Knowledge Management
IAEA Program and Activities on NKM

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Presentation topics

• Introduction to Knowledge Management
• Nuclear Knowledge Management
• IAEA Program and Activities
  ➢ Documents and Guidance
  ➢ Education and Networking
  ➢ Products and Services
• Summary
IAEA Mandate, Secretariat, Programme and Budget
What is Knowledge Management?

![Diagram showing knowledge management processes]

- **Information/Data**
  - Analysis/interpretation
  - Knowledge
  - Education, Training & Preservation
  - Users

**R&D**
- Creation

**Dissemination**
- Application

**Organizational Knowledge Creation (SECI Model)**
- **Socialization**
  - Sharing and creating tacit knowledge through direct experience
- **Externalization**
  - Articulating tacit knowledge through dialogue and reflection
- **Internalization**
  - Learning and acquiring new tacit knowledge in practice
- **Combination**
  - Systemizing and applying explicit knowledge and information

I = Individual, G = Group, O = Organization, E = Environment
Some Key Words

- **Data**: facts, concepts or instructions
- **Information**: data that are processed to be useful; provides answers to "who", "what", "when", and "where" questions
- **Knowledge**: application of **data** and **information**; provide answers “how” and “why” questions
- **Have Knowledge** = Have capacity to understand and give a meaning to data and information – *insight and experience*
- Intelligence and Wisdom
More Key Words

Three types of Knowledge

**Explicit knowledge**: can easily expressed in writing in documents, drawings, calculations, designs, databases, procedures and manuals

**Implicit knowledge**: can be written down but which has not yet been written down

**Tacit knowledge**: can NOT be written down and is obviously the most difficult to capture
Knowledge Management

Strategies and practices used in an organisation to identify, create, represent, distribute, and enable adoption of insights and experience.

Business Process and Practices
• Business administration
• Human resource management
• Information science
• Information system
• Library

Knowledge and expertise is constructed in many different ways (spiral, social process)

Spiralling Knowledge process interaction between “explicit” and “tacit” knowledge
Takeuchi and Nonaka, Japan (1995)
Knowledge Management

Knowledge Management is an integrated, systematic approach to identifying, acquiring, transforming, developing, disseminating, using, sharing, and preserving knowledge, relevant to achieving specified objectives.

- Definition from IAEA Glossary -

“Knowledge management enables the creation, distribution, and exploitation of knowledge to create and retain greater value from core business competencies”

- HSK, Switzerland Nuclear Safety Inspectorate -
Nuclear Knowledge
a remarkable achievement of human development
Nuclear Knowledge

- **Long-term** developed and accumulated
- **Complex** technologies from basic nuclear science to practical applications
- Remarkable **investment** from governments (public money)
- **Security, non-proliferation** and **safety** concerns, international obligations
- Nuclear technologies is **knowledge** based and relied on skilled workers and their know-how

Knowledge - People, Technology, Processes
NKM Characteristics

Knowledge - People, Technology, Processes
Nuclear Knowledge Stakeholders

- **Government** including Regulators
- **Industry** - Designers, vendors, utilities, operators, suppliers, consultants, and support organisations
- **Training** and **Education** institutions
- Research and Development (R&D) organisations
- Public and Non-Governmental Organisations (NGOs),
- **Local** community
- **International** organisations

Knowledge - People, Technology, Processes
## Levels of Nuclear Knowledge

<table>
<thead>
<tr>
<th>Type of Knowledge</th>
<th>Typically Required by</th>
</tr>
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<tbody>
<tr>
<td><strong>Know-What</strong> (Understanding what is needed for effective decisions)</td>
<td>Managers, Plant Owners, Policy-makers</td>
</tr>
<tr>
<td><strong>Know-How</strong> (Application of knowledge)</td>
<td>Operators, Regulators, Suppliers, Constructors</td>
</tr>
<tr>
<td><strong>Know-Why</strong> (Generation of knowledge)</td>
<td>Designers, Developers, National Laboratories, Universities, Vendors, Regulators</td>
</tr>
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Distribution of Disciplines for the Nuclear Workforce
The “Other than Nuclear” Challenge

2-year Associate Degree Backgrounds

4-year Degrees
Other Engineering Disciplines

Mechanical Engineers
Chemical Engineers
Engineering Physics
Engineering Technology
Non-licensed Operators
Mechanical Systems
Instrumentation & Control
Maintenance
Rad Protection
Electrical Systems
Chemistry
Electrical Engineers
Nuclear Engineers

Nuclear Power Institute, Texas A&M
Distribution of jobs by fields of activity

Need of skills for NPP Design, Construction, Operations, Dismantling,…
goes beyond pure nuclear education and training

Électricité de France SA (EDF)
Effective NKM System

Organizational Culture

- With appropriate skills, experience, attitude and motivation

people

technology

processes

Knowledge - People, Technology, Processes
Need to Manage Nuclear Knowledge

- Aging Workforce
- Retirement
- Loss of knowledge and experience
- Nuclear safety
- Loss of innovation, R&D, Education and Training
- Imbalance of nuclear knowledge

Needs to build knowledge base in countries introducing NPP
Evolution of IAEA’s NKM Program

OVERALL TRENDS


KM DEMAND GROWTH

NKM DEMAND GROWTH

PROVIDING SERVICES AND SUPPORT
DEVELOPING METHODOLOGY
PROMOTING NUCLEAR KNOWLEDGE MANAGEMENT
ANALYZING NEEDS

KM STRATEGY AND IMPLEMENTATION

KM CULTURE

International Atomic Energy Agency
NKM Program Strategy

**DEMANDS**

1. Develop Methodology and Guidance
2. Facilitate educational networks
3. Develop pilot projects

**ACTIONS**

1. Transfer NKM to MS through workshops, schools, assist visits, TC projects
2. Establish and facilitate nuclear E-Learning networks
3. Create advanced knowledge products

**OBJECTIVES**

1. Integrate NKM in Management Systems
2. Promote NKM Culture in Member states.
3. Enhance innovative nuclear education
Three Main Axes

1. **Documents and Guidance** Methodology and guidance for implementing NKM
2. **Education and Networking** Facilitating education and training for nuclear science and technology
3. **Knowledge Products and Services** Supporting knowledge maintenance, analysis and integration
1. Publications
“Status and Trends in Nuclear Education”

Government-University-Industry interaction

- Vocational Pipeline
  - Vocational/Technical Schools
  - TRAINING
    - Skills Certificate Licence
    - Knowledge Degrees BS, MS, PhD, Eng.
  - Professionalism
  - Competent Workers
    - NPP
    - Regulation
    - R&D
    - Education
    - Etc.

- Professional Pipeline
  - Universities
  - EDUCATION
  - Employers
Documents to come ....

- Nuclear Knowledge Management Basis
- NKM for Waste Management Organizations
- Core competences in Nuclear Engineering
- Innovative Methods and tools in Nuclear Education
- NKM for Universities
- Best practices and Lessons learned in NKM
2. Education and Networks

Networking education promote regional and interregional cooperation:

• To provide a forum to discuss policies and strategies for nuclear education and training,

• To share best practices and lessons learned,

• To share educational experience, material and resources.
Projections by region
Asian Network for Education in Nuclear Technology

Objectives:

- Sharing nuclear information and knowledge relevant to nuclear education and training;
- Providing expert assistance and review services to members as needed;
- Serving as facilitator for communication between ANENT members and other regional and global networks.
ANENT Group Activities

E-learning Platform Development
Republic of KOREA, UAE

Utilization of the Platform
INDONESIA, Mongolia, Philippines, Malaysia

Education Material Development
JAPAN, China, Lebanon, Mongolia, Sri Lanka, Thailand

Enhance Nuclear Knowledge Management systems in Member States
INDIA, Jordan, Philippines, Thailand, Vietnam

Liaison and Communication
JORDAN, All

Coordination Committee
Chairperson
Mr Hendriyanto Haditjahyono, Indonesia
Vice Chairperson
Ms Nguyen Thi Yen Ninh, Vietnam

Secretary IAEA
Latin American Network for Education in Nuclear Technology (LANENT)

www.cnea.gov.ar/lanent
Hosted by the National Atomic Energy Commission of Argentine (CNEA)
AFRA-Network for Education of Nuclear Science and Technology (AFRA-NEST)

afra-nest.gaecgh.org
Currently hosted at a sub-domain of Ghana Atomic Energy Commission (GAEC)
E-learning is a powerful method for education and training that deserves further attention, it’s a way forward...

For teachers and students

• New and more **opportunities**
• Vast availability of **best quality** resources
• **New approaches** to teaching and studying
• Learn from **best practices** and **experience**
IAEA supported Cyber Learning Platform

Portal (CMS; Content Management System)
http://clp4net.iaea-nkm.org

CLP4NET

Moodle-based LMS (Learning Management System)
http://lms.iaea-nkm.org
E-Learning course and material in common interest of MSs

Energy Planning

Multimedia of Nuclear Reactors Physics, Technical Univ. of Catalonia

Knowledge Management

“Scientific and Technical Challenges in Nuclear Power Development” National Research Nuclear University (NRNU)

Development of regional nuclear generating capacities

E-Book on Nuclear Medicine standardized by Asian School of Nuclear Medicine

E-Textbook on Nuclear and Ionizing Radiation Technologies

International Atomic Energy Agency
3. NKM Assist Visits

Technical Support Organizations, Regulatory Bodies, Nuclear Education, Operational Organizations

International Experts

IAEA staff

WANO Experts

Experts from technical support organizations and regulatory body
NKM Assist Visits - Objectives

• Facilitate transfer of practical KM methodologies and tools
• Provide specific **consultancy services** to address NKM-related issues
• Assist formulation of requirements and action plan related to KM
• Help identification of own KM maturity levels by **NKM self-assessment**
• Senior & middle management involvement
KM Assessment Criteria

To help identify strengths and limitations in the overall KM strategy

1. Policy/Strategy
2. Human Resource Planning and HR Processes
3. Training and Human Performance Improvement
4. Methods, Procedures & Documentation Processes for Improving KM
5. Technical (IT) Solutions
6. Approaches to Capture/ Use Tacit Knowledge
7. KM culture/ Workforce Culture Supporting KM

radar/spider diagrams for each category
KM Assist Visits - Achievements
Summary

Knowledge Management

- Data, Information, Knowledge
- Explicit and Tacit Knowledge
- To create, capture, preserve, transfer, use
- NK is unique in many ways
- Element of NKM: People, Process and Technology

- IAEA’s Role and NKM Programme
  - Publications
  - Education Networking in Asia, LA and Africa
  - Cyber Learning Platform and e-Learning courses
  - KM Assessment Criteria
  - www.iaea.org/nuclearenergy/nuclearknowledge/
www.iaea.org/nuclearenergy/nuclearknowledge/
Thank you for your attention!

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Challenges to Capture/ Use Tacit Knowledge

- Tacit knowledge is in the heads of experts.
- Experts find it difficult/ impossible to describe.
- Experts tend to be busy.
- Tacit knowledge has a limited life (~5-10 y max)
- Experts can be replaced.
- You cannot force experts to “give away” knowledge.
How to Capture/ Use Tacit Knowledge

- Develop Taxonomies
- **Identify** critical knowledge areas
- **Harvest** critical knowledge: Interview, videos, seminars, story telling, documents
- **Concept mapping**
- **Communities of Practice**
- Coaching & mentoring: fellowship, rotation of personnel
- Develop a **culture of knowledge sharing**
- Disseminate, transfer, use captured knowledge
• Tacit knowledge is generally more valuable but is difficult to capture
• The solutions require People and Technologies
• A wide variety of techniques work – but be prepared to spend a lot of time and effort on these projects
• Convinced and committed leaders are needed
• It is important NOT to try to capture knowledge from everyone. Focus on critical knowledge based on the results of a risk assessment