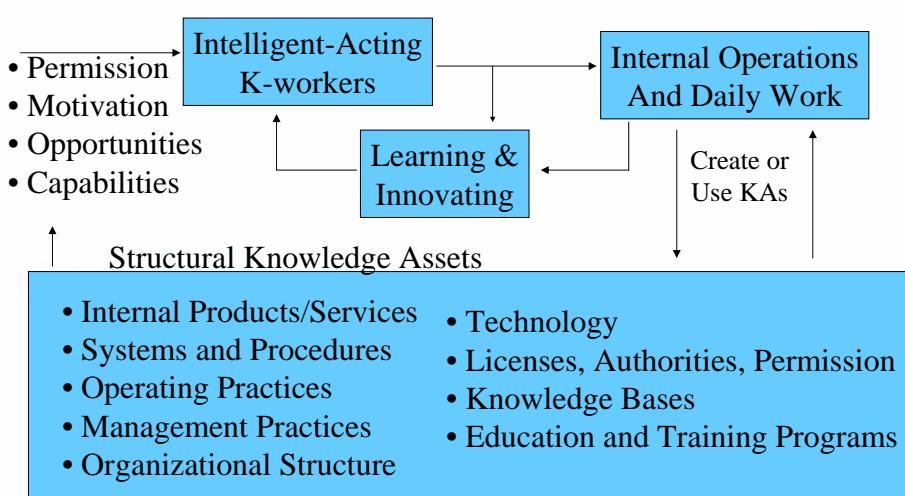



Why KM is Challenging for NPPs

- a complex technology base
- long technology & plant life cycles, high capital intensiveness
- a need for life-cycle asset management strategies that are knowledge-driven
- dependence on multi-disciplinary technologies, expertise
- competing operational objectives
- need for simultaneous integrated coordination of complex physical and human (socio-technical) systems
- potentially high hazards managed to low tolerable risks
- a regulated industry environment
- configuration management between “design basis” and “real plant state” and “documentation”

NPPs are K-Driven Organizations (adapted from K.M. Wiig, 2000)



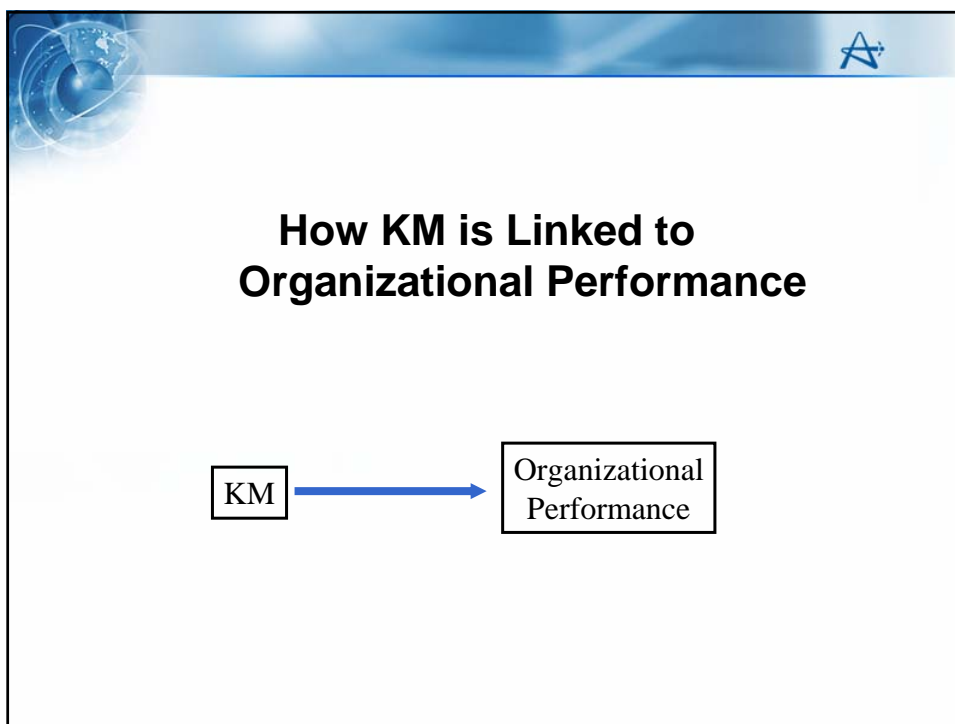
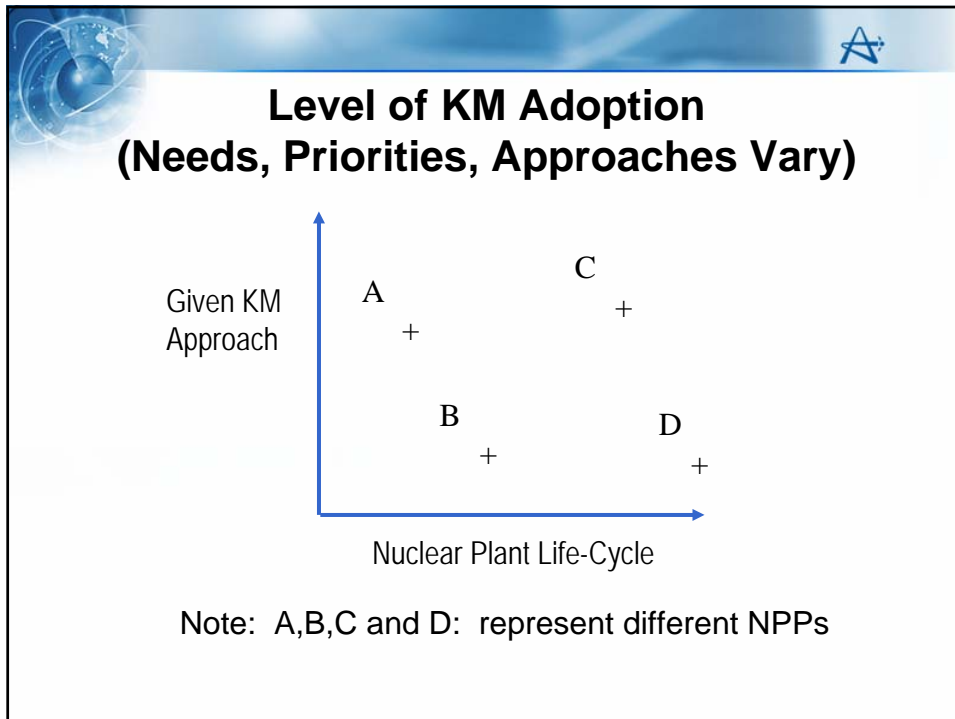
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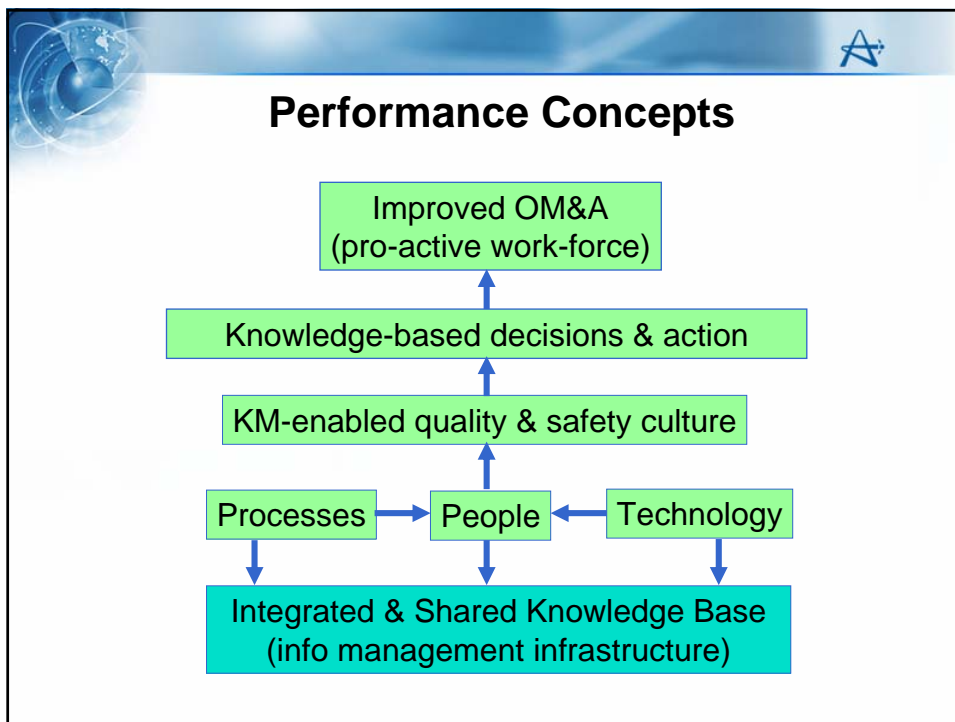
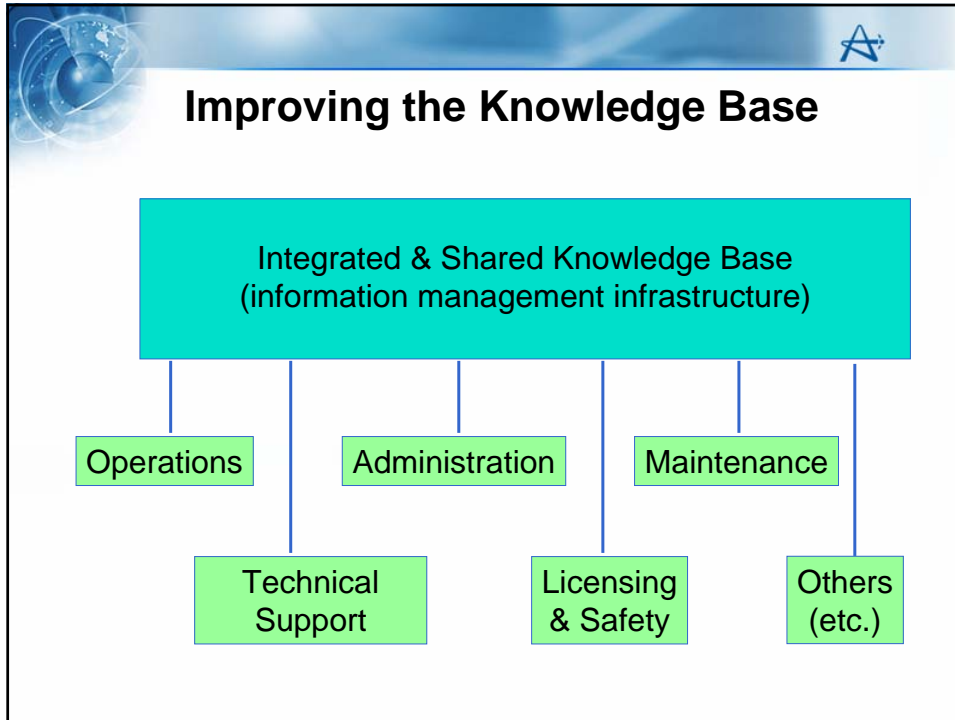
graph TD
    subgraph Inputs
        P[• Permission]
        M[• Motivation]
        O[• Opportunities]
        C[• Capabilities]
    end
    subgraph KAs [Structural Knowledge Assets]
        IP[• Internal Products/Services]
        SP[• Systems and Procedures]
        OP[• Operating Practices]
        MP[• Management Practices]
        OS[• Organizational Structure]
        T[• Technology]
        LA[• Licenses, Authorities, Permission]
        KB[• Knowledge Bases]
        ET[• Education and Training Programs]
    end
    KAs --> IA[Intelligent-Acting K-workers]
    IA --> IO[Internal Operations And Daily Work]
    IO --> LI[Learning & Innovating]
    LI --> IA
    IO --> KAs
    KAs --> IO
  
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The diagram illustrates the flow of knowledge and operations in NPPs. On the left, four factors (Permission, Motivation, Opportunities, Capabilities) influence Intelligent-Acting K-workers. These workers engage in Internal Operations And Daily Work, which leads to Learning & Innovating. Learning & Innovating then feeds back into Intelligent-Acting K-workers. Additionally, Internal Operations And Daily Work interacts with Structural Knowledge Assets, which are used to create or use Knowledge Assets (KAs) that are fed back into the operations.

Structural Knowledge Assets:

- Internal Products/Services
- Systems and Procedures
- Operating Practices
- Management Practices
- Organizational Structure
- Technology
- Licenses, Authorities, Permission
- Knowledge Bases
- Education and Training Programs








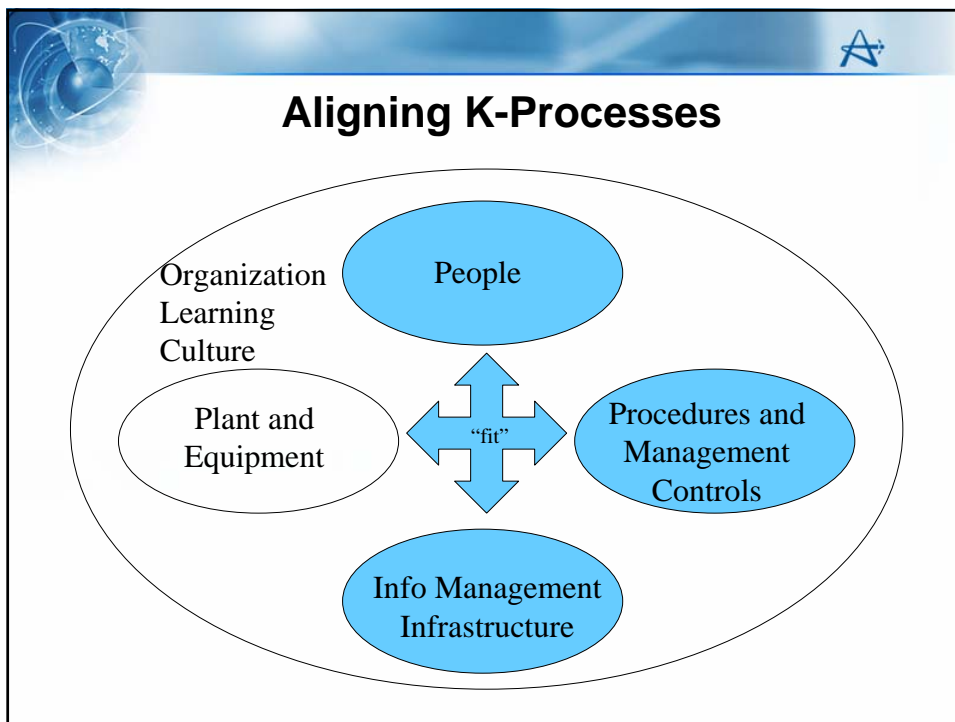
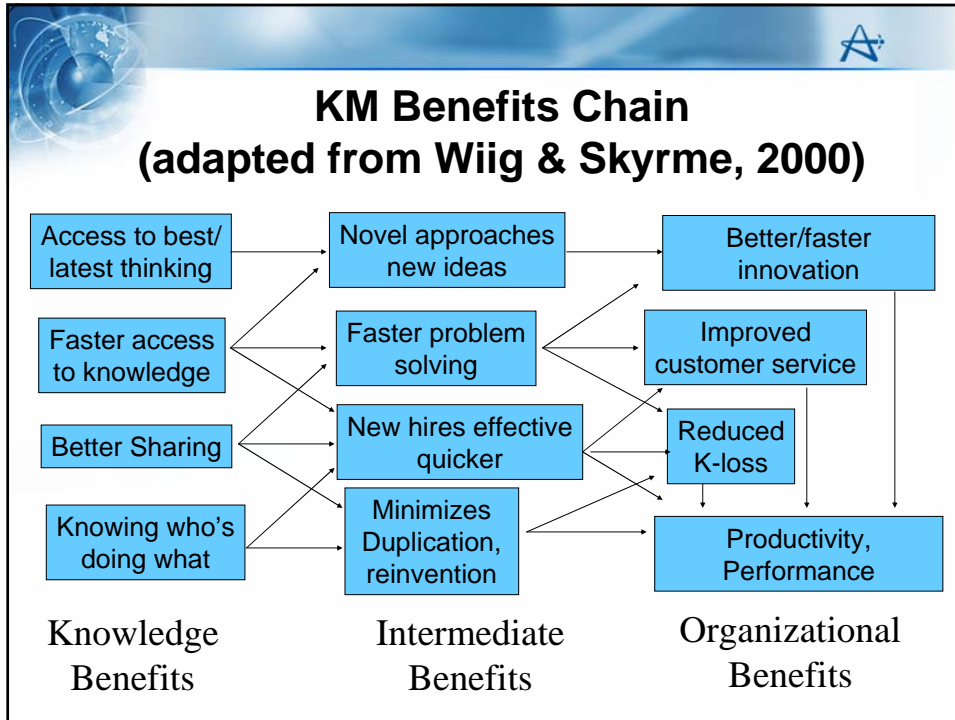
KM Links to Performance

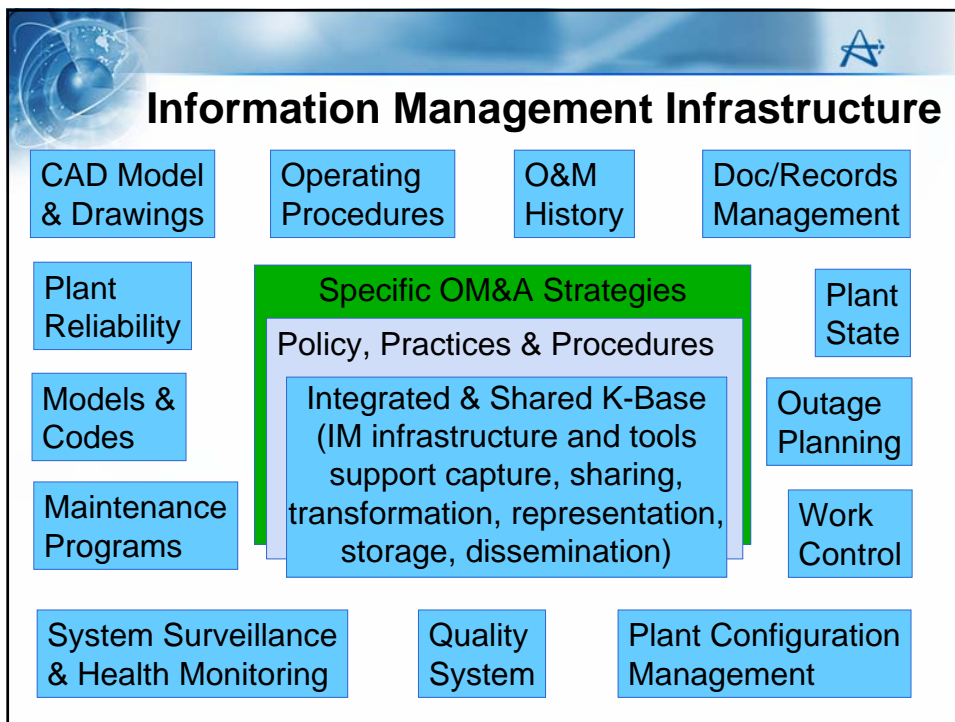
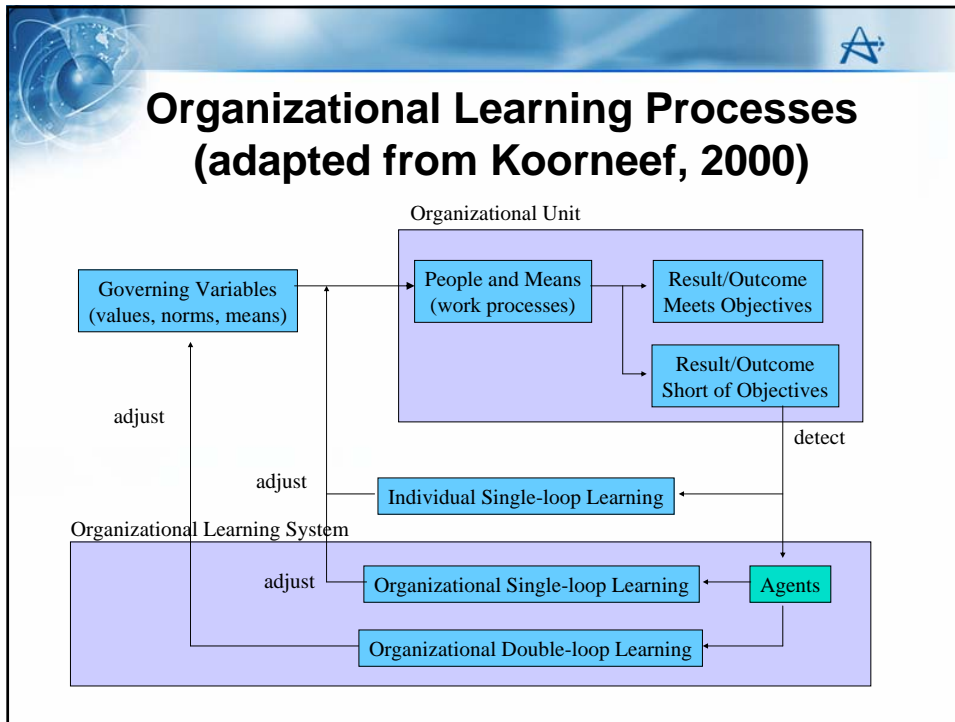
- Performance is the result of focused work/effort that achieves objectives and produce value
- Work is achieved by the use of the firm's resources
- Decisions and actions determine what, how, when, where, and why work activity is performed
- Decisions and actions are driven by need, but also by know-how, capacity, information and knowledge.
- Information and knowledge must be obtainable, acquired, relevant, correct, current





Links to Performance (cont'd)

- Effectiveness and efficiency with which work/effort is performed depends to a large degree on
 - data, information, & knowledge availability
 - capacity and willingness to learn, share
 - skills and experience of employees
- This in turn depends on the adequacy of the “flows and stores” of data, information, and knowledge:
 - knowledge sharing, conversion, and transfer
 - Knowledge storage and retention
 - Knowledge acquisition
 - Knowledge utilization

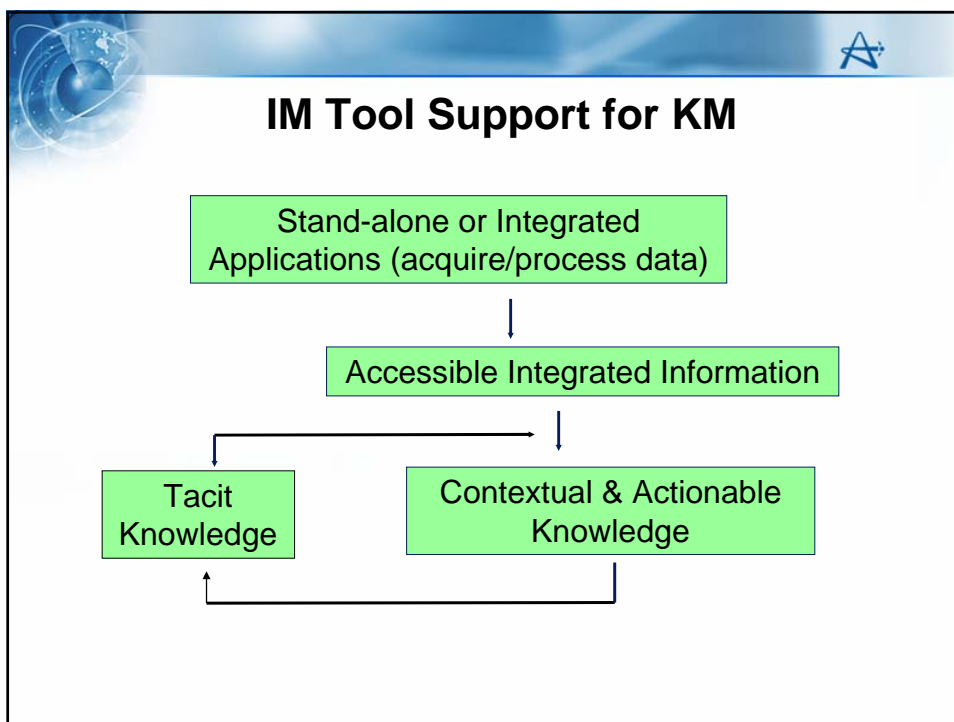


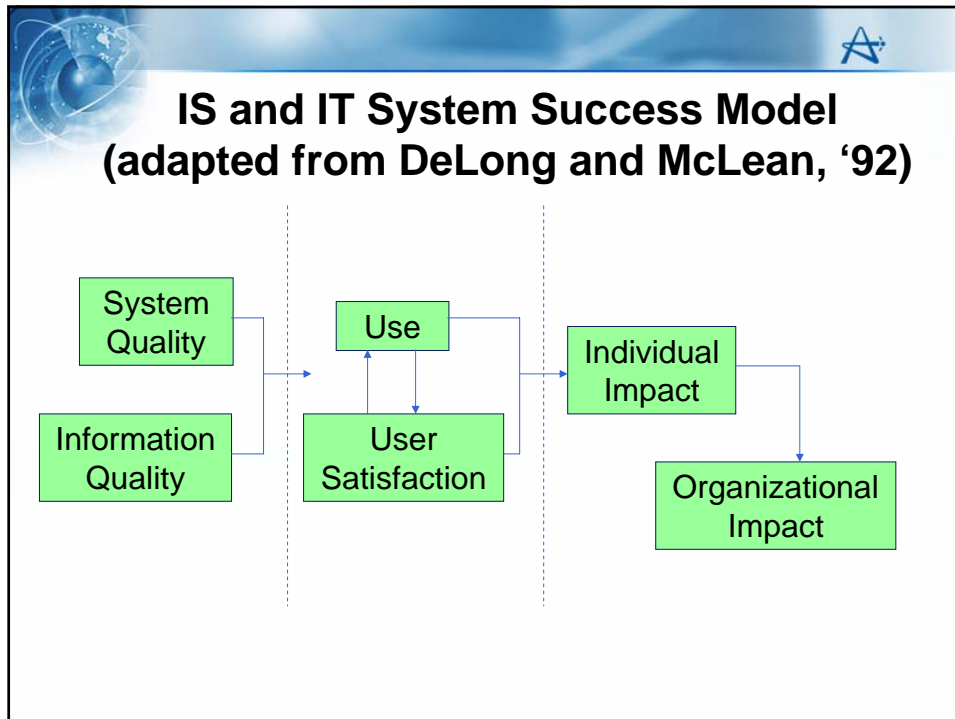




Importance of IM Systems/Tools

- Permit means of data/information management or conversion:
 - Capture, transfer, organize, store/archive
 - Provide interpreted or interpretable information
- Aid in knowledge generation (capture and learning, innovation):
 - Plant system patterns and behaviors
 - Test and verify assumptions, premises
- Can capture tacit knowledge in “decision support” or process, procedure, and task support tools:
 - Rules, constraints, sequences, inter-dependencies, guidance, limits and constraints







The slide contains text under a blue header with a globe icon on the left and a stylized 'A+' logo on the right. The text is organized into two sections: 'Research Question:' and 'Research Approach:'. The 'Research Question' section contains a single bullet point asking if KM improves organizational performance of NPPs. The 'Research Approach' section contains four bullet points detailing the study's methodology: empirical study of NPPs (survey), measuring KM practices, measuring organizational performance, and looking for correlations.

Research Question:

- Does KM improve organizational performance of NPPs ?



Research Approach:

- empirical study of NPPs (survey)
- measure extent and maturity of KM practices
- measure organizational performance
- look for correlations

Many KM Assessment Approaches

- *Knowledge Management Performance Scorecard*, de Gooijer (2000)
- *Knowledge Management Assessment Tool (KMAT)*, Arthur Andersen
- *The International Most Admired Knowledge Enterprises (MAKE) Award*, Teleos and The KNOW Network
- *Knowledge Management PAS 2001: A Guide to Good Practice*, British Standards Institute
- *Frid Framework™ for Enterprise Knowledge Management*, by Canadian Institute of Knowledge Management
- *KM Roadmap to Success*, American Productivity & Quality Centre
- *Interim KM Standard AS 5037(Int)*, KM Standards Australia
- *European Guide to Good Practice in Knowledge Management*, European Standardisation Committee
- *Intangible Assets Monitor*, Sveiby (1997)

Example Measures of KM Practice

Savings due to knowledge re-use

Knowledge user complaints & satisfaction

Network building

Data Availability, Accessibility, and Usability

Information maintenance

Time to create new knowledge

Use of Mentoring

extent of employee utilization of intranet resources

Rate of new idea generation, utilization

Information Integration

Contribution to knowledge bases

Information Quality

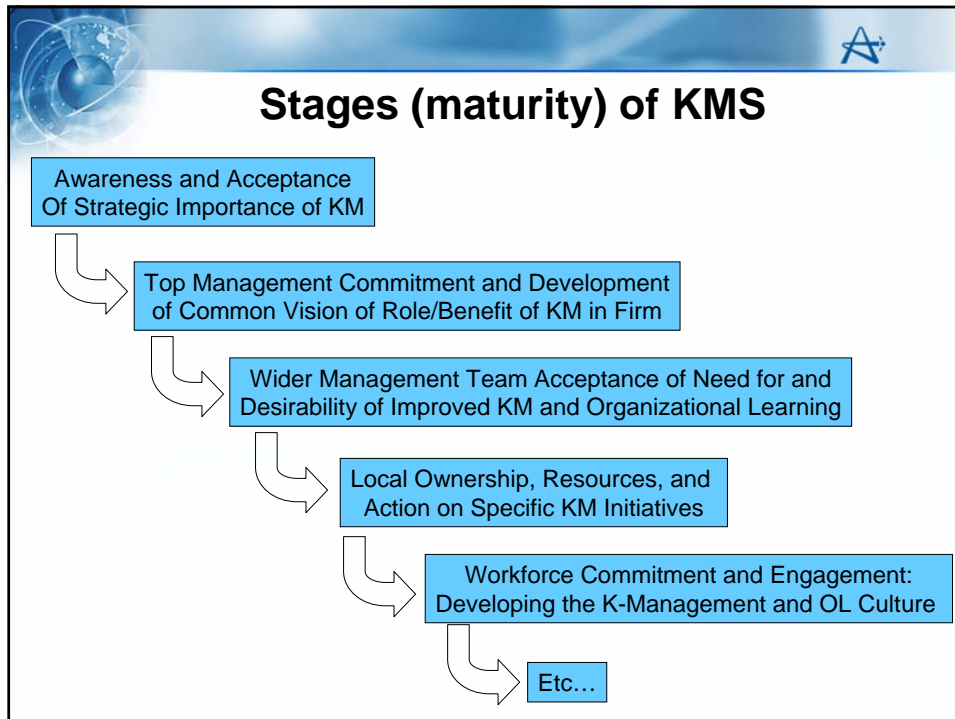
Information Sharing

Competence maintenance

K-Gaps

KM Culture

K-utilization



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- Key Factors for implementing a KMS**
- It is widely recognized in the literature that implementing a successful firm-wide KMS depends on five components:
 - Leadership support
 - Technological infrastructure
 - Supporting culture (values, beliefs, commitment)
 - Organizational processes
 - Performance measurement and feedback
 - Measures exist for each



Defining Performance Measurement

- ‘...the acquisition and analysis of information about the actual attainment of company objectives and plans, and about factors that may influence this attainment...’
(Kerssens-van Drongelen and Cook, 1997);
- ‘...the process of determining how successful organizations or individuals have been in attaining their objectives...’ (Sinclar and Zairi, 1995).

- ‘...**assessing the level to which a goal is attained**’
(Dwight, 1995)



Measuring Organizational Performance

Typical Measures:

- Productivity (output)
- Efficiency (output/input)
- Effectiveness (utility, benefit)
- Quality
- Safety
- Reliability
- Cost

Focus of Measures:

- Individual
- Team/Group/Unit
- Organizational
- Processes
- Systems and support systems



Summary

- KM is an important strategic issue for NPPs
- KM is difficult and challenging
- KM recognized as an important driver of sustained organizational performance
- Information management tools and infrastructure are important (leverage K-processes)
- An integrated approach to KM is needed
- KM thinking and principles need to become part of the organizational culture
- A better understanding of the link between KM practices and organization performance is needed
- Research is ongoing: a survey of NPPs is forthcoming



Thank you !

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