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Planning and Execution of Knowledge Management Assist Missions for Nuclear Organizations

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PLANNING AND EXECUTION OF KNOWLEDGE MANAGEMENT ASSIST MISSIONS FOR NUCLEAR ORGANIZATIONS

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FOREWORD

The important role which the IAEA plays in assisting Member States in the preservation and enhancement of nuclear knowledge and in facilitating international collaboration in this area has been recognized by the General Conference of the International Atomic Energy Agency in resolutions GC(46)/RES/11B, GC(47)/RES/10B, GC(48)/RES/13 and GC(50)/RES/13.

The Director General of the IAEA, Mohamed ElBaradei, in his statement to the forty-seventh regular session of the IAEA General Conference 2003, said:

> *"Whether or not nuclear power witnesses an expansion in the coming decades, it is essential that we preserve nuclear scientific and technical competence for the safe operation of existing facilities and applications. Effective management of nuclear knowledge should include succession planning for the nuclear work force, the maintenance of the 'nuclear safety case' for operational reactors, and retention of the nuclear knowledge accumulated over the past six decades".*

In 2005, the IAEA introduced the concept of Knowledge Management (KM) assist missions. The missions were established to:

— Facilitate the transfer of pragmatic KM methodologies and tools.

— Assist Member States considering implementation of nuclear power programmes to integrate KM in their management system from the very beginning.

— Provide specific consultancy services to address emergent problems and long term issues related to KM and associated issues.

— Assist organizations formulate detailed requirements and action plans related to KM.

— Help organizations identify, by self-assessment, their own KM maturity levels against a set of pre-defined criteria.

This report is intended for all participants involved in a KM assist mission and provides general guidance as to the nature of a mission and the means by which a mission is initiated and executed.

Appreciation is expressed to all the participants who contributed to the production of this document. Particular thanks are due to G. Cairns of the United Kingdom for his assistance in the initial preparation of this report and its finalization.

The IAEA officers responsible for this publication were A. Kosilov, and Y. Yanev of the Department of Nuclear Energy.

EDITORIAL NOTE

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CONTENTS

1. INTRODUCTION

The nuclear industry is knowledge based, similar to other highly technical industries, and relies heavily on skilled employees and their know-how. Recent trends such as workforce ageing, declining student enrolment numbers, and the risk of losing accumulated knowledge and experience, have drawn attention to the need for better management of nuclear knowledge. These problems are exacerbated by the deregulation of energy markets around the world. The nuclear industry is now required to significantly reduce its costs in order to compete with generators with different technology life cycle profiles. In many countries, government funding has been dramatically reduced or has disappeared altogether, while the profit margins of generators have been severely squeezed. The result has been lower electricity prices but also the loss of expertise as a result of downsizing to reduce salary costs, a loss of research facilities to reduce operating costs and a decline in support to universities to reduce overheads. The above factors have led to a reduction in technical innovation and a potential loss of technical competences, drawing the attention of all concerned parties to the need for effective strategies and policies for Knowledge Management (KM).

These issues have been recognized as being of key importance for the IAEA, and the General Conference of the IAEA has adopted resolutions on Nuclear Knowledge that request the IAEA to develop corresponding activities. The first resolution, adopted in 2002 was reiterated in 2004 and in 2006. Current activities in KM aim to further increase the level of attention and awareness given to activities for preserving and enhancing nuclear knowledge; to assist Member States to ensure the preservation of nuclear experience and competence needed for the effective and safe use of nuclear energy; to promote the networking of institutions for nuclear education and training; to evaluate the relevance of current programs and activities regarding nuclear knowledge, and to identify approaches aimed at how best to address the problems. The IAEA is implementing a special subprogram on Nuclear Knowledge Management with a focus on the development of guidance for KM, on networking nuclear education and training and on the preservation of nuclear knowledge.

In the IAEA context, knowledge management is defined as:

> *"An integrated, systematic approach to identifying, acquiring, transforming, developing, disseminating, using, sharing, and preserving knowledge, relevant to achieving specified objectives. Knowledge management helps an organization to gain insight and understanding from its own experience. Specific activities in knowledge management help the organization to better acquire, store and utilize knowledge."*

Knowledge management consists of three fundamental components: people, processes and technology. Knowledge management focuses on people and organizational culture to stimulate and nurture the sharing and use of knowledge; on processes or methods to find, create, capture and share knowledge; and on technology to store and make knowledge accessible which will allow people to work together without being located together. People are the most important component. Managing knowledge depends upon people's willingness to share and reuse knowledge.

In 2005, the IAEA introduced the concept of KM missions. The missions were established to:

— Facilitate the transfer of pragmatic KM methodologies and tools.

— Assist Member States considering implementation of nuclear power programmes to integrate KM in their management system from the very beginning.

— Provide specific consultancy services to address emergent problems and long term issues related to KM and associated issues.

— Assist organizations formulate detailed requirements and action plans related to KM.

— Help organizations identify, by self-assessment, their own KM maturity levels against a set of pre-defined criteria (See Appendix I for more details).

This document is written to provide a common framework for KM missions and to provide general guidance for all mission participants.

2. PURPOSE

This document has been prepared to provide a basic structure and common reference for KM missions. As such, it is addressed, principally, to the team members of KM missions and also to the Counterpart requesting a mission. Although not mandatory, the guidelines provided in this document should be used as the basis for all future KM missions.

3. OBJECTIVES OF A KM MISSION

The objectives of a KM mission are to:

— Provide assistance, education and consultancy to Counterparts who want to benefit from the application of good practice KM strategies and techniques.

— Recognise good practice areas where KM is already providing benefits.

— Make recommendations on how KM shortcomings identified in the mission could be rectified or further activities implemented that would derive real business value for the Counterpart.

A KM mission will therefore consider existing good practices and will recommend possible improvement options based on the collective experiences of the mission team members.

Missions are designed to assist the Counterpart in establishing or improving its KM programme. They are not intended to evaluate performance where deficiencies are identified and held open for corrective action.

All information received and retained by team members will be subject to strict control by the Agency and will not be released to others without the written consent of the Counterpart.

4. ADMINISTRATIVE REQUIREMENTS

In principle a KM mission could be requested by any organization of a Member State regardless of the maturity of existing KM provisions.

A KM mission will only be initiated when the IAEA receives a formal request from a Member State at an appropriate government level. All KM missions will require the approval of the Department of Nuclear Energy or Department of Technical Cooperation.

5. SCOPE AND DURATION

The scope of a KM mission will be agreed with the Counterpart and IAEA Team Leader well in advance of the anticipated start date. The KM mission can, in theory, be based upon any of the KM strands discussed in IAEA documentation or via the IAEA Nuclear KM web site (http://www.iaea.org/inisnkm/). Relevant documents include:

— IAEA-TECDOC-1399 - Ageing Workforce: Transfer of Knowledge To The Next Generation [1]

— IAEA-TECDOC-1510 - Knowledge Management for Nuclear Industry Operating Organizations [2]

— STI/PUB/1248 - Risk Management of Knowledge Loss in Nuclear Industry Organizations [3]

— STI/PUB/1266 - Managing Nuclear Knowledge IAEA Proceedings [4]

— STI/PUB/1235 - Managing Nuclear Knowledge: Strategies and Human Resource Development [5]

Counterparts are advised to be aware of the above prior to agreeing the mission details with the Team Leader. A comprehensive list of definitions related to KM can be found in the Annex of this document.

The duration of the mission will typically range from 2–5 working days depending on the nature and complexity of the scope. Longer missions may be possible if multiple locations/sites are to be visited or if broader national KM issues are to be discussed requiring extensive travel.

6. TECHNICAL OFFICER

On receipt of a request for a KM mission, the Director of the Nuclear Energy Department will designate an IAEA staff member with appropriate experience member as the technical officer who will be responsible for:

— Initiating the approval process.

— Coordinating the preparatory work and making the necessary arrangements to conduct a KM mission.

— Establishing liaison with the appropriate Counterparts of the host country who will be the primary point of contact with the team during the mission.

— Nominating a Team Leader for the mission.

— Selecting the members of the team, in consultation with the Team Leader.

— Arranging for a preparatory discussion or meeting with the host country to plan the mission.

— Ensuring the follow-up action plan is fully implemented after the mission is completed.

7. TEAM LEADER

The Team Leader will normally be an IAEA staff member and should be approved by the DDG-NE. The Team Leader will be responsible for:

— Liasing with the Counterpart before the KM mission to agree mission objectives and agenda.

— Selection of mission team members and issuing terms of reference, job description and briefing notes. This is done in conjunction with the IAEA Department of Technical Cooperation which is responsible for the mission contractual arrangements.

— Coordination of the preparation of all presentations and other input material. Of particular importance here is confirmation that the proposed presentations from the Experts reflect the needs of the Counterpart, are consistent and have minimal overlap.

— Coordination of the KM team, including pre-mission team briefing where necessary and assignment of specific duties.

— Representation of the team in the preparatory, entry and exit meetings.

— Management of the mission, including ensuring that objectives are met, liasing with government officials during the KM mission, resolving issues requiring decisions and preparing for the exit meeting.

— Co-ordination of the End of Mission Report and follow-up of any actions needed to support the Counterpart.

— Addressing feedback from the end of mission critique and incorporating any lessons learned prior to the next mission.

— On-going communication with the Counterpart as necessary to maintain good working relationships and to advise of other related KM IAEA initiatives.

8. TEAM COMPOSITION

The size of the team will depend on the scope of the mission which is discussed in Section 5. It could vary, e.g., from two to six members. It is important to have strong membership on the team experienced in the application of KM within the nuclear industry. Such national experts should come from different organizations and countries, if possible, to represent a range of views and experiences. The IAEA members will typically be chosen from the INIS & Nuclear KM Section.

In appointing a KM expert, the following guidelines apply:

— Experts need to be registered with the IAEA by completion of a Personal History Form (PHF). This form is completed by the Expert and is used to establish relevant qualifications and experience.

— The PHF is used by the Team Leader to determine suitability for a mission. The Expert's experience should align with the mission scope and objectives.

— The KM expert must accept the IAEA's specific terms and conditions prior to appointment for a mission.

— Each expert is likely to have, in addition to a particular area of KM expertise, knowledge of national and organizational approaches within his/her home country.

— Knowledge of the host country's language and culture should also be considered.

The final choice of team members will reside with the Technical Officer and the Team Leader. Team members will be selected so as to ensure that a variety of national approaches to KM and implementation is represented.

9. ROLE OF THE COUNTERPART

The Counterpart is the main contact in the organization that requires assistance. In general the Counterpart is responsible for the following activities:

— Initial contact with the IAEA to arrange the KM mission. Informal preliminary discussions should be held with representatives within the INIS & KM Section describing current issues and problems. The request for a formal visit must be made through DDG-NE or DDG-TC.

— Specifying options for the date, time and place of proposed mission meetings and presentations.

— Gathering together and sending to the IAEA background material related to the nuclear organization requesting the assistance. This should include details of general issues and those issues that the Counterpart believes may be solved using KM methodologies or systems. A description of what KM methodologies or systems are currently deployed should also be provided.

— Prior to the mission, establishing current KM maturity in the organization. This is a self-assessment made against the IAEA criteria given in Appendix I. Although this is not mandatory exercise, the IAEA believe that such an assessment will provide valuable insights into current good practice and possible development areas. All information provided will be kept confidential and not passed to others without the consent of the Counterpart.

— Co-ordinating travel and accommodation arrangements for all mission team members and assisting others who may be attending meetings and presentations. Security, health & safety and welfare aspects are very important here.

— Ensuring equipment and meeting rooms are available to support presentations and meetings.

— Liasing with key stakeholders within the organisation to ensure attendance at meetings and presentations as appropriate.

— To complete the mission evaluation proforma (critique) used to establish the applicability and value of presentations and meetings during the visit.

— On-going communication with the IAEA on completion of the mission to provide feedback on the value of the mission and to maintain good working relationships for the future.

10. ROLE OF THE EXPERT

The Expert is selected according to the guidance given in Section 8. The Expert is responsible for the following activities:

— Initial contact with the IAEA to offer services prior to engagement on a mission. This will involve submitting a CV and, at later date, a PHF form.

— Assisting the IAEA Team Leader with the planning of the mission and preparation of the mission agenda.

— Prior to the mission ensuring that any necessary presentation slides and other background material is prepared and ready for use.

— Ensuring that the appropriate security, health & safety pre-checks are carried out. See Section 12.

— Planning personal travel arrangements to and from the host country including obtaining the necessary visas. Within the host country itself, internal travel and accommodation arrangements will generally be the responsibility of the Counterpart.

— During the mission the Expert will give presentations in accordance with the mission agenda and, if required, facilitate workshops and other activities as necessary. See Section 13.

— At the end of the mission the Expert will provide input information for the End of Mission Report. See section 14.

— On-going communication with the IAEA after the mission, as necessary, to maintain good working relationships and to provide availability information for possible future missions.

11. PREPARATION

KM missions are normally planned at least three months in advance of the start date. The Team Leader, Counterpart and Expert are all involved in the planning phase and undertake the activities as outlined in Sections 7, 9 and 10. In summary, preparation involves:

(i) Generation of mission objectives, format and agenda. The mission agenda describes the activities to be carried out together with timescales, locations and the people involved.

(ii) Selection of team members and other resources as necessary.

(iii) Establishing travel and accommodation details.

(iv) Developing presentation slides and other materials for use during the mission. This is the most important part of the mission preparation work for the Expert which may require several hours of research. The objectives and content of each presentation should match

the mission objectives. As general guidance, each presentation should have a duration of between 30 to 50 minutes. This will allow adequate time for questions, overruns and set-up between presentations. The exact structure/content of each presentation is left to the discretion of each speaker but some general pre-requisites need to be considered. For example:

— Is the scope and context of the presentation directly applicable to the issues faced by the Counterpart's organization?

— If KM techniques or methodologies are described, are the source references adequately defined?

— Where case studies are used, is the context and type of end-user organization clearly defined? Are the timescales/costs for the case study project described?

— Are recommendations/conclusions provided?

— Are IAEA logos provided on all presentations?

— Are the presentation slides available for all to copy without Intellectual Property Rights (IPR) or copyright restrictions?

(v) Making arrangements with the host organization being visited to ensure the provision of necessary support facilities such as meeting rooms, computer equipment and interpreters.

(vi) Taking due account of security, health and safety factors relevant in the host country. See Section 12.

12. SECURITY, HEALTH AND SAFETY

Security, health and safety matters are of great importance to the IAEA and as a result care is taken to ensure the safety of all participants during travel to and residence in the host country.

IAEA experts and consultants are required to complete the on-line safety course "Basic Security in the Field (BSITF): Safety, Health and Welfare" and the "Advanced Security in the Field (ASITF)" training course as a follow up to the BSITF, prior to engagement on the first mission. Successful completion of both the BSITF and the ASITF training courses is mandatory for all consultants and experts employed under a SSA before they travel on mission for the a duty station that is in Security Phase I or above.

A separate website has been established to allow consultants/experts to easily access and complete the BSITF and the ASITF courses from any location by logging into http://dss.un.org/BSITF/, http://dss.un.org/ASITF/, by using Microsoft Internet Explorer. This will enable the vast majority of consultants/experts to complete the course and print their certificates prior to their travel.

Individuals who do not have access to the Internet should obtain a copy of the CD-ROM version of the courses, by contacting the office of the IAEA. Individual user id codes and passwords will be provided by the IAEA for access.

On completion of the on-line course a final test must be passed and a certificate will be generated automatically. A printed copy must be issued to the IAEA administrative contact and retained by the Expert. This is valid for three years.

Refresher training using the same user id details as above is recommended at regular intervals but is currently not compulsory.

Medical/hospital insurance is the responsibility of the Expert and should be valid for the country to be visited.

13. THE MISSION

To meet the objectives listed in Section 3, the mission team will be well prepared and fully aware of the KM issues of importance to the Counterpart. The format of the mission will have been agreed in advance (see Section 11) and will normally comprise a mix of presentations, questions and open discussions. In some circumstances a "workshop" environment may be more appropriate. In such cases it may be necessary to prepare practical exercises, organize breakout sessions, conduct panel discussion and similar activities to facilitate effective learning for Counterpart participants.

13.1. Pre-Mission Brief

On arrival, and prior to the commencement of the main session, the Team Leader will hold a pre-meeting to confirm the agenda details and the order/timing of presentations and other activities. This pre-meeting also helps team members get to know each other and understand any gaps or overlaps within the prepared material.

This is also a good time to consider the final deliverable of the mission, i.e. the End of Mission Report (See Section 14 and Appendix II). The Team Leader may decide to allocate specific areas of production to Experts and other members of the mission at this time. This will ensure that all input information is available on request to the author so that the document can be produced in a timely manner.

13.2. Main Session — Introduction

The Team Leader will, in most cases, chair the meeting. The main session will always start with introductions from the mission team, the Counterpart and his representatives. The Team Leader will be responsible for ensuring that the agenda is followed and that the planned timings are maintained. A "mission critique" (See Appendix III) can be handed out at this point to gain feedback from the presentations and other activities planned for the main session.

The Counterpart should, in most cases, start the proceedings with an outline of the organization/plant and the particular issues that are pertinent to the mission. This may include some issues which are not directly related to KM.

13.3. Main session — Presentations

Expert presentations should run to the timings agreed in the agenda and allow time for questions either during or immediately following delivery. Where interpreters are used for presentations, the mission team members should allow reasonable time for translation and vary the content and length of the delivery to suit.

During the course of the presentations and subsequent discussions, individual team members are advised to keep notes on the areas assigned to them, including summaries of their contributions, good practices observed and recommendations for improvement. These notes

will form the basis of presentations and summaries at the exit meeting and also input for the End of Mission Report (See Section 14).

13.4. Main Session — Exit meeting/conclusions

For missions planned over several days, the Team Leader may convene a separate meeting, involving mission team members, to receive input and help formulate conclusions and recommendations for the final day.

On the final day some time will be set aside with the Counterpart and his representatives for an exit meeting to discuss observations, conclusions and recommendations. The Team Leader will facilitate this discussion and will request each Expert to give a summary of his observations and recommendations (see 6 below). As part of this summary, the mission team members will also outline good practices observed during the visit.

The Team Leader will collect completed forms related to the mission critique if applicable.

The Team Leader will formally end the mission, thank all contributors and outline the next stages for the distribution of the End of Mission Report.

13.5. Mission Visits

Most KM missions will involve a visit or tour of the facilities. Although not always focussed on KM, certain aspects of the tour may be relevant to related issues such as people management, culture, business processes and the use of technology etc. Mission members should be aware of these aspects as the information and insights gained can often be relevant to the mission recommendations.

13.6. Basis for Expert Recommendations

Each Expert will have particular knowledge and expertise relating to KM aspects and will use this knowledge to formulate views and ideas as part of the recommendations process. The main cognitive model used will be that of a “gap analysis” between observed practices and good practice assimilated over many years of experience. However, the Expert must take into account the political, social, economic and technical trend information that the host provides. They should recognise that good practice solutions are not necessarily transferable between organizations.

13.7. Documents and Confidentiality

All documents related to the mission, including advance reference material, the presentations of findings, and the report of the mission, including drafts, will be treated in the appropriate manner according to the IAEA's procedures governing the security of information.

14. END OF MISSION REPORT

The objectives of a KM mission are given in Section 3. The End of Mission Report should clearly address all of these objectives and document the team's findings and recommendations, including an action plan for follow-up if this is requested.

On completion of the mission the Team Leader will co-ordinate the draft End of Mission Report. The report will utilise contributions from each team member and summarise the

team's main findings and conclusions, including all good practices and recommendations. The outline structure of the report is shown in Appendix II together with details of the suggested content. The Team Leader will then pass the draft report to the team for final comment before submitting it to the Counterpart within one month of the completion of the mission.

The IAEA will restrict initial distribution to the authorities concerned, the contributors to the report and relevant IAEA staff. Any further distribution will be at the discretion of the Counterpart.

15. FOLLOW UP

At completion of the End of Mission Report, the Team Leader will confirm that all recipients have received a copy of the document and the Counterpart is satisfied with the content and recommendations. It is important that the Team Leader receives prompt feedback from the Counterpart on the benefits of the mission and acknowledgement that the mission has achieved the pre-defined objectives.

Further communication between the Team Leader and Counterpart is recommended to help foster a long term working relationship that will be valuable to all parties. Of particular interest to the IAEA is the ongoing feedback related to mission recommendations (i.e. confirmation of value added or problems of implementation).

APPENDIX I
KNOWLEDGE MANAGEMENT ASSESSMENT TOOL

The self-assessment methodology described here is intended to provide participants, including senior management, with a tool to help identify strengths and development areas in the organization's overall KM strategy.

Individual criteria have been identified that are considered as key elements towards an effective approach to KM. These criteria have been grouped into seven organizational or functional categories, to facilitate the self-assessment, via:

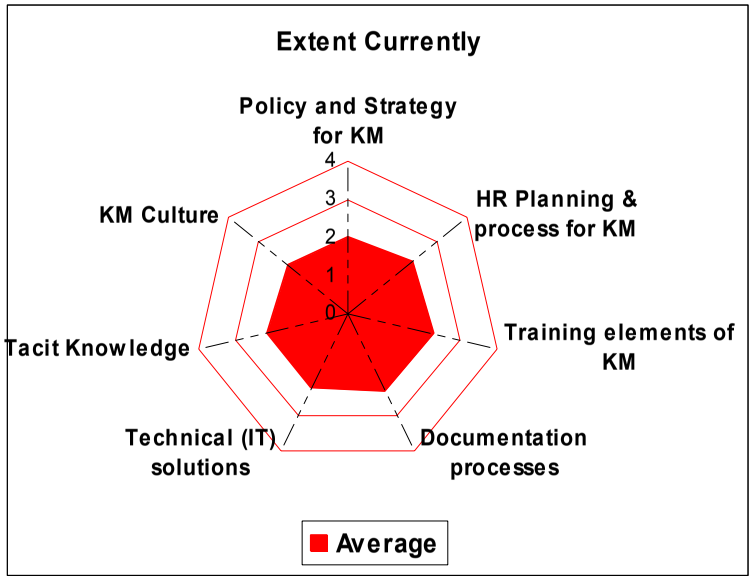
(1) Policy/Strategy
(2) Human Resource (HR) Planning and HR Processes
(3) Training and Human Performance Improvement
(4) Methods, Procedures & Documentation Processes for Improving KM
(5) Technical (IT) Solutions
(6) Approaches to Capture/Use Tacit Knowledge
(7) KM culture/Workforce Culture Supporting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

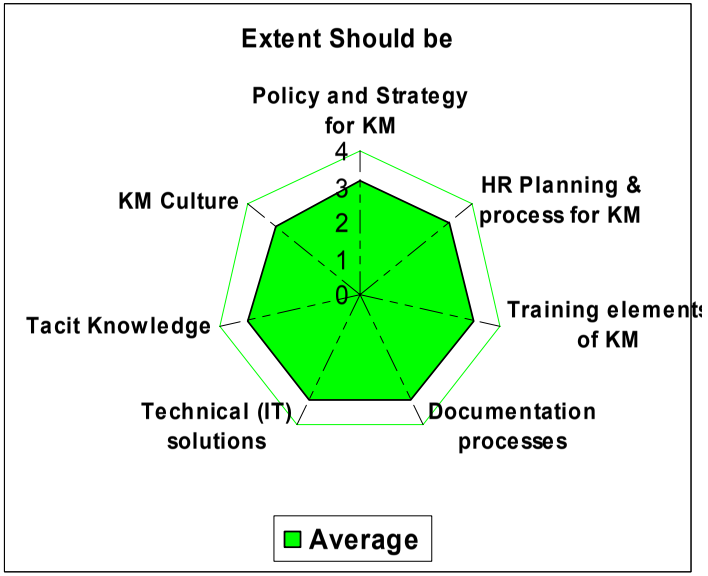
Metrics for the overall self-assessment and for each individual category have been developed as shown below:

KM Self-Assessment Metrics Scoring

Rating	Extent Currently	Extent Should Be
0	Not utilized at all	Not utilized at all
1	To a little extent	To a little extent
2	To some extent	To some extent
3	To a great extent	To a great extent
4	To a very great extent	To a very great extent

A self assessment questionnaire has been developed based on the above seven categories. A Microsoft Excel based tool is also available that is used to facilitate the self assessment process. The tool uses radar/spider diagrams for each of the seven functional categories and at an executive summary level to give management a graphical depiction of current KM strengths and future development areas. An example of the output is given below:





Self-assessment can be used independently by a nuclear operating organization for an internal review, as a prerequisite for a KM assist mission or during a KM assist mission. These criteria are not so much intended to provide a "report card" as they are to assist managers in identifying strengths to build upon and areas for improvement to be addressed in the knowledge management area.

1. POLICY/STRATEGY

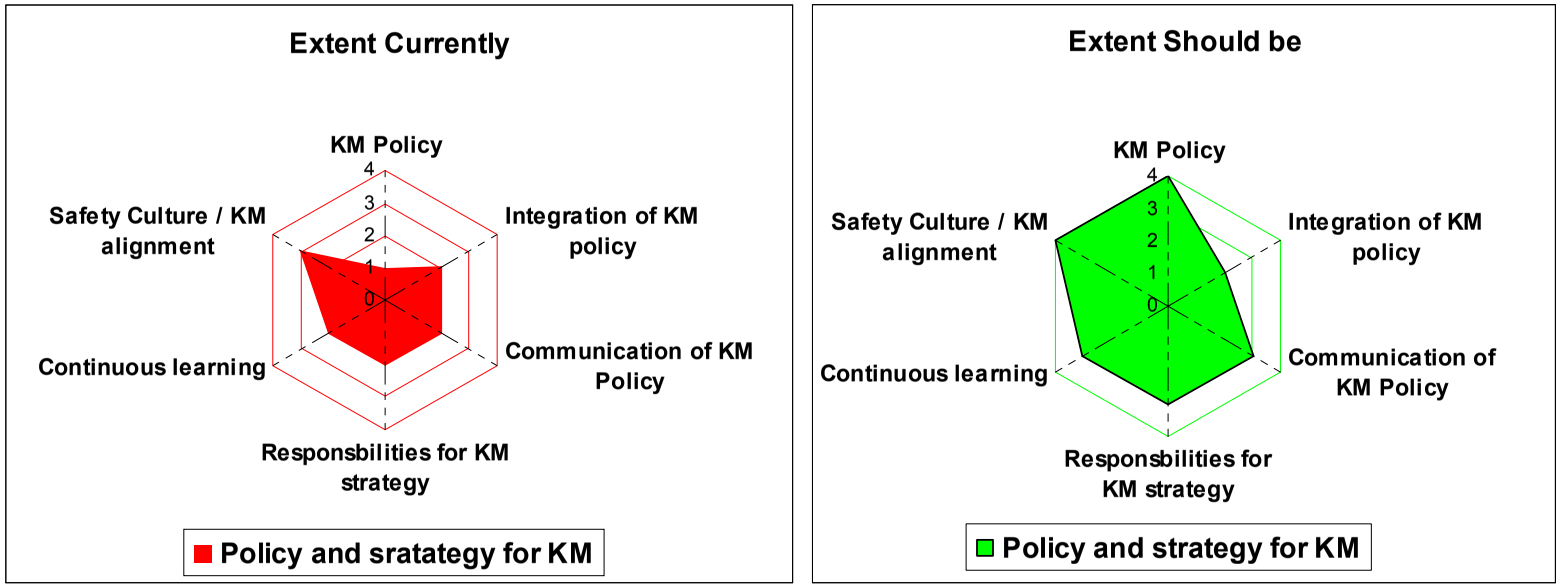
This topic covers the following aspects:

- Written policies/strategies
- Communication strategy
- Identification of KM responsibilities

For background information see References [1–7].

No.	Assessment Criteria/Questions	Extent currently utilized					Extent should be utilized					Comments
		0	1	2	3	4	0	1	2	3	4	
1	Does the organization have a written policy for implementing its strategy in KM area?											
2	Is a KM policy integrated into the management system?											
3	Is the KM policy communicated to all staff in the organization?											
4	Are those responsible for managing the formulation and implementation of the organization KM strategy clearly identified?											
5	Does the organization's strategic focus support continuous learning to improve individual and organizational performance?											
6	Is the organization's KM policy aligned with continued emphasis on a strong safety culture?											

An example of the output (in form of a radar/spider diagram) for the category 1 is given below:



2. HUMAN RESOURCE (HR) PLANNING & HR PROCESSES

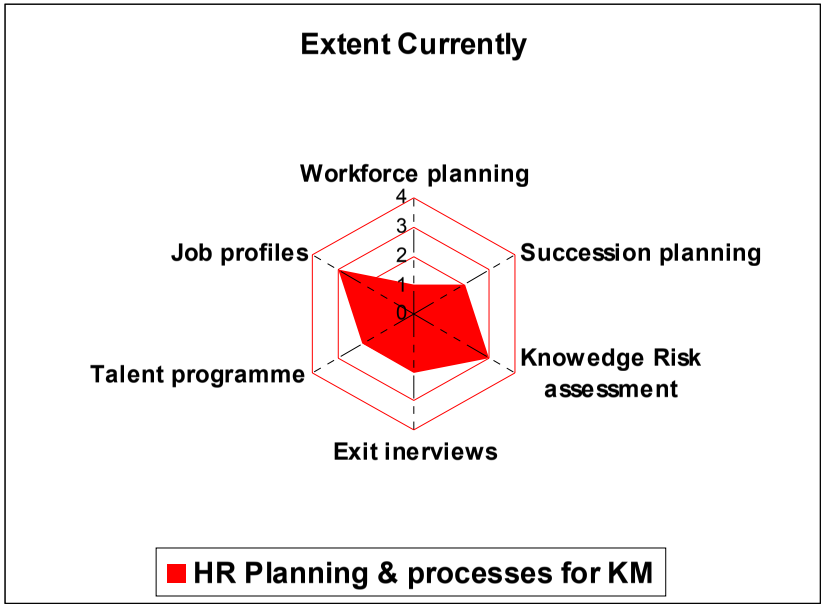
This topic covers the following aspects:

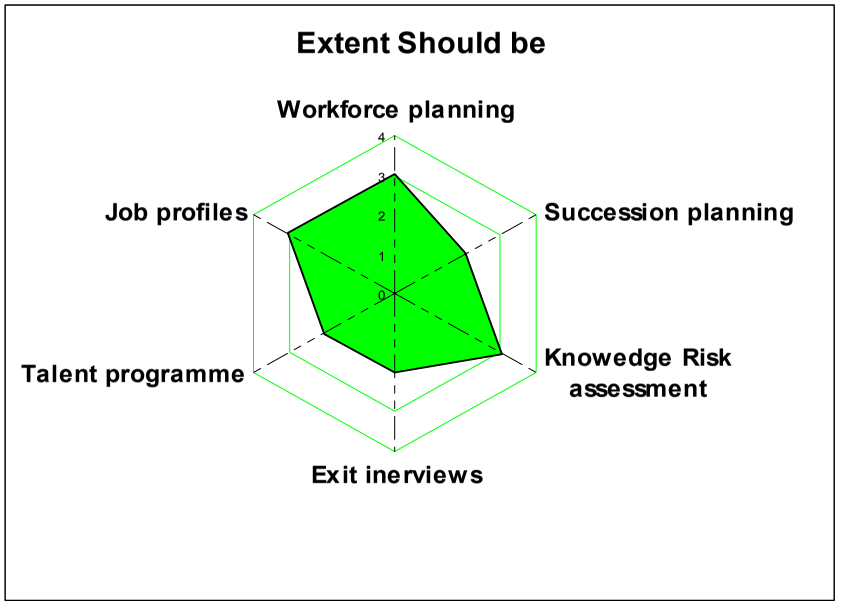
- Workforce planning
- Succession planning
- Risk assessment for critical knowledge loss
- Employee development plans for KM

For background information see References [3, 4, 6, 8–12]

No.	Assessment Criteria/Questions	Extent currently utilized					Extent should be utilized					Comments
		0	1	2	3	4	0	1	2	3	4	
1	Does the organization implement a comprehensive methodology to ensure that HR needs both current and future are met (work force planning)?											
2	Is there an effective succession planning programme in place?											
3	Are risk assessments carried out to identify potential loss of critical knowledge and skills?											
4	Are exit interviews carried out to capture critical knowledge and experience when people leave the organization?											
5	Does a programme exist to develop new leadership /technical talent in a timely manner?											
6	Does the organization utilise job profiles or equivalent to assess and monitor its skills/competency needs?											

An example of the output for the category 2 is given below:





3. TRAINING AND HUMAN PERFORMANCE IMPROVEMENT

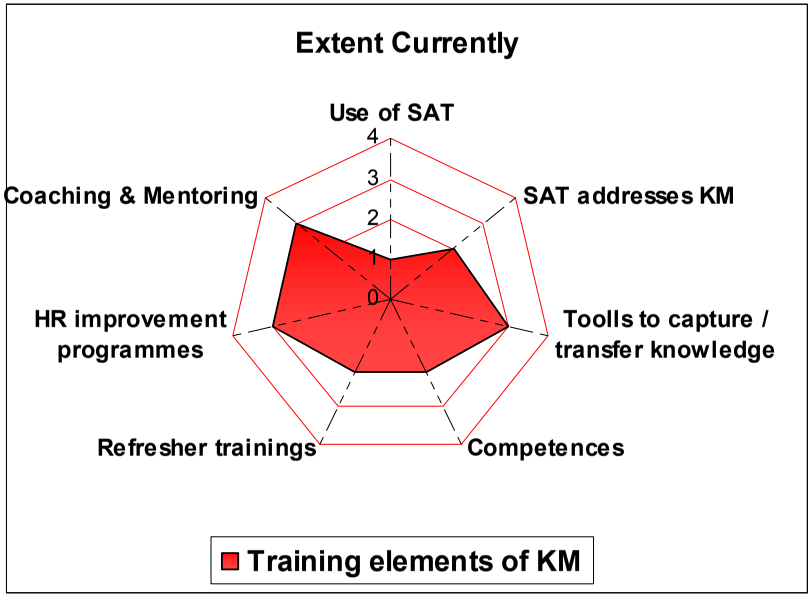
This topic covers the following aspects:

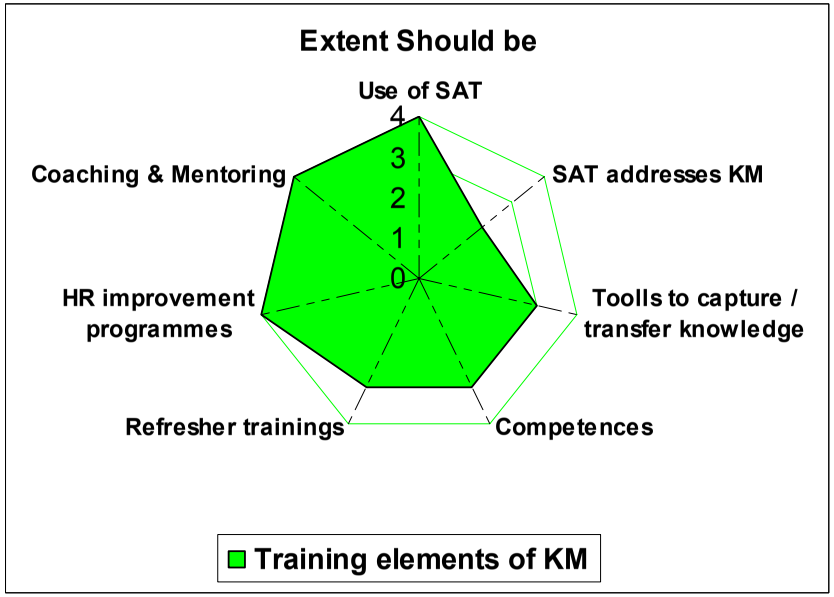
- Coaching and mentoring
- SAT
- Simulator use
- CBT (e-learning)
- Refresher training
- Human Performance Improvement

For background information see References [4, 6, 9, 10, 13–19]

No.	Assessment Criteria/Questions	Extent currently utilized					Extent should be utilized					Comments
		0	1	2	3	4	0	1	2	3	4	
1	Does the organization incorporate formal Systematic Approach to Training (SAT) principles into its training programmes?											
2	Does the formal SAT programme address capture and dissemination of knowledge?											
3	Does the training programme utilise appropriate tools such as simulators, Computer Based Training (CBT), multi-media simulations, etc. to capture/transfer critical knowledge?											
4	Is competence evaluated on a regular basis?											
5	Is regular refresher training carried out to maintain and enhance competence?											
6	Does the organization have a formal human performance improvement programme to maintain and enhance competence?											
7	Are coaching and mentoring approaches used to support knowledge sharing?											

An example of the output for the category 3 is given below:





4. METHODS, PROCEDURES & DOCUMENTATION PROCESSES FOR IMPROVING KM

This topic covers the following aspects:

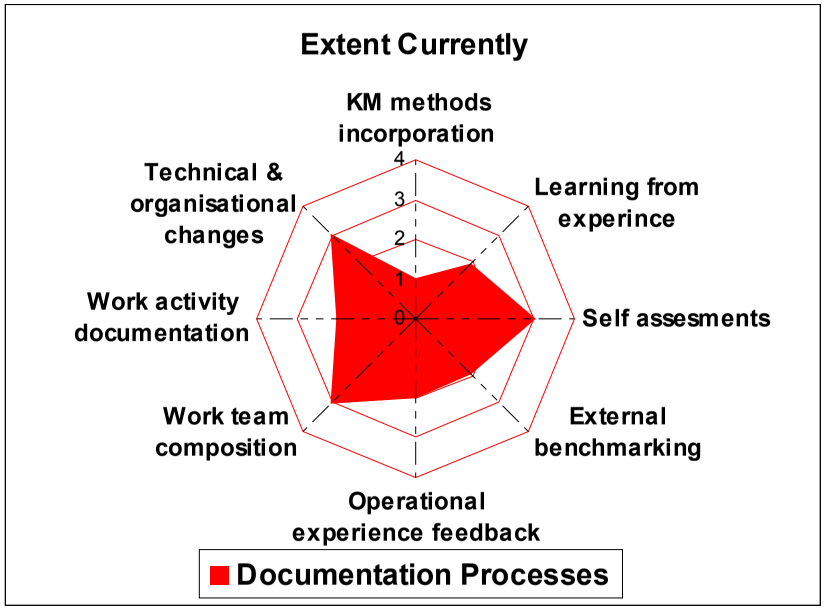
- Learning from Operating Experience
- Work control methods
- Error prevention
- Document control/Configuration
- Corrective action programme
- Benchmarking

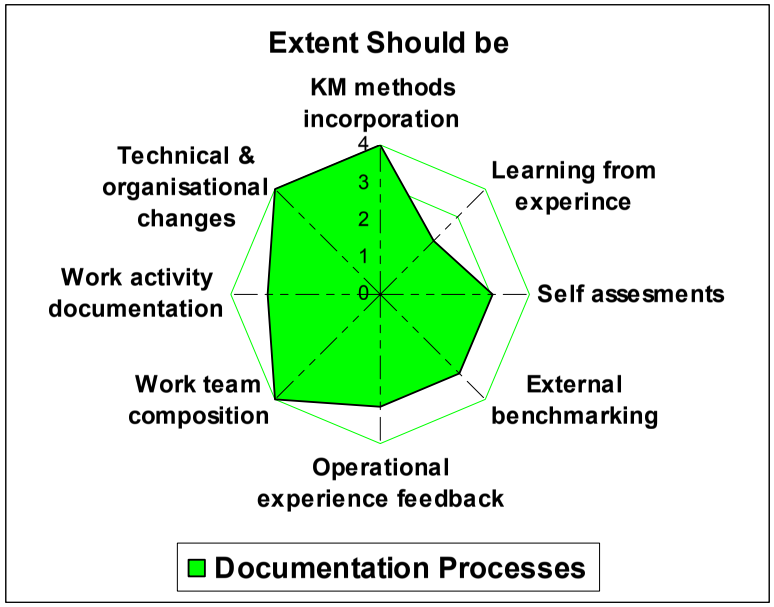
For background information see References [3, 4, 18–27]

No.	Assessment Criteria/Questions	Extent currently utilized					Extent should be utilized					Comments
		0	1	2	3	4	0	1	2	3	4	
1	Are KM methods incorporated into procedures and processes rather than being separate add-on tasks?											
2	Does the organization have a comprehensive methodology that addresses learning from experience?											
3	Are self assessments regularly used to enhance organizational knowledge?											
4	Is external benchmarking regularly used to enhance organizational knowledge by adopting good industry practices?											
5	Is the feedback (internal and external) from operational experience (lessons learned) used by the organization for corrective action planning to achieve improvements?											
6	Is the composition of work teams (such as individual expertise/experience) considered in order to enhance knowledge transfer?											
7	Are all work activities documented in such a way that knowledge can be effectively retrieved, shared and utilized?											

No.	Assessment Criteria/Questions	Extent currently utilized					Extent should be utilized					Comments
		0	1	2	3	4	0	1	2	3	4	
8	Are procedures, drawings, lesson plans and related documentation updated promptly in a systematic way to address technical and organizational changes?											

An example of the output for the category 4 is given below:





5. TECHNICAL (IT) SOLUTIONS

This topic covers the following aspects:

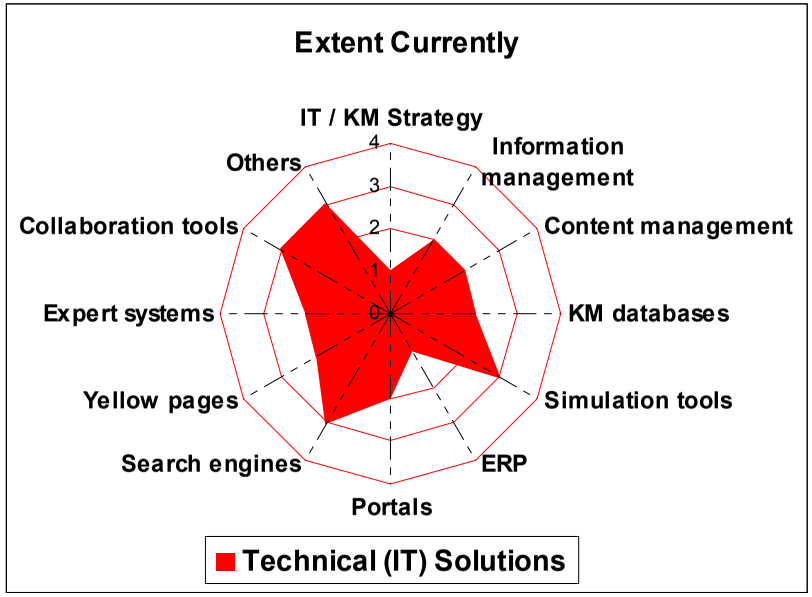
- Knowledge data bases
- Content/document management systems
- Search engines
- Portals/Intranet
- Wikis/blogs
- Skill/competency databases
- Expert yellow pages
- Enterprise Resource Planning (EPR)
- Other IT supporting systems

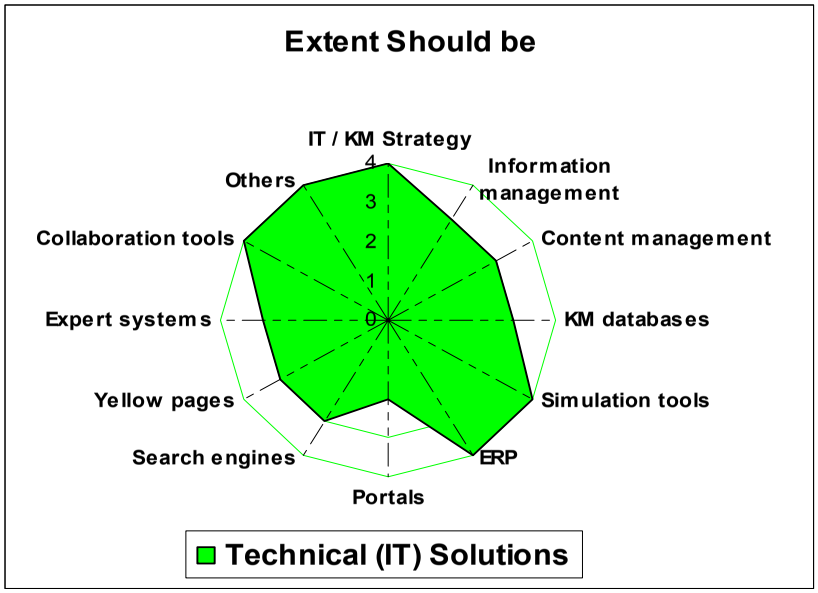
For background information see References [3–5, 21, 28, 29]

No.	Assessment Criteria/Questions	Extent currently utilized					Extent should be utilized					Comments
		0	1	2	3	4	0	1	2	3	4	
1	Are IT and KM strategies aligned?											
2	Is the organization utilising an integrated approach in managing its information?											
3	Does the organization utilise appropriate IT support systems and tools such as:											
3.1	• Content/document management											
3.2	• Concept mapping											
3.3	• Knowledge databases											

No.	Assessment Criteria/Questions	Extent currently utilized					Extent should be utilized					Comments
		0	1	2	3	4	0	1	2	3	4	
3.4	• Simulation tools											
3.5	• Enterprise Resource Planning (ERP)											
3.6	• Portals/Intranets											
3.7	• Knowledge search engines											
3.8	• Expert yellow pages											
3.9	• Expert systems											
3.10	• Wiki's/blogs											

An example of the output for the category 5 is given below:





6. APPROACHES TO CAPTURE/USE TACIT KNOWLEDGE

This topic covers the following aspects:

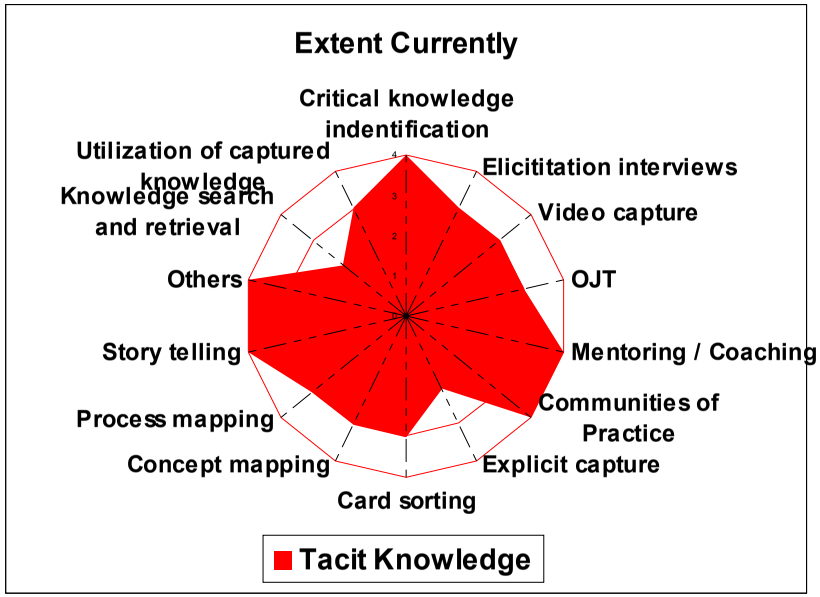
- Taxonomy development
- Process for critical knowledge ID
- Processes for knowledge elicitation/harvesting
- Concept mapping
- COPs
- Coaching & mentoring

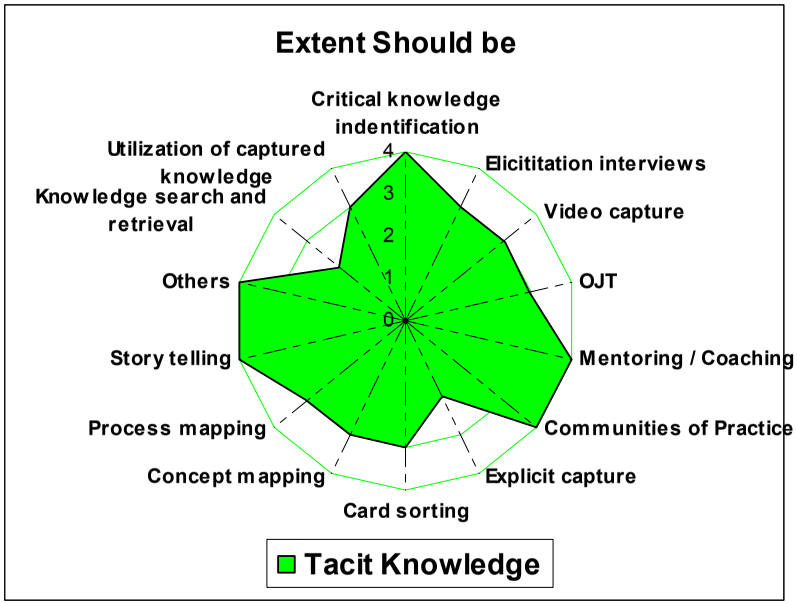
For background information see References [1, 4, 5, 8].

No.	Assessment Criteria/Questions	Extent currently utilized					Extent should be utilized					Comments
		0	1	2	3	4	0	1	2	3	4	
1	Does the organization utilise methods to identify people who have critical knowledge?											
2	Does the organization adopt effective techniques to capture critical knowledge such as:											
2.1	• Elicitation interviews											
2.2	• Video capture											
2.3	• On the Job Training (OJT) dialogue											
2.4	• Mentoring/coaching											
2.5	• Communities of Practice (COP)											
2.6	• Explicit capture (narrative documentation)											
2.7	• Card sorting (manual concept map)											
2.8	• Concept mapping											
2.9	• Process mapping											
2.10	• Story telling											
2.11	• Others											
3	Is information and data retained and presented in an effective way to facilitate search and retrieval?											

No.	Assessment Criteria/Questions	Extent currently utilized					Extent should be utilized					Comments
		0	1	2	3	4	0	1	2	3	4	
4	Does the organization have processes for the effective transfer and utilisation of captured knowledge?											

An example of the output for the category 6 is given below:





7. KM CULTURE / WORKFORCE CULTURE SUPPORTING KM

This topic covers the following aspects:

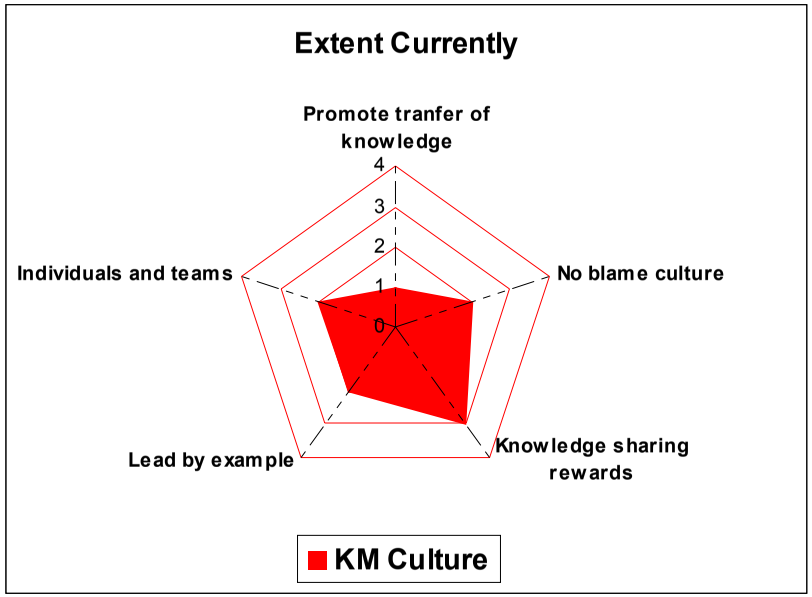
- No blame environment
- Sharing knowledge
- Leadership/commitment

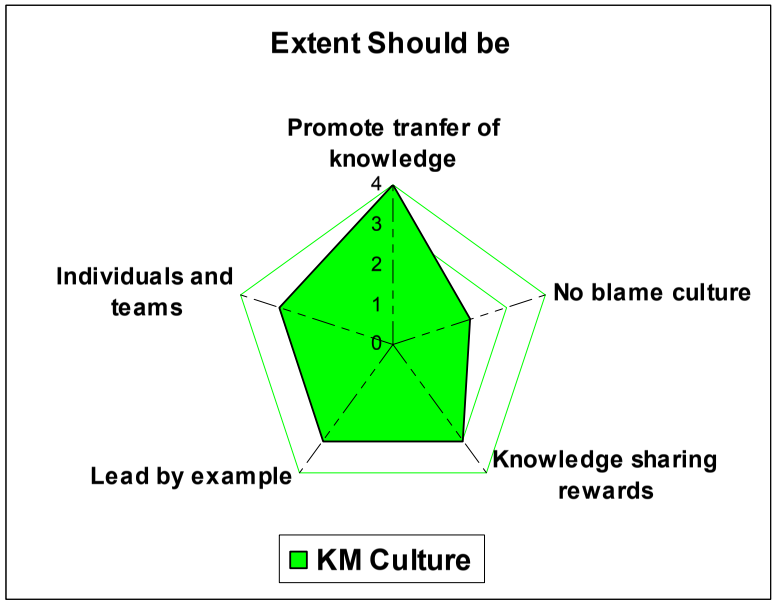
For background information see References [1, 3, 4, 19].

No.	Assessment Criteria/Questions	Extent currently utilized					Extent should be utilized					Comments
		0	1	2	3	4	0	1	2	3	4	
1	Does the culture of the organization promote the sharing and transfer of knowledge, particularly tacit knowledge, amongst personnel?											
2	Does the organization have an open, no blame approach to reporting incidents/events and sharing from lessons learned?											
3	Is sharing of knowledge in the organization recognised and rewarded?											
4	Do managers lead by example performing practical, visible leadership supporting the knowledge management strategy?											

No.	Assessment Criteria/Questions	Extent currently utilized					Extent should be utilized					Comments
		0	1	2	3	4	0	1	2	3	4	
5	Do managers encourage trust, cooperation and collaboration between individuals and teams?											

An example of the output for the category 7 is given below:





APPENDIX II
END OF MISSION REPORT CONTENTS

The following content is required for each of End of Mission Report. The report will have six main sections as detailed below with Appendices as required for detailed information captured during the mission.

Examples of previous mission reports are available from the IAEA on request but are subject to confidentiality restrictions.

1. ADMINISTRATIVE INFORMATION

   This section contains project information related to the mission and comprises:

   - *project number*
   - *project title*
   - *task title*
   - *list of participating experts*
   - *dates of the assignment*
   - *Counterpart information, i.e. names and location*
   - *duty station location*
   - *IAEA programme reference – i.e. Sub Programme C.3. Nuclear Knowledge Management*

2. TERMS OF REFERENCE

   This section describes the objectives of the mission, the mission scope and duties. Three separate sub-sections apply:

   - *objectives of mission – This is a paragraph describing the mission objectives as agreed with the Counterpart prior to commencement.*
   - *mission scope – This details the KM areas addressed during the mission.*
   - *mission duties – This is a paragraph describing the form of the mission, i.e. how the mission was conducted (e.g. preparation & delivery of presentations, meetings with senior management etc.)*

3. BACKGROUND

   This section provides background to the visit in the context of knowledge management and the issues the nuclear industry is facing worldwide. If there are specific issues within the host country, organization or plant then these should also be specified here. Typically three or four paragraphs are provided here.

4. WORK PROGRAMME

   This section outlines the programme of work undertaken during the visit with details of dates, times, locations and responsibilities. It can consist of the agreed agenda as prepared prior to the visit with any modifications as appropriate.

5. RECOMMENDATIONS TO THE IAEA

   This section contains recommendations to the IAEA that are received from the Counterpart, Experts or other parties involved with the mission. The recommendations to the IAEA may consist of:

   - *Strategic IAEA initiatives that should be undertaken to support generic KM issues*
   - *Suggestions for further IAEA work at the Counterpart's location.*

- *Suggestions involving government action or coordinated activity in the Counterpart's country.*
- *Other recommendations that are relevant to KM that can be executed directly or facilitated by the IAEA.*

6. RECOMMENDATIONS TO THE COUNTERPART

This section contains the combined recommendations from the IAEA team. The recommendations are varied in nature and should be grouped in order according to the locations or organizations visited. The recommendations should aim to identify good practice areas as well as areas that need to be developed. Typical recommendations will cover one or more of the following issues:

- *Observations of good practice.*
- *Strategic recommendations that may involve central government, multiple organizations or political factors.*
- *General recommendations, applicable to the Counterpart's organization, that relate to KM improvement.*
- *Specific recommendations that could be applied to the Counterpart's organization that relate to KM improvement. This would typically be at the technology, process or HR level and may involve good practice techniques used in similar organizations.*

Wherever possible, the IAEA team will endeavour to provide pragmatic advice that can be translated into an action plan by the Counterpart at the end of the mission.

LIST OF APPENDIXES

Appendices are included as required and may contain information such as presentation summaries, lists of participants, self assessment output, contact details, and other information that is requested or provides value to the Counterpart

APPENDIX III
KM ASSIST MISSION CRITIQUE

KM ASSIST MISSION CRITIQUE

(The personal information is voluntary)

Name: _____

Job Title: _____

Company: _____

City: _____

Country: _____

(To be completed by IAEA)

Assist Mission Code:

Assist Mission Title:

Assist Mission Location:

Host Orgnisation:

Assist Mission Dates:

Please fill in the Questionnaire and return to IAEA Assist Mission Technical Officer

Please rate using a scale of 1–5
(whereby 1 is the weakest and 5 is the strongest)

1.1 What are your views on the following?

(a) **Technical Content of the Assist Mission:**

1: ☐	2: ☐	3: ☐	4: ☐	5: ☐

(b) **Quality of presentation and other material**:

1: ☐	2: ☐	3: ☐	4: ☐	5: ☐

(c) **Assist Mission duration:**

1: ☐	2: ☐	3: ☐	4: ☐	5: ☐

1.2 If you answered "1" or "2" please explain why:

1.3 Did you receive and understand the scope and content of the Assist Mission in advance?

Yes: ☐	No: ☐

1.4

(a) Were your specific needs of the Assist Mission addressed?

1: ☐	2: ☐	3: ☐	4: ☐	5: ☐

(b) If you answered "1" or "2" please explain why:

2.1 Did the mission team experts demonstrate a thorough knowledge and understanding of their subjects?

1: ☐	2: ☐	3: ☐	4: ☐	5: ☐

2.2 Please provide comments, if any:

3.1 Was the KM self assessment beneficial to your organization?

1: ☐	2: ☐	3: ☐	4: ☐	5: ☐

3.2 Please provide comments, if any:

4. What would you consider were the main strengths of this Assist Mission? (Please try to be specific)

5. What would you consider were the main faults or weaknesses of this Assist Mission? (Please try to be specific)

6. To what extent was the Assist Mission applicable to the needs of the organization for which you work?

1:		2:		3:		4:		5:	

6.2 Please provide comments, if any:

7. Do you think a follow up Assist Mission should be planned?

Yes:			No:		

7.1 Please provide comments, if any:

8. What do you think about the organization and administration of the Assist Mission?

1:		2:		3:		4:		5:	

9. Do you have any general recommendations for future Assist Missions of this kind?

REFERENCES

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Managing Nuclear Knowledge: Strategies and Human Resource Development. Summary of an international conference, 7–10 September 2004, Saclay, France, IAEA Proceedings Series; STI/PUB/1235, ISBN 92-0-110005-1; IAEA, Vienna (2006).

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, The Management System for Facilities and Activities, IAEA Safety Standards Series No. GS-R-3, IAEA, Vienna (2006).

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Application of the Management System for Facilities and Activities, Safety Standards Series No. GS-G-3.1, IAEA, Vienna (2006).

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Knowledge Management for Nuclear Industry Operating Organizations, IAEA-TECDOC-1510, IAEA, Vienna (2006).

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Managing Nuclear Knowledge IAEA Proceedings, STI/PUB/1266, ISSN: 0074-1884, IAEA, Vienna (2006).

[6] INTERNATIONAL ATOMIC ENERGY AGENCY, The nuclear power industry's ageing workforce: transfer of knowledge to the next generation, IAEA-TECDOC-1399, IAEA, Vienna (2004).

[7] INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Power Plant Organization and Staffing for Improved performance: Lessons learned, IAEA-TECDOC-1052, IAEA, Vienna (1998).

[8] INTERNATIONAL ATOMIC ENERGY AGENCY, Risk Management of Knowledge Loss in Nuclear Industry Organizations, STI/PUB/1248, IAEA, Vienna (2006).

[9] INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Power Plant Personnel Training and its Evaluation A Guidebook, IAEA Technical Reports Series No. 380, IAEA, Vienna (1996).

[10] INTERNATIONAL ATOMIC ENERGY AGENCY, Experience in the use of systematic approach to training (SAT) for nuclear power plant personnel, IAEA-TECDOC-1057, IAEA, Vienna (1998).

[11] INTERNATIONAL ATOMIC ENERGY AGENCY, Managing human resources in the nuclear power industry: Lessons learned, IAEA-TECDOC-1364, IAEA, Vienna (2003).

[12] INTERNATIONAL ATOMIC ENERGY AGENCY, Selection, Development and Assessment of NPP Managers, IAEA-TECDOC-1024, IAEA, Vienna (1998).

[13] INTERNATIONAL ATOMIC ENERGY AGENCY, Recruitment, Qualification and Training of Personnel for Nuclear Power Plants Safety Guide, Safety Standards Series No. NS-G-2.8, IAEA, Vienna (2002).

[14] INTERNATIONAL ATOMIC ENERGY AGENCY, Competency Assessments for Nuclear Industry Personnel, STI/PUB/1236, IAEA, Vienna (2006).

[15] INTERNATIONAL ATOMIC ENERGY AGENCY, Development of Instructors for Nuclear Power Plant Personnel Training, IAEA-TECDOC-1392, IAEA, Vienna (2004).

[16] INTERNATIONAL ATOMIC ENERGY AGENCY, Assuring the Competence of Nuclear Power Plant Contractor Personnel, IAEA-TECDOC-1232, IAEA, Vienna (2001).

[17] INTERNATIONAL ATOMIC ENERGY AGENCY, Use of Control Room Simulators for Training of NPP Personnel, IAEA-TECDOC-1411, IAEA, Vienna (2004).

[18] INTERNATIONAL ATOMIC ENERGY AGENCY, Systematic Approach to Human Performance Improvement in Nuclear Power Plants: Training Solutions, IAEA-TECDOC-1204, IAEA, Vienna (2001).
[19] INTERNATIONAL ATOMIC ENERGY AGENCY, Human Performance Improvement in Organizations: Potential Applications in the Nuclear Industry, IAEA-TECDOC-1479, IAEA, Vienna (2005).
[20] INTERNATIONAL ATOMIC ENERGY AGENCY, Good Practices with Respect to the Development and Use of Nuclear Power Plant Procedures, IAEA-TECDOC-1058, IAEA, Vienna (1998).
[21] INTERNATIONAL ATOMIC ENERGY AGENCY, Information Technology Impact on Nuclear Power Plant Documentation, IAEA-TECDOC-1284, IAEA, Vienna (2002).
[22] INTERNATIONAL ATOMIC ENERGY AGENCY, Management of Continual Improvement for Facilities and Activities: A Structured Approach, IAEA-TECDOC-1491, IAEA, Vienna (2006).
[23] INTERNATIONAL ATOMIC ENERGY AGENCY, OSART Guidelines - 2005 Edition, IAEA Services Series No. 12, IAEA, Vienna (2005).
[24] INTERNATIONAL ATOMIC ENERGY AGENCY, Self-Assessment of Safety Culture in Nuclear Installations Highlights and Good Practices, IAEA-TECDOC-1321, IAEA, Vienna (2002).
[25] INTERNATIONAL ATOMIC ENERGY AGENCY, Self-assessment of operational safety for nuclear power plants, IAEA-TECDOC-1125, IAEA, Vienna (1999).
[26] INTERNATIONAL ATOMIC ENERGY AGENCY, Effective Corrective Actions to Enhance Operational Safety of Nuclear Installations, IAEA-TECDOC-1458, IAEA, Vienna (2005).
[27] INTERNATIONAL ATOMIC ENERGY AGENCY, Configuration Management in Nuclear Power Plants, IAEA-TECDOC-1335, IAEA, Vienna (2003).
[28] INTERNATIONAL ATOMIC ENERGY AGENCY, Development of Knowledge Portals for Nuclear Power Plants, IAEA Nuclear Energy Series, No. NG-T-6.2, IAEA, Vienna (2008).
[29] INTERNATIONAL ATOMIC ENERGY AGENCY, Managing Change in Nuclear Utilities, IAEA-TECDOC-1226, IAEA, Vienna (2001).

ABBREVIATIONS

CV	Curriculum Vitae
DDG-NE –	Deputy Director General, Department of Nuclear Energy
DDG-TC	Deputy Director General, Department of Technical Cooperation
IAEA	International Atomic Energy Agency
INIS	International Nuclear Information System
IPR	Intellectual Property Rights
KM	Knowledge Management
PHF	Personal History Form

ANNEX
DEFINITIONS OF TERMS IN THE FIELD OF NUCLEAR KNOWLEDGE MANAGEMENT

The following definitions apply specifically to the field of Knowledge Management. It should be noted that identical terms applied to, or used in, other fields may have somewhat different definitions.

Knowledge Management is defined, in this publication, as an integrated, systematic approach to identifying, acquiring, transforming, developing, disseminating, using, sharing, and preserving knowledge, relevant to achieving specified objectives. Knowledge Management helps an organization to gain insight and understanding from its own experience. Specific activities in knowledge management help the organization to better acquire, store and utilize knowledge.

---

adaptive learning

The use of knowledge to solve specific problems based on existing assumptions, and often based on what has been successful in the past. Also termed Single-loop learning.

Comment: In contrast, generative learning (also termed *double-loop learning*) goes a step further and questions existing assumptions in order to create new insights. For example, take the problem 'how to prevent earthquakes from killing people?' The single-loop answer would be to learn how earthquakes happen and try to predict them in order to be prepared. The double-loop answer would question the notion of 'earthquake' and might conclude that earthquakes do not kill people, falling buildings do. (See *Double-loop learning*).

after-action review

A process that involves conducting a structured and facilitated discussion after a task or project has been completed to review what should have happened; what actually happened; and, where differences exist, why it happened. Also termed Post-job briefing.

Comment: After-action review allows participants to learn how to sustain strengths and improve on weaknesses in subsequent tasks or projects. It is used to help teams to learn quickly from their successes and failures and share their learning with other teams.

after-event review

A process, that involves consideration of the what, how and why of events.

Comment: After event review includes analysis in sufficient depth to determine contributing factors (including behavioural, organizational and physical conditions), precipitating actions, consequences, probable causes, learned lessons, and corrective actions to minimize recurrence. In the nuclear industry, organizations focus attention on such problem-solving endeavours, through systematic and systemic analyses, to determine the most probable root causes of such events in order to correct problematic conditions and to prevent recurrence of similar events. (See *Lessons learned* and *Root cause analysis*).

appreciative inquiry

A strategy of asking positively framed questions to focus on what is going right within an organization. The aim is to help alleviate resistance to change and to improve processes, products, services, communication, leadership and other issues by focusing on the best possible outcomes and practices using the 'four-d' cycle of discovery, dream, design, and destiny.

Comment: The nuclear industry has traditionally been inclined to 'drive forward looking in a rear-view mirror' by devoting extensive resources to event investigation and techniques, such as root cause analysis. Complementing such necessary techniques with an appreciative inquiry can improve morale as well as performance. (See *Root cause analysis*).

articulation

The process of making tacit knowledge explicit. Also termed Externalization. (See *Knowledge* and *Internalization*).

artificial intelligence

— The ability of a computer or other machine to perform those activities that are normally thought to require intelligence.
— The branch of computer science concerned with the development of machines having this ability.

asset management

An approach to responsible management of an enterprise that considers, in a balanced fashion, the entirety of its resources; these include tangible assets such as personnel and other animate creatures, facilities, equipment, fiscal investment, inventory, and intangible assets such as goodwill and intellectual capital.

Comment: Approaches such as the balanced scorecard can be employed to assure appropriately distributed attention to the whole of an organization's resources. In the nuclear industry, the combination of increased retirements and a more difficult recruitment environment requires even greater attention to achieving and maintaining such a balance. Well-planned knowledge management programmes can contribute to meeting such challenges. (See: *Balanced scorecard, Intangible assets*, and also *Intellectual assets*, and *Knowledge assets*).

attrition

A decrease in the number of employees in an organization due to retirements, other terminations, or transfers to other organizations.

Comment: In the nuclear industry attrition due to retirement is a particularly important issue because plants typically have stable workforces, all or most of whom joined during the commissioning phase, and thus they often have similar retirement dates.

balanced scorecard

A business model used as a tool to measure organizational performance against both short and long-term goals.

Comment: This model is designed to focus attention on the factors that most help business strategists and so, alongside financial measures, offers means of measuring internal processes and employee learning. Some organizations in the nuclear industry use the 'balanced scorecard' model in setting and measuring knowledge management strategies.

benchmarking

The practice of comparing features and performance of an organization, department or function with those of other organizations and standards.

Comment: The following axioms should be considered in benchmarking:

- What works well for a given organization in one situation may not work well in another organization under different circumstances.
- There are lessons to be learned from undesirable situations as well as from best practices – things that have been proven to work well and produce good results.
- Examining the practices of organizations with fundamentally different aims can produce surprisingly useful insight about another organization.

best practice

A process or methodology that has been shown to work well and produce good results and is, therefore, recommended as a model. Also termed Good practice.

capacity building

The process of enhancing an organization's ability to achieve its goals and also implement knowledge management principles and practices.

champion

A person who proactively promotes something with the aim of persuading others of its benefits.

Comment: In the nuclear industry a champion for organizational change is often a senior line manager who regularly monitors the plans and progress in implementing change, and helps to overcome barriers to change.

chief information officer (CIO)

A senior position with strategic responsibility for information management and information technology.

chief knowledge officer (CKO)

A senior position with strategic responsibility for promoting and implementing knowledge management.

coaching

A relationship between more experienced individuals and less experienced individuals designed to enhance learning and performance of both individuals and teams, typically focused on the achievement of specified objectives within given time frames.

Comment: The role of a coach is to create a supportive environment that will develop the ability of those being coached to perform existing tasks better or new tasks. In the nuclear

industry, coaching is a legitimate and effective teaching tool for situations like on-job training (OJT); however, it is to be avoided during the process of confirming acquired competences. For this reason, some utilities prohibit OJT instructors/coaches from also serving to evaluate the effectiveness of the learning by trainees on given tasks. Coaches may be from within or from outside an organization. (See also *Mentoring* and *Reverse Coaching and Mentoring*).

codification

The process of converting people's knowledge into a form to enable it to be communicated independently of those people.

Comment: The most common method of codification is writing things down and incorporating them into documents and databases. Other methods include pictures, sound and video recordings. In the nuclear industry codification has been particularly important in ensuring that the design basis for an NPP's safe operation is effectively maintained. (See also *Knowledge harvesting*).

collaboration

A generic term to describe teamwork or group effort.

Comment: In knowledge management, collaboration is often used more specifically to describe close working relationships involving the sharing of knowledge. An example of collaboration in the nuclear industry is a cross-functional team.

communities of practice

Networks of people who work on similar processes or in similar disciplines, and who come together to develop and share their knowledge in that field for the benefit of both themselves and their organization(s).

Comment: Communities of practice may be created formally or informally, and they can interact online or in person. In a less-formal context, they are sometimes referred to as *Communities of interest*. An example in the nuclear industry is the Nuclear Energy Institute's Community of Practice.

concept maps

Tools for organizing and representing knowledge.

Comment: Concept maps include concepts, usually depicted in circles or boxes of some type, and relationships between concepts or propositions, indicated by a connecting line between two concepts.

configuration management

The process of identifying and documenting the characteristics of an organization's structures, systems and components (including computer systems and software), and of ensuring that changes to these characteristics are properly developed, assessed, approved, issued, implemented, verified, recorded and incorporated into the organization's documentation.

Comment: The IAEA-TECDOC-1335, January 2003, *'Configuration management in nuclear power plants'* presents a basic approach to configuration management; it considers experience gained from discussions at meetings organized on the subject, and from organizations and

utilities, which have successfully implemented partial or full configuration management programmes.

content management

A means of ensuring that computer-based information, such as the content of a website or a database, is relevant, up-to-date, accurate, easily accessible, or well organized, so that quality information can be delivered to the user.

Comment: Configuration management, as used in the nuclear industry, is an effective tool for the maintenance of content management.

corporate memory

The knowledge and understanding embedded in an organization's employees, processes and products or services, together with its traditions and values. Corporate memory can either assist or inhibit the organization's progress. Also termed Organizational memory.

Comment: Corporate memory becomes a critical concern when there is sufficient migration of personnel from an organization as to cause a knowledge deficit. This phenomenon can be due to factors such as planned reductions in the workforce, accidents, illness, retirements, or – most commonly – personnel leaving due to dissatisfaction with immediate supervision. In these situations, the tremendous financial investment in an organization's personnel and their tacit knowledge becomes evident. In the nuclear industry corporate memory is particularly important in ensuring that the design basis for the NPP safe operation is effectively maintained. (See *Knowledge*).

critical knowledge

The knowledge established in the context of a particular position that is deemed imperative for incumbents of said position to possess before being allowed to perform associated duties and tasks independently.

customer relationship management (CRM)

A business strategy based on selecting and proactively managing the most valuable customer relationships. A customer-focused philosophy is necessary to support effective marketing, sales and customer service processes.

data

A representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by people or by automatic means.

database

A collection of information organized in such a way that a computer program can quickly select desired pieces of data. Relational databases are organized by fields, records, and tables. A field is a single piece of information, a record is one complete set of fields, and a table is a collection of records. Storing content in fields rather than on static pages makes that content appropriate for dynamic delivery.

Comment: The International Nuclear Information System (INIS), maintained by the IAEA, is the world's leading information system on the peaceful uses of nuclear science and technology. This database indexes scientific literature published worldwide on the peaceful applications of nuclear science and technology focusing on technical data, references, and

bibliographies from the world's biggest digital nuclear reference centers in fields of nuclear science and technology. Legal and social aspects associated with nuclear energy are included, as well as the economic and environmental aspects of all non-nuclear energy sources.

data mining

A technique for analyzing data in databases and making new connections between the data in order to reveal trends and patterns.

demographics

Social statistics that are often employed in workforce composition and planning.

Comment: Information on factors such as age, gender, race, ethnicity, educational level, and professional qualification can be most helpful in achieving organizational goals and objectives. For example, developing a demographic profile of an organization can help with succession planning and recruiting. In the context of Knowledge Management, attrition is the most relevant demographic. (See *Attrition*).

document

A record of an event or knowledge, taken so, that the information will not be lost.

Comment: Documents are usually written, but they can also be made up of images or sound. Documents can be put into electronic or digital form and stored in a computer.

document management

Systems and processes for managing documents including the creation, editing, production, storage, indexing and disposal of documents. This often refers to electronic documents and uses specific document management software.

Comment: The publication IAEA-TECDOC-1284, April 2002, '*Information Technology Impact on Nuclear Power Plant documentation'* addresses all aspects of documentation associated with various life-cycle phases of NPPs and the information technology (IT) that are relevant to the documentation process. It also provides a guide for planning, designing, and executing an IT documentation project. This report includes examples that demonstrate successful implementations at NPPs and also discusses issues related to the application of IT at NPPs and the trends for applications of IT at NPPs as well as the technology itself.

double-loop learning

Problem solving by means of Adaptive learning uses knowledge based on existing assumptions and is often based on what happened in the past. Adaptive learning is also termed 'single loop learning'. In contrast, Double-loop learning (also called 'generative learning') goes a step further and questions existing assumptions in order to create new insights.

Comment: Single-loop learning has been compared to a thermostat that controls temperature to a fixed setting and double-loop learning to a thermostat that could ask why it were set on that particular temperature. In the nuclear industry, these learning concepts are particularly pertinent in root cause analysis, appreciative inquiry, and other performance improvement initiatives. Double-loop learning requires more introspection by participants, as they must be willing to probe their own thoughts, actions, and attitudes rather than just seeking something or someone else to 'blame' for problems. The use of such a process is essential for an

organization to adopt a learning culture. (See *Adaptive learning*, *Appreciative inquiry* and *Root cause analysis*).

e-business

An abbreviation of electronic business. The use of electronic information systems (especially internet technologies) in business processes.

e-learning

An abbreviation of electronic learning. The use of electronic information systems (especially internet technologies) to deliver or receive learning and training.

Comment: A common application of E-learning in the nuclear industry is general employee refresher training. Due to the large number of trainees, the relatively high cost of E-learning can be justified, and the flexibility of E-learning is well suited to allowing the trainees to complete the training when they have the time available. Also, a 'test-out' feature can allow trainees who already understand the material to complete a pre-test, and if successful to avoid spending time on topics in which they are already competent.

events

Activities, occurrences, or incidents – planned or unplanned – that have significance to society, organizations or individuals.

Comment: In nuclear technology fields, events are typically both unplanned and undesirable. Some regulatory systems have categories for events based on their levels of severity, i.e. their potential for harmful results. Within the IAEA, and specifically in the context of the reporting and analysis of events, an event is any unintended occurrence, including operating error, equipment failure or other mishap, the consequences or potential consequences of which are not negligible from the point of view of protection or safety.

Note: Within IAEA documentation, the terminology related to the reporting and analysis of events is not always consistent with the terminology used in safety standards, and great care should be taken to avoid confusion. In particular, the definition of 'event' as given above is identical in essence to the safety standards' definition of 'accident'. The difference derives from the fact that event reporting and analysis is concerned directly with the question of whether an event that could develop into an accident with significant consequences, actually does so; terms such as accident are used only to describe the end result and, therefore, other terms, such as event, are needed to describe the earlier stages.

exit interview

A survey that is conducted with an employee who is about to leave an organization.

Comment: The information from each exit interview is used to provide feedback on why employees are leaving, what they liked about their employment and what areas of the organization need improvement. Exit interviews are used as part of *knowledge harvesting* to glean knowledge from the departing employee so that it is retained within the organization. (See *Knowledge harvesting*).

expert system

A data processing system that provides for solving problems in an expert manner within a given field or application area, by drawing inferences with the aid of a knowledge base

developed from human expertise. An expert system is a branch of artificial intelligence. (See *Artificial intelligence* and *Knowledge base*).

expertise directory

An alternative term for Yellow pages. (See *Yellow pages*).

experts directory

An alternative term for Yellow pages. (See *Yellow pages*).

explicit knowledge - See *Knowledge*.

externalization

An alternative term for Articulation. (See *Articulation* and also see *Internalization*).

extranet

A computer network that links an organization with other specific organizations or persons. Extranets are accessible only to specified organizations or persons and are protected by passwords. (See also *Intranet*).

generative learning

An alternative term for *Double-loop learning*. (See *Double-loop learning*).

good practice - See *Best practice*.

groupware

Computer software applications that are linked by networks, and so allow people to work together and share electronic communications and documents.

human assets

The knowledge, skills and competences of the people in an organization. Human assets are a component of *intellectual* assets. (See *Intellectual assets*).

Comment: The publication IAEA-TECDOC-1479, November 2005, *'Human performance improvement in organizations: Potential application for the nuclear industry'* provides managers and specialists in nuclear facility operating organizations working in the area of human resource management with practical information that they can use to improve human performance in their organizations.

implicit knowledge - See *Knowledge*.

information

Data that has been organized within a context and translated into a form that has structure and meaning. (See also *Knowledge*).

information audit

A method of reviewing and mapping information within an organization.

Comment: An information audit examines what information is needed, what information there currently is, where it is, in what forms, how it flows around the organization, where there are

gaps and where there is duplication, how much it is costing, what its value is, how it is used etc. See also *Knowledge audit*.

information management

The management of an organization's information resources with the aim of improving the performance of the organization. Information management underpins knowledge management, as knowledge is derived from information.

information overload

A state where persons have so much information that they are no longer able to effectively process and make use of it.

information technology (IT)

The elements of computing, including software, servers, networks and desktop computing, which enable digital information to be created, stored, used and shared.

institutional knowledge

The collective knowledge of all the employees working in an organization or institution.

intangible assets

The non-physical assets or resources of an organization.

Comment: Examples of intangible assets in the nuclear industry include the skills and knowledge of plant personnel, and the reputation of the organization (with the regulatory authority and the public) for safe and effective plant operation.

integrated staffing plan

A plan that is designed to ensure that an organization has the right skills at the right time and at the right cost. The plan is a standardized and consistent methodology for overall human resources planning, driven by strategic and business objectives.

intellectual assets

An alternative term for knowledge assets. (See *Knowledge assets*).

intellectual assets management

A part of knowledge management that focuses on issues relating to intellectual property such as organizing and exploiting patents, copyrights, trademarks and other intellectual property rights.

intellectual capital

The intellectual material, such as knowledge, information, intellectual property, experience, which can be put to use to create wealth.

Comment: In the nuclear industry, the large investment in intellectual capital is perhaps most visible by the high financial outlay required to get control room personnel authorized (licensed) and to maintain the knowledge base that warrants continuation of those individual operating permits. (See also *Intellectual property* and *Knowledge assets*).

intellectual property

Explicit *knowledge assets* that are protected by law. Intellectual property includes items such as patents, trademarks, copyrights, licenses etc. (See *Knowledge* and *Knowledge assets*).

internalization

The process of absorbing explicit knowledge and making it tacit. (See *Knowledge* and *Externalization*).

intranet

A computer network that functions similarly to the Internet, but the information and web pages are located on computers within an organization rather than being accessible to the general public. (See also *Extranet*)

know-how

Skill or competence derived from knowledge and experience.

knowledge

A acquiring, understanding and interpreting of information. Knowledge is often used to refer to a body of facts and principles accumulated by humankind over the course of time. Explicit knowledge is knowledge that can be easily expressed in documents. *Implicit knowledge* and *tacit knowledge* represent knowledge or know-how that people carry in their heads.

Comment: Knowledge is distinct from information as knowledge is information that has a purpose or use. Data leads to information and information leads to knowledge. Knowledge confers a capacity for effective action.

Knowledge may be applied to such purposes as problem solving and learning, forming judgments and opinions; decision making, forecasting and strategic planning; generating feasible options for action and taking actions to achieve desired results. Knowledge also protects intellectual assets from decay, augments intelligence and provides increased flexibility.

Explicit knowledge is contained in documents, drawings, calculations, designs, databases, procedures and manuals. *Explicit knowledge* implies declared knowledge (i.e., knowledge that is conscious to the knowledge bearer). *Explicit knowledge* is why it is not a problem for the employee to tell about rules and obviously learned facts. Very often this knowledge is already written down in books. Examples that contain explicit knowledge include NPP documentation and databases such as a website, an operational manual, records or a report of research findings.

Implicit knowledge and *tacit knowledge* are held in a person's mind and have typically not been captured or transferred in any form (if they had, they would then become *explicit knowledge*). Compared with *explicit knowledge*, such knowledge is more difficult to articulate or write down and so it tends to be shared between people through discussion, stories and personal interactions. It includes skills, experiences, insight, intuition and judgment.

Implicit knowledge is difficult to reveal, but it is still possible to be recorded. Usually knowledge bearers cannot recall this knowledge by themselves, because the information is too obvious to them. Some authorities draw a distinction between *tacit* and *implicit knowledge*, defining *tacit knowledge* as that which cannot be written down, and *implicit knowledge* as that

which can be written down but has not been written down yet. In this context, *explicit knowledge* is defined as that which has already been written down.

Tacit knowledge has been called 'what we know but don't know we know'. It is the most difficult type of knowledge to recall and, thus, to transfer. *Tacit knowledge* includes knowledge about topics such as how to ride a bicycle or how to talk. These examples describe knowledge everybody just has. However, every individual possesses a lot of *tacit knowledge*. Employees, for example, tacitly know how they persuade other people, how to behave in different situations, or how to organize a meeting. Such knowledge cannot be completely explained, since it is wholly embodied in the individual, rooted in practice and experience, expressed through skillful execution, and transmitted by apprenticeship and training through watching and doing forms of learning.

Sometimes *Tacit knowledge* is used as alternative terminology for *Implicit knowledge;* however, technically, the two identify different categories of knowledge.

(See *Information*, *Intellectual assets* and *Critical knowledge*.)

knowledge assets

Those parts of an organization's *intangible assets* that relate specifically to knowledge, such as *know-how*, *best practices*, and *intellectual property*. Knowledge assets are often divided into human (people, teams, networks and communities), structural (the codified knowledge that can be found in processes and procedures) and technological (the technologies that support knowledge sharing such as databases and intranets). Also termed *Intellectual assets*. (See *Best practices*, *Intangible assets*, *Intellectual property*, and *Know-how)*.

Comment: By understanding the knowledge assets an organization possesses, the organization can improve its ability to use them to best effect and also identify any gaps that may exist.

knowledge audit

A method of reviewing and mapping knowledge in an organization, including an analysis of its knowledge needs, resources, flows, gaps, users and uses.

Comment: A knowledge audit generally includes aspects of an information audit but is broader in its scope. (See *Information audit*).

knowledge base

The fundamental body of *knowledge* available to an organization, including the knowledge in people's heads, supported by the organization's collections of *information* and *data*. (See *Data*, *Information* and *Knowledge*).

Comment: An organization may also build subject-specific knowledge bases to collate information on key topics or processes. Knowledge base is also sometimes used to describe a *database* of information. The nuclear industry has a variety of knowledge bases; some are industry wide, such as the IAEA's Power Reactor Information System (PRIS) database and International Nuclear Information System (INIS) database. Knowledge bases of NPP operating organizations include plant procedure systems, system description documents and technical manuals.

knowledge broker

A person who facilitates the creation, sharing and use of knowledge within an organization.

Comment: Many organizations have created knowledge broker roles such as a 'Knowledge Co-coordinator'. 'Knowledge broker' is also sometimes used to describe a company or individual that operates commercially as a knowledge trader or provides knowledge-related services.

knowledge capture

A process of capturing the knowledge available within an organization and making it available.

Comment: More than ever before, organizations need to find ways to capture employee knowledge and best practices and ensure that they are shared and used throughout the workplace. To achieve this, organizations must uncover and address the gaps between their goals and their current knowledge-transfer practices. New tools and technologies must be supported with process and cultural changes and populated with high-quality structured content. A complete solution requires:

- effective architectures, techniques, and standards for organizing and presenting content effectively;
- new skills to help personnel understand what knowledge to capture, and how to document it, in order to maximize its usefulness to others;
- revised goals and expectations that make knowledge capture a high-priority in everyone's job;
- efficient systems and tools that centralize knowledge content and make it easy to store, access, and maintain.

(See *Knowledge transfer*).

knowledge center

A place where knowledge is gathered and stored and can be accessed and used.

Comment: A knowledge center may be a physical place such as a library, a virtual place (a knowledge portal), such as an interactive website or online discussion board, or a place where people gather, such as a café, an informal meeting room or a discussion area created to encourage knowledge sharing. (See *Knowledge portal* and *Virtual*).

knowledge economy

An economy in which knowledge plays a predominant part in the creation of wealth.

knowledge flows

The ways in which knowledge moves within, and into and out of, an organization.

knowledge harvesting

A set of methods for making *implicit knowledge* more explicit - incorporating people's knowledge into documents, to enable it to be more easily shared with others. (See K*nowledge* and *Codification*).

knowledge loss risk assessment

A process used to determine the potential business impact of the loss of critical knowledge from an organization.

Comment: This process is a part of organization's overall strategy to address the challenges created by an ageing workforce. The process is designed to:

Identify expert incumbents who possess critical knowledge and skills;

- Conduct a risk assessment based on two factors: time until retirement and position criticality;
- Determine the most appropriate method(s) for addressing potential knowledge loss through attrition;
- Establish knowledge retention plans that meet continuously changing business needs;
- Provide a process to review results and ensure knowledge retention plans are monitored and evaluated.

(See *Attrition, Critical knowledge, Knowledge retention plan* and *Position criticality*).

knowledge management

The integrated, systematic approach to identifying, managing and sharing an organization's knowledge, and enabling persons to create new knowledge collectively and thereby help achieve the objectives of that organization.

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

Note: Knowledge management consists of three fundamental components: people, processes and technology. Knowledge management focuses on people and organizational culture to stimulate and nurture the sharing and use of knowledge; on processes or methods to find, create, capture and share knowledge; and on technology to store and make knowledge accessible and to allow people to work together without being together. People are the most important component, because managing knowledge depends upon people's willingness to share and reuse knowledge.

knowledge management solution

A solution to a knowledge management problem, or the use of knowledge management techniques to solve an organizational problem.

Comment: Examples of knowledge management solutions include upgrades of plant procedure systems to provide additional detail, mentoring assignments for employees soon to retire, and more structured on-job training programmes.

knowledge management strategy

A detailed plan outlining how an organization intends to implement knowledge management principles and practices in order to achieve organizational objectives.

Comment: There are many strategies used to preserve knowledge. Primarily, the activities to be deployed largely depend on the nature of knowledge: tacit knowledge requires greater

efforts to preserve knowledge than explicit knowledge. While tacit knowledge can be preserved only by transferring it to successors or simply other people (a so-called personalization strategy), explicit knowledge benefits from the possibility of articulation or codification and being stored, with the help of advanced information and communication technologies. Preserving tacit knowledge is equal to transferring tacit knowledge to other employees or to engage in a knowledge transformation process that transforms tacit knowledge to explicit knowledge. Such endeavours are highly time-consuming.

Generally, two categories of knowledge preservation strategies (activities) can be discerned: personalization strategies (knowledge transfer) and codification strategies (knowledge articulation/elicitation). (See *Articulation, Codification,* and *Knowledge*).

knowledge mapping

A process to determine where *knowledge assets* are in an organization, and how *knowledge flows* operate within the organization. Evaluating relationships between holders of knowledge will then illustrate the sources, flows, limitations, and losses of knowledge that can be expected to occur. (See *Knowledge assets* and *Knowledge flows* and see also *Concept maps)*.

knowledge officer

A role with responsibility for implementing knowledge management principles and practices. (See also *Chief knowledge officer*).

knowledge portal

A comprehensive access structure to resources that are suitable to support the fundamental activities of knowledge management in a given knowledge domain to communicate, study and do research.

Comment: Knowledge portals typically provide a single, personalized interface point for accessing and consolidating information from disparate sources. Knowledge portals can be used to access knowledge repositories and communities of practice. Typical resources that should be accessible via a knowledge portal are information items about places of learning, opportunities for learning and research, experts, meeting opportunities, factual data and informative texts. (See *Communities of practice* and *Knowledge repositories*).

knowledge preservation

A process of maintaining an organizational system of knowledge and capabilities that preserves and stores perceptions, actions and experiences over time and secures the possibility of recall for the future.

Comment: The preservation of knowledge is an important building block within the knowledge management field. Organizations that intentionally manage their experiences for them to be available for the future have to master three basic processes of knowledge management:

— select, from the large number of organizational events, persons or experts and processes, only those that are worth preserving;
— store their experience in a suitable form;
— ensure the setting up and operation of the organizational memory.

knowledge repository

A place to store and from which to retrieve explicit knowledge.

Comment: An example of a low-technology knowledge repository is a set of file folders. A high-technology knowledge repository might be based on a database platform.

knowledge retention plan

A plan that identifies the critical knowledge and positions in an organization, and methods to be used for addressing potential knowledge loss through attrition, and the process that will ensure that the plan is continually updated to meet changing business needs. (See *Attrition* and *Critical knowledge*).

knowledge transfer

The transfer of knowledge in a broad array of settings: between individuals, groups of individuals, communities, organizations, industries, or even nations.

Comment: Several 'levels of transfer' can be distinguished, depending on complexity. At *level I*, the objects of transfer are data and materials (materials, components, intermediate and end products, etc.). Such knowledge transfer will not enable the recipient to recreate the sender's knowledge. At *level II* the sender transfers documentation and blueprints and the necessary information to manufacture products based on documentation and blueprints. Documentation and blueprints correspond to the explicit knowledge of the original technology developer. At level III the recipient is able to reproduce the knowledge and change it, adapting it to different conditions. Such transfers have to be accompanied by elements of level I and II transfers for the recipient to fully understand the sender's knowledge. (See *Knowledge*).

knowledge worker

An employee whose role relies on an ability to find and use knowledge.

learning

See *Adaptive learning*, *E-Learning*, *Double-loop learning*, *Generative learning*, *Learning histories*, *Learning organization*, *Organizational learning*, and *Single-loop learning*.

learning histories

Explicit knowledge that has been developed from storytelling by individuals who are familiar with activities and events, in order to record their observations, perspectives, and interpretations for analysis and use by others in performance-improvement initiatives.

Comment: Such documenting processes typically involve small groups of people familiar with the topic and can be in formats varying from simple narratives to elaborate compilations. The development processes themselves have the potential of increasing involvement and trust, raising sensitive issues that otherwise might not be put forward, transferring knowledge beyond the immediate source environment, and building a body of management knowledge about what works and what does not work (and, in some cases, why). In the nuclear industry, developing learning histories can serve not only the above purposes but also enhance the enjoyment and effectiveness of training exercises that are designed to convey operating experience and lessons learned. (See *Knowledge* and *Storytelling*).

learning organization

An organization whose key personnel view its future success as being based on continuous learning and adaptive Behavior. The organization, therefore, becomes renowned for creating, acquiring, interpreting and retaining knowledge and then modifying its Behavior to reflect new knowledge and insights.

lessons learned

Concise descriptions of knowledge derived from experiences that can be communicated through mechanisms such as *storytelling*, debriefing etc, or summarized in databases. (See *Database* and *Storytelling*).

Comment: Such lessons often reflect on 'what was done right', 'what should be done differently', and 'how to improve the process and product to be more effective in the future'. In the nuclear industry, operating experience feedback is an example of an applied lessons learned programme.

leverage

The realization of the inherent value of an asset - physical or knowledge-based - beyond what is currently being realized. In short, to get more value out of it. (See *Knowledge asset*).

mentoring

A relationship between a more experienced individual and a less experienced individual that exists in a one-on-one fashion, designed to enhance the menthe's understanding of, and ability to put into practice, knowledge and skills possessed by the mentor. Such relationships are usually established for extended periods of time and typically have general rather than specific objectives.

Comment: The role of a mentor is to transfer from the mentor to the menthe ideas and thought processes that are designed to foster critical thinking skills, self-confidence, and role maturity rather than to teach physical capabilities to perform specific tasks. In the nuclear industry, mentoring is often used to pair more senior personnel with junior personnel to assist the latter with professional and career development. As with coaches, mentors may be drawn from within or from outside an organization. (See also *Coaching* and *Reverse coaching and mentoring*).

multi-skill assistance

A process in which an individual or team arranges a meeting or a workshop in order to make use of the knowledge and experience of others before embarking on a project or activity.

Comment: In the nuclear industry some organizations have established multi-skilled teams for maintenance work, where each team has the collective skills needed to complete their assigned work. Often team members provide cross-training for other team members on simpler tasks in their discipline for team members to be individually assigned to a broader range of tasks. Also termed Peer Assistance.

network

(1) A connection of two or more institutions that enables them to share information resources.
(2) A wide variety of systems of interconnected components. Specific examples include:

— social networks, business networks and entrepreneurial networks,
— computer networks, which transfer information between computers. (Specific configurations include star networks and grid networks.) The Internet is a large-scale computer network. A website and the entire World Wide Web are also networks of *web-pages*, a link web.

Comment: The Asian Network for Education in Nuclear Technology (ANENT) supported by the IAEA is a new partnership for co-operation in human resource development and research in nuclear technology as a key strategy for capacity building, nuclear infrastructure development and better use of available information resources. The ANENT was established in February 2004, to promote, manage and preserve nuclear knowledge; to ensure the continued availability of talented and qualified manpower in the nuclear field in the Asian region; and to enhance the quality of the human resources for the sustainability of nuclear technology. Universities, research centers, government agencies and other institutions involved in nuclear education and training in the region, are accepted as participating members of ANENT and international or regional networks as collaborating members. Currently there are 28 participating institutions from 12 countries (Australia, China, India, Indonesia, Malaysia, Mongolia, Pakistan, Republic of Korea, Sri Lanka, Thailand, Philippines and Vietnam) and six networks as collaborating members. (See also Extranet and Intranet).

nuclear knowledge portal

A knowledge portal that focuses on resources in the domain of nuclear knowledge. (See *Knowledge Portal*).

organizational culture

A mixture of an organization's traditions, values, attitudes and behaviors. In short, 'the way things are done around here'. Different organizations can have very different cultures.

Comment: In knowledge management, an organization's culture is extremely important - if it is not based on qualities such as trust and openness, then knowledge management initiatives are unlikely to succeed. In the nuclear industry some organizations use organizational culture surveys, which help managers to know the extent to which the organizational climate supports the sharing of knowledge.

organizational learning

The ability of an organization to gain knowledge from experience through experimentation, observation, analysis and a willingness to examine both successes and failures, and to then use that knowledge to do things differently.

Comment: While organizational learning cannot take place without individual learning, individual learning does not necessarily produce organizational learning. Organizational learning occurs when an organization becomes collectively more knowledgeable and skillful in pursuing a set of goals.

organizational memory

An alternative term for Corporate memory. (See *Corporate memory*).

organizational silo

An individual group within an organization, such as a department or unit.

Comment: ‘Silo’ is often used to suggest that such groups tend to be inward-looking and do not take account of what other similar groups are doing or how their work affects other such groups.

peer assistance

An alternative term for Multi-skill assistance. (See *Multi-skill assistance*).

portal

A special web page that organizes access to all of the online resources relating to a topic, similar to providing a ‘one-stop shop’.

position criticality

The importance of a particular position relative to all positions being considered in an assessment of available qualified staff to perform the functions necessary to assure safe, reliable, cost-effective operation.

Comment: In the operation of a nuclear power plant, it is obvious that the positions occupied by those persons who operate the control room - and, thus, the nuclear reactor controls - are more critical those that of nuclear engineers whose work will be checked and re-checked by peers and responsible managers before being accepted for action. Both roles are important to power plant operation; however, the former can influence the reactor’s operation directly and immediately, whereas the latter's impact is indirect and subject to intermediate assurances of correctness.

position disposition

The determination of whether or not a position will be refilled when vacated.

post-job briefing

An alternative term for After-action review. (See *After-action review*).

pre-job briefing

A process that involves conducting a structured and facilitated discussion before a task or project is performed to explain what should happen. (See also *After-action review*).

records management

Processes relating to the generation, receipt, processing, storage, retrieval, distribution, usage and retirement of an organization’s records.

Comment: A means of helping an organization to make sure it is creating and maintaining an adequate documentary record of its functions, policies, decisions, procedures, and essential transactions, whether in paper, film, electronic record, or some other medium. Records management thus helps the organization to decide which records to keep and which to destroy and how best to organize them all. (See also *Document management*).

reverse coaching and mentoring

A relationship by which senior individuals in an organization can learn from junior personnel whose experiences, skills and thought perspectives differ from their own.

Comment: Even where formal 'reverse relationships' are not established within an organization, this is a critical strategic consideration as the demographic profiles of the workforce and social dynamics change from traditional patterns to ones that tend to create generation gaps. In the nuclear industry, such relationships hold the potential to improve new employees' feelings of contributing and being valued for what they bring to the organization; to enhance diversity initiatives; to facilitate the learning by more senior personnel of new skills from less senior personnel (such as computer utilization and understanding the jargon of younger employees and their peer groups).

review

See *After action review*, *After event review* and *Periodic review*.

root cause analysis (RCA)

A generic problem-solving methodology employed to determine the fundamental causes (root causes) of events that have an impact on safety, health, environment, quality, reliability, or production. Such systematic investigations help identify 'what, how, and why' something happened so that recurrence might be prevented.

Comment: Events rarely have a single root cause. Thus, it is critical that a Root Cause Analysis (RCA) team does not 'jump to judgment' and that a sufficiently thorough investigation is made to be reasonably certain that all underlying causes have been identified and that relevant, but non-causal factors, have been filtered out during the RCA process.

search engine

A mechanism that identifies which items, out of a given collection, conform to a given query string.

self-assessment

The process by which an organization assesses its own KM maturity by considering its present processes/systems and its future KM needs.

Comment: The IAEA has developed a self-assessment tool to facilitate this process.

silo

See *Organizational silo*.

single-loop learning

An alternative term for Adaptive learning. (See *Adaptive learning* and *Double-loop learning*)

skills directory

See *Expertise directory*

socialization

The process of sharing tacit knowledge by bringing people together to facilitate observation, discussion, imitation, and practice.

Comment: One way of implementing socialization is by storytelling. However, the transfer of tacit knowledge through socialization, without the creation of explicit knowledge in the

process, is a rather limited form of knowledge creation. Because of this, the nuclear industry has structured training programmes to achieve not just tacit-to-tacit knowledge creation, but also explicit-to-explicit, tacit-to-explicit, and explicit-to-tacit knowledge transfer. (See *Storytelling* and *Knowledge*).

social network

A way of describing systems composed of multiple elements that are related in some way. Each element, or node, may or may not have a relationship with the other nodes. In an organizational context 'nodes' are people and 'relationships' might be a subject (e.g. 'customer needs') that the 'nodes' discuss, or might be a physical activity (e.g. 'are in contact with as part of normal work'). Often, the 'relationship' between two people is further described by a frequency, indicating how often the relationship is active.

Comment: Effective knowledge-sharing is a key to success in most organizations. Social network analysis can document how knowledge is currently shared within the organization and help identify simple initiatives that often lead to a dramatic increase in knowledge sharing. Social network analysis can also help managers to understand how knowledge enters and flows within an organization. It can also identify pools of knowledge within the organization and can document how accessible it is to others. (See Knowledge).

storytelling

The practice of relating personal recollections, impressions, perspectives, observations, and interpretations, typically with the aim of conveying a particular series of events that collectively convey a message that is of use to the listeners.

Comment: Civilization has spread and advanced through the gathering of people to orally share perspectives and interpretations of events in their lives and in the lives of others. From such activities, 'stories' have emerged that have been transferred beyond the original gathering in both oral and written forms. This practice is used in business and industry to transmit tacit knowledge orally and to develop learning histories that can then be utilized extensively for a variety of purposes. (See *Learning histories* and *Knowledge*).

succession planning

A methodology for identifying and developing employees to ensure that key organizational positions can be filled with qualified internal candidates, in advance of actual need, and to assist in managing diversity and workforce planning.

Comment: When necessary, candidates may be recruited externally. In the nuclear industry succession planning is often used for management and senior technical positions.

tacit knowledge

See K*nowledge*.

taxonomy

A hierarchical structure in which a body of information or knowledge is categorized, allowing an understanding of how that body of knowledge can be broken down into parts, and how its various parts relate to each other. Taxonomies are used to organize information in systems, thereby helping users to find it.

thesaurus

A hierarchical arrangement of related words and phrases often displayed in systematized lists of synonyms.

undocumented knowledge

Knowledge in an organization that has not been documented in such a way that it is accessible to those who may need it.

Comment: Undocumented knowledge can be tacit knowledge which may be very difficult to elicit, such as clues that an experienced field operator uses to anticipate problems at an NPP, or knowledge that can easily be externalized, such as an engineer's informal calculation of the basis for the minimum required feed water flow that has never been included in the appropriate plant system description document. (See *Knowledge*).

virtual

Something that exists or is brought together via electronic networks, rather than existing in a single physical place. (See also *Portal* and *Virtual team*).

virtual team

A team whose members are not located together but who utilize electronic networks for communication, collaboration and work processes.

workforce planning

The process that identifies or anticipates vacant positions and the required staffing levels and skills to ensure the retention of institutional knowledge and critical skills and competences to support future business strategies.

Comment: This information addresses potential gaps between current and projected workforce needs. It takes into account diversity and labor costs and so becomes a part of the staffing plan in an organization's business plan. It includes attrition data, planned retirements, vacant positions, development plans, succession plans, and current workforce requirements. (See *Attrition*, *Institutional knowledge* and *Succession planning*).

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