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# Planning and Execution of Knowledge Management Assist Visits for Nuclear Organizations

IAEA
International Atomic Energy Agency

# PLANNING AND EXECUTION OF KNOWLEDGE MANAGEMENT ASSIST VISITS FOR NUCLEAR ORGANIZATIONS

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IAEA-TECDOC-1880

# PLANNING AND EXECUTION OF KNOWLEDGE MANAGEMENT ASSIST VISITS FOR NUCLEAR ORGANIZATIONS

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2019

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# FOREWORD

The IAEA's nuclear knowledge management activities support the development of methods and applications for transferring and preserving knowledge, exchanging information, establishing and supporting cooperative networks, and training the next generation of nuclear experts and managers. These activities assist Member States in the preservation and enhancement of nuclear knowledge and in facilitating international collaboration, and have been recognized by the General Conference of the IAEA in a number of resolutions since 2002.

An effective knowledge management system combines elements of organizational processes, technology, and human resources and their expertise and experience. Decisions affecting safety must be made using the best knowledge and information available. Good knowledge management is a critical enabler of safety, security, and environmental and financial management. Once in place, knowledge management must be sustained and continuously strengthened. It becomes a robust component of a working environment, and with appropriate support from the executive level it turns to an organizational routine.

In 2005, the IAEA introduced the Knowledge Management Assist Visit (KMAV) as a peer review service to nuclear organizations in Member States. Since then, more than forty KMAVs have been carried out, addressing the needs of many different types of nuclear organization. The present publication is an update of IAEA-TECDOC-1586, Planning and Execution of Knowledge Management Assist Missions in Nuclear Organizations; it provides additional guidance on how these visits are best planned and executed, based on the experience gained and feedback from KMAVs, and provides a more holistic approach to maturity assessment that can be applied to many different types of nuclear organization.

The IAEA expresses its appreciation to all the participants who contributed to this publication. Particular thanks are due to G. Cairns (United Kingdom) for his assistance in the initial preparation of this publication and its finalization. The IAEA officer responsible for this publication was O. Glöckler of the Division of Planning, Information and Knowledge Management.

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# 1. INTRODUCTION

## 1.1. BACKGROUND

The nuclear industry is knowledge based, similar to other highly technical industries, and relies heavily on skilled employees and their know-how. The risk of losing accumulated knowledge and experience due to trends such as workforce ageing, and workforce mobility coupled with declining student enrolment numbers in nuclear education, and availability of new digital tools, 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 significantly declined over the years, or has been withdrawn altogether, while the profit margins of power generators have been severely reduced. The result has been lower electricity prices but also the loss of expertise as a result of workforce downsizing to reduce salary costs, a loss of research facilities to reduce operating costs, and a decline in support to universities to reduce overhead costs. 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) that are organizationally integrated over people, technology and processes.

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 subprogramme on Nuclear Knowledge Management with a focus on the development of guidance for KM implementation in nuclear organizations, networks for nuclear education and training and on the management of nuclear knowledge over the technology or facility lifecycle.

In the IAEA context, knowledge management is defined as:

> *"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 consists of three fundamental components: people, processes and technology. It 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.

The IAEA Knowledge Management Assist Visit (KMAV) was 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 (i.e. strategy, requirements, performance indicators and action plans related to KM implementation);
— Help organizations identify, through a self-assessment exercise, their own KM maturity levels against a set of pre-defined criteria.

## 1.2. OBJECTIVE

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

The publication also provides a valuable reference for other IAEA's peer review services, such as those for SALTO and OSART. Details of the aims and methodologies used for such services can be found in References [1] and [2], respectively.

## 1.3. SCOPE

The scope of the publication has been updated to recognize:

— Different nuclear organizational types (see Appendix I for details of the types of organization now addressed and the range of KMAV topics that are relevant to these);
— The varying levels of KM support now needed from Member States (from basic awareness to advanced training);
— The latest good KM practices and emerging technologies now embedded in some organizations;
— The potential utilization of KMAV practices with existing IAEA's peer review services, such as SALTO [1], OSART [2], INIR [3] and IRRS [4], which now have extended scope to address the requirements of KM.

The KM maturity models used by the IAEA with KMAVs have also been updated (See Appendix II).

## 1.4. STRUCTURE

In addition to this introductory section, this publication consists of additional 14 sections that describe the KMAV process. More specifically, Section 2 provides information about the objectives of a KMAV, Section 3 on KMAV initiation and approval requirements, Section 4 on its scope, level and duration, Section 5 describes the role of the Technical Officer, Section 6 the role of a Team Leader, Section 7 outlines the composition of the KMAV expert team, Section 8 describes the role of the expert, Section 9 describes the role of the Counterpart, Section 10 provides information on the preparation required in advance of the KMAV, Section 11 highlights the key information relating to security, health and safety aspects prior to and during the KMAV, Section 12 outlines the KMAV structure and activities, Section 13 describes the End of the Visit report and Section 14 the follow up stage.

Additionally, this publication has four appendices consisting of Appendix I which provides information on KMAV topics and scope for different organizational types, Appendix II on the Knowledge Management Maturity Assessment tool, Appendix III provides suggested "End of the visit report" contents and Appendix IV a KMAV feedback form. Lastly, the publication also has an Annex which contains the definitions of terms in the field of Nuclear Knowledge Management.

## 2. OBJECTIVES OF A KM ASSIST VISIT

The objectives of a KMAV are to:

- Provide assistance, consultancy support and an information forum to Counterparts who want to learn and benefit from the application of good practice KM strategies and techniques;
- Recognize good practice areas where KM is already providing benefits;
- Make recommendations on how KM shortcomings identified in the visit could be rectified or further activities implemented that would derive real business value for the Counterpart.

A KMAV will therefore consider existing good practices and will recommend possible improvement options based on the collective experiences of the visit team members. In cases where more advanced consultancy services are sought by the Counterpart, the KMAV approach can be more focussed, practical or training based to meet organizational objectives.

Visits are designed to assist the Counterpart in establishing, improving or embedding 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 regarded as confidential and subject to strict control by the IAEA and will not be released to others without the written consent of the Counterpart.

## 3. KMAV INITIATION AND APPROVAL REQUIREMENTS

The KMAV preparation process will be initiated when the IAEA receives a formal request from a Member State organization at executive managerial level. In principle, a KMAV could be requested by any organization of a Member State regardless of the maturity of existing KM provisions. Requests should be sent to the Head of Nuclear Energy Department through official channels. These should normally be at least six months prior to the intended visit date. All KMAVSs will require the approval by the IAEA Department of Nuclear Energy.

## 4. SCOPE, LEVEL AND DURATION

The scope of a KMAV will be agreed with the Counterpart and IAEA Team Leader well in advance of the anticipated start date. The KM visit can, in theory, be based upon any of the KM strands discussed in IAEA publications (examples listed below). Relevant publications can be found in the References of this publication.

The main topics covered have relevance to the following:

- Knowledge Management Requirements for Nuclear Industry Operating Organizations
    - Impact of Knowledge Management on Safety [5-8]
    - Impact of Knowledge Management for Long Term Operation [9, 10]
    - Approaches to implementation of KM programmes in nuclear organizations [11, 12]
- Maintaining Knowledge, Training and Infrastructure for Research and Development in Nuclear Safety [13]
- Knowledge Management for Human Resources Processes, Training and Competence Development
    - Workforce Planning for New Nuclear Power Programmes [14]
    - Evaluation of Human Resource Needs for a New Nuclear Power Plants [15]
    - Strategies and Human Resource Development [16]

- Risk Management of Knowledge Loss in Nuclear Organizations [17]
- Design Knowledge Management and Plant Information Systems
- Methods, Processes and Tools for Effective Retention and Transfer of Knowledge [18]
    - Nuclear Power Industry's Ageing Workforce: Transfer of Knowledge to the Next Generation [19]
    - Comparative Methods and Tools for Nuclear Knowledge Preservation [20]
    - Knowledge Preservation System: Taxonomy and Basic Requirements [21]
    - Development of Knowledge Portals for Nuclear Power Plants [22]
    - Web Harvesting for Nuclear Knowledge Preservation [23]
- Knowledge Management and Organizational Culture
- Impact of Knowledge Management Practices on NPP Organizational Performance [24]
- Partnerships and Networks for Nuclear Education and Training [25,26]
- Nuclear Engineering Education: Competence-based Approach in Curricula Development [27, 28]

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

In terms of organizational role, the IAEA KMAV approach is flexible and addresses most organizational types:

- Nuclear Power Plant Operators;
- Nuclear Regulators;
- Nuclear Technical Support /Design/Consultancy Organizations;
- Nuclear R&D Organizations;
- Nuclear Decommissioning Management Organizations;
- Nuclear Waste Management Organizations;
- Nuclear Education and Training Providers;
- Other Nuclear Organizations, Agencies or Bodies, including national networks of nuclear organizations.

KMAV support can also be requested for organizations in the early stage of development or undergoing significant change (e.g. organizations that are capacity building to address new nuclear build; organizations that are downsizing to address decommissioning and long-term care and maintenance). The KMAV is also valuable for a collection of organizations or government bodies that want to improve through recognised KM good practices.

It is beyond the scope of this publication to describe precisely how a KMAV will achieve its objectives as each individual visit is tailored to the needs of the Counterpart. However, for the organizational types listed above, Appendix I contains topic areas on how each organizational type could benefit from a KMAV.

To assist in the identification of team resources, tools and support activities, the IAEA will use the following classification levels (Figure 1) to help define the details of the visit:

**LEVEL 1 - KM Awareness and Orientation**: For organizations where the level of KM maturity is relatively low and an introduction to KM is required to help establish strategy, policy and future work areas.

**LEVEL 2 - KM Implementation and Roll-Out**: This level of intervention is intended for organizations that have been active in KM for some time and need further assistance in the general implementation of KM tools and techniques, and possibly change management support.

**LEVEL 3 - KM Expert Assistance**: This support includes dedicated training, coaching and mentoring activities and provides high level, specialist assistance in targeted KM areas. It is intended for organizations that are already running advanced KM programmes but need hands-on assistance to help overcome specific technical or implementation issues.

For Level 2 or 3 visits, the Counterpart should be very clear in describing the issues and objectives of the KMAV well in advance of the visit. This will allow the IAEA to put together the best possible team and be well prepared prior to the visit.

Further information relating to the different types of intervention described above can be found in Section 12 of this publication.

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

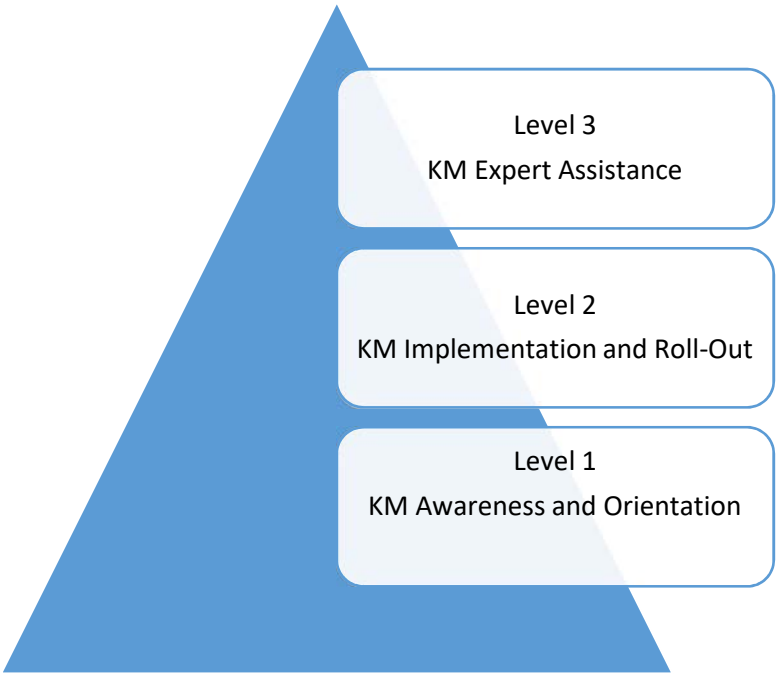


*FIG. 1. KM classification levels*

## 5. TECHNICAL OFFICER

On receipt of a request for a KMAV, the IAEA designates an IAEA staff member with appropriate experience 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 visit;

— Establishing liaison with the appropriate Counterparts of the host country who will be the primary point of contact with the team during the visit;
— Nominating a Team Leader for the visit;
— 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 visit;
— Ensuring the follow-up action plan is fully implemented after the visit is completed.

## 6. TEAM LEADER

The Team Leader is an IAEA staff member or an IAEA approved external expert. The Team Leader is responsible for:

— Liaising with the Counterpart before the KM visit to agree on visit objectives and agenda;
— Selecting the visit team members issuing terms of reference, job description and briefing notes;
— Coordinating travel arrangements with the team members and taking advice from the Counterpart in such matters;
— Coordinating of the visit team, including team briefing where necessary and assignment of specific duties;
— Representing the team in the preparatory, entry and exit meetings;
— Preparing and customizing KM tools that are to be used during the visit (e.g. the maturity assessment model);
— Managing the visit, among others ensuring that objectives are met, liaising with any government officials during the KM visit, resolving issues requiring decisions and preparing for the exit meeting;
— Coordinating the End of Visit Report, KMAV feedback form and follow-up of any actions needed to support the Counterpart;
— Addressing feedback from the visit and incorporating any lessons learned prior to future visits;
— Communicating with the Counterpart as necessary to maintain good working relationships and to advise of other related KM IAEA initiatives.

## 7. TEAM COMPOSITION

The size of the team depends on the scope and level of the visit which is discussed in Section 4. 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 sector. Such national experts should come from different organizations and countries, if possible, to represent a range of views and experiences.

In appointing a KM expert, the following guidelines apply:

— Experts need to be registered with the IAEA by completion of an online career profile managed by the IAEA Human Resource function. This profile is completed by the expert and is used to establish relevant qualifications and experience;
— The profile is used by the Team Leader to determine suitability for a visit. The expert's experience should align with the KMAV scope and objectives;
— The KM expert must accept the IAEA's specific terms and conditions prior to appointment for a KMAV;

— Each expert is likely to have, in addition to a particular area of KM expertise, knowledge of national and organizational nuclear KM 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 resides with the Technical Officer and the Team Leader and is agreed with the Counterpart. Team members will be selected to ensure that a variety of national approaches to KM and implementation are represented.

## 8. ROLE OF THE EXPERT

The expert is selected according to the guidance given in Section 7. The expert is responsible for the following activities:

— Contacting the IAEA to offer services prior to engagement on a visit. This involves submitting a CV and, at later date, completing an online career history profile;
— Assisting the IAEA Team Leader with the planning of the visit and preparation of the visit agenda;
— Prior to the visit 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 11;
— Planning personal travel arrangements to and from the host country including obtaining the necessary visas. Internal host country travel and accommodation arrangements are generally the responsibility of the Counterpart;
— Giving presentations in accordance with the visit agenda and, if required, facilitate workshops and other activities as necessary. See Section 12;
— Providing input information for the End of Visit Report. See Section 13;
— Communicating with the IAEA after the KMAV, as necessary, to maintain good working relationships and to provide availability information for possible future visits.

## 9. ROLE OF THE COUNTERPART

The Counterpart is the main contact in the organization that requires assistance. In general, the Counterpart is a director or senior manager. The Counterpart organization is responsible for the following activities:

— Contacting the IAEA to arrange the KMAV. Informal preliminary discussions should be held with representatives within the IAEA NKM Section describing current issues and problems. The request for a KMAV should typically be made six months prior to the intended start date;
— Specifying options for the date, time and place of proposed visit meetings and presentations;
— Gathering and sending to the IAEA background material related to the nuclear organization requesting the assistance. This should include details of general issues and the issues that the Counterpart believes may be solved using KM methodologies or systems. This advance information should be written in English, taking into consideration the fact that the KMAV team members may have no prior knowledge of the KM strategy and systems deployed in the organization. Also, team members may not have prior knowledge of the Counterpart’s national practice and regulations. Typical advance information may include:
    — Current KM policy/procedures/methodology documentation;

    - Completed and ongoing KM project list and descriptions;
    - Organizational and KM team structures (organograms);
    - List of current IT systems used to support KM;
    - Details of KM benefits realised to date.
- Prior to a Level 1 or 2 visit, establishing current KM maturity in the organization. This is a self-assessment made against the IAEA criteria given in Appendix II. Although this is not a mandatory exercise, the IAEA believes that such an assessment provides valuable insights into current good practice and possible development areas. All information provided is kept confidential and not passed to others without the consent of the Counterpart;
- Coordinating travel and accommodation arrangements for all KMAV team members and assisting others who may be attending meetings and presentations. Arranging local travel within the host country for IAEA and team members is generally the responsibility of the Counterpart. Strong importance is placed on security, health & safety and welfare aspects;
- Advising any applicable rules/regulations pertaining to the visit such as the handling of sensitive information, health & safety policy, procedures for working in the Counterparts offices and facilities etc.;
- Ensuring equipment and meeting rooms are available to support presentations and meetings;
- Liaising with senior management and other key stakeholders within the organization to ensure attendance at meetings and presentations as appropriate;
- Completing the KMAV Feedback Form used to evaluate the quality and value of presentations and meetings during the visit;
- Communicating with the IAEA upon completion of the KMAV to provide feedback on the value of the visit and to maintain good working relationships for the future.

## 10. PREPARATION

KMAVs are normally planned at least six months in advance of the start date. The Technical Officer, Team Leader, Counterpart and Experts are all involved in the planning phase and undertake the activities as outlined in Sections 5, 6, 7, 8 and 9. In summary, preparation involves:

- Generation of visit objectives, format and agenda. The visit agenda describes the activities to be carried out together with timescales, locations and the people involved;
- Selection of team members and other resources as necessary;
- Establishing travel and accommodation details;
- Developing presentation slides and other materials for use during the visit. This is the most important part of the visit preparation work for the Expert which may require several hours of research. Wherever presentations are needed, the objectives and content of each presentation should match the visit 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 setup 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 the presentation slides and other materials available for all to copy without Intellectual Property (IP) rights or copyright restrictions? (*This should be established as early as possible before copies are sent to the Counterpart or to others in the team*.)
- Making arrangements with the host organization being visited to ensure the provision of necessary support facilities such as meeting rooms, computer equipment and interpreters;
- Taking due account of security, health and safety factors relevant in the host country. See Section 11;
- Ensuring that IP requirements and Non-Disclosure Agreements are understood and complied with before, during and after the KMAV.

## 11. 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 non-staff consultants who have a direct contractual agreement with the IAEA are required to comply with the IAEA's personnel administration and staff welfare procedure defined in their contracts and complete the UN online security awareness training course, BSAFE, through the site of "training.dss.un.org".

The course concludes with a final test and generation of a certificate which should be forwarded to the IAEA Officer organizing the travel. The certificates are valid for three years, after which time the tests must be taken again. It is the responsibility of all team members to ensure that they have valid certification to travel prior to any KMAV. External team members are responsible for organizing their own travel and medical insurance cover.

## 12. KMAV STRUCTURE AND ACTIVITIES

To meet the objectives listed in Section 2, the KMAV team will be well prepared and fully aware of the KM issues and aspects of interest to the Counterpart. The attendees, and the format and scope of the visit, will have been agreed in advance and will reflect the level of intervention required as defined in Section 4.

### 12.1. ENTRY 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 activities. This informal 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 visit, i.e. the End of Visit Report (See Section 13 and Appendix II). The Team Leader may decide to allocate specific areas of production to Experts and other members of the visit 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.

### 12.2. LEVEL 1 INTERVENTION APPROACH

Level 1 interventions are intended for organizations with little or no KM experience where the main objective is to understand the basics and to formulate a strategy for future implementation.

The Team Leader will, in most cases, chair the meeting. The main session will always start with introductions from the visit team, the Counterpart and related representatives. The Team Leader will be responsible for ensuring that the agenda is followed and that the planned timings are maintained. A visit Feedback Form (See Appendix IV) 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 visit. This may include some issues which are not directly related to KM. Level 1 interventions generally adopt a reciprocal structure of presentations (e.g. in Microsoft PowerPoint) that allow ideas and issues to be shared constructively. As well as describing KM fundamentals, the expert team, wherever possible, will provide case studies to demonstrate good practice and benefits of KM implementation. Diagnostic tools should be used to support the presentations. Of particular value are tools such as:

(i) The KM Maturity Analysis tool – is described in Appendix II of this publication and is a benchmarking tool designed to highlight good practice and potential gaps in KM performance. The tool is available via the Excel spreadsheet form and provides an excellent starting point for identifying priority areas for action.
(ii) SWOT Analysis – a high-level analysis of an organization's strengths, weaknesses, opportunities and threats that can be used to focus on any area of an organization's operations. It is useful in KM to help identify areas for improvement or change.
(iii) PESTLE Analysis:

— Political
— Economic
— Social
— Technological
— Environmental
— Legal

This is similar to SWOT analysis but considers aspects of an organization's activities. PESTLE analysis is excellent for government or groups of inter-related organizations where there are many interfaces and external factors which may be improved through a systematic KM approach.

In all the examples above, the IAEA Team Leader or experts will facilitate sessions with senior managers and others in the organization to provide meaningful insight and recommendations for KM implementation.

## 12.3. LEVEL 2 INTERVENTION APPROACH

Level 2 interventions are intended for organizations that have already begun their KM journey and whom are looking for additional guidance and insight to help overcome implementation issues. Some of these issues may be technical, process related or cultural. It is not unusual to come across barriers to implementation and quite often a "change management" approach may be needed to support the KM strategy. In such cases the structure of the expert team and the agenda for the KMAV may need to be significantly different to a Level 1 intervention. Wherever possible the Counterpart should be quite clear in describing the main issues prior to commencement of the KMAV. Based on this information the expert team may be required to carry out further diagnosis to identify specific problem areas. The tools used to achieve this may comprise the tools described in 13.2 or may be more sophisticated techniques requiring the use of:

— Stakeholder mapping;
— Project management analysis;
— Engineering practices;

— Organizational cultural analysis;
— Communication plans;
— Surveys and other forms of stakeholder feedback.

The expert team will assist the Counterpart during the visit based on the output of the above and other discussions. The main deliverable will be a recommended implementation plan or project programme that can be used by the Counterpart to ensure the KM project is aligned with business objectives.

During a Level 2 intervention there will be less emphasis on the use of presentations and more focus on the use of diagnostic tools, KM method demonstration and KM planning activities. Specific technical aspects may also be included and discussed. However, very detailed technical aspects are covered in a Level 3 intervention as discussed below.

## 12.4. LEVEL 3 INTERVENTION APPROACH

Level 3 interventions are for those organizations that are well advanced with their KM programme but need very specialised support to achieve a particular KM objective. Thus Level 3 visits are generally single topic visits covering a specific KM area in great detail. The style used for this type of KMAV is a more coaching/mentoring focused with the nominated experts and more hands-on and practical. Examples of such a visit may be:

— To configure a KM related technical tool (e.g. Microsoft SharePoint) to set up an on-line Community of Practice;
— To demonstrate a particular type of KM method (e.g. how to conduct effective elicitation interviews with staff leavers);
— Detailed project management or planning assistance to develop a KM programme;
— Practical set-up and configuration of IT tools for Concept Mapping, Plant Design Modelling, Ontology modelling etc.;
— KM team or end user training in the use of advanced KM tools and techniques;
— Support to educational establishments in the detailed development of courses in nuclear education;
— To further integrate KM into the business management system;
— To improve effectiveness of KM performance indicators.

Because of the specialist input needed to help with a Level 3 visit, it is imperative that the requirements are agreed with the Counterpart several months in advance of the KMAV. Also, prior engagement with the Counterpart is likely to have taken place via a previous Level 1 or 2 visit. The style of such a visit is less formal than with Level 1 or 2 and is likely to have fewer participants from the IAEA team depending on the nature of the speciality and skills required. The need for formal presentations is thus reduced; a more adaptive approach will be used depending on the visit objectives.

## 12.5. PRESENTATIONS

Wherever presentations are used in KMAV sessions, these should run to the timings agreed in the agenda allowing time for questions either during or immediately following delivery. Where interpreters are used for presentations, the visit team members should allow reasonable time for translation and adjust the content and length of the presentations accordingly.

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 Visit Report (See Section 13).

### 12.6. EXIT MEETING/CONCLUSIONS

For visits planned over several days, the Team Leader may convene a separate meeting, involving visit 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, recommendations and future work activities. The Team Leader will facilitate this discussion and may request each Expert to give a summary of his observations and recommendations (see Section 13 below). As part of this summary, the visit team members will also outline good practices observed during the visit.

The Team Leader will collect completed Feedback Forms related to the visit if applicable.

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

### 12.7. KMAV TOURS AND FACILITY VISITS

Most KMAVs 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. Visit members should be aware of these aspects as the information and insights gained can often be relevant to the visit recommendations.

### 12.8. 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 for Level 1 or 2 visits will be that of a “gap analysis” between observed practices and good practice assimilated over many years of experience. For Level 3 visits the emphasis is more training and mentoring related and the recommendations resulting from this intervention will relate directly to the application of the delivered support. The Experts will take into account the political, social, economic and technical trend information that the host provides. They should recognize that good practice solutions are not necessarily transferable between organizations.

### 12.9. DOCUMENTS AND CONFIDENTIALITY

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

## 13. END OF VISIT REPORT

The objectives of a KM visit are given in Section 2. The End of Visit 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 visit the Team Leader will co-ordinate the draft End of Visit 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. Where appropriate, any day to day observations recorded during the visit can be agreed and included at this time. A suggested outline structure of the report is shown in Appendix III together with details of the typical content. The Team Leader will then pass the draft report to the team for final comment before submitting it

to the Counterpart along with any other relevant deliverables produced within one month of the completion of the visit.

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.

## 14. FOLLOW UP

At completion of the End of Visit Report, the Technical Officer will confirm that all recipients have received a copy of the document and any other deliverables 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 visit and acknowledgement that the visit has achieved the pre-defined objectives.

Further communication between the Technical Officer 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 visit recommendations (i.e. confirmation of value added, or problems related to implementation). Based on this feedback, consideration should be given to further KMAVs if these are deemed beneficial to the Counterpart.

Figure 2 outlines the key steps in the KMAV workflow, as described in Sections 10-14.


*FIG. 2. Key steps in KMAV workflow*

## APPENDIX I
## KMAV TOPICS AND SCOPE FOR DIFFERENT ORGANIZATIONAL TYPES

This Appendix describes the range of topics and benefits that a KMAV may bring when undertaken for different organizations. The list of activities is not exhaustive and is provided only to give an indication to Counterparts of some of the KM areas that may be explored. High level visits (Level 1) will generally deal with a range of topics in overview while the more specific KMAVs (Level 3) will generally focus on single topics at a detailed level.

### I.1. GENERIC – APPLIES TO ALL ORGANIZATIONAL TYPES

Most organizations can benefit from a KMAV covering the following topics:

- KM fundamentals and benefits;
- KM policy and organizational long-term strategy;
- Organization knowledge needs and KM requirements (internal and external knowledge sources, utilization of knowledge, knowledge sharing, capture and preservation of organizational knowledge, others;)
- KM organizational, technological, procedural and cultural aspects;
- KM and its contribution to nuclear safety;
- Organizational learning and approaches for collecting and using operational experience feedback;
- Security of knowledge, information and data;
- Protection of intellectual property;
- Managing KM projects;
- KM and monitoring Key Performance Indicators (KPIs);
- Benchmarking KM performance with other similar organizations;
- KM practices and processes their integration into the management system;
- KM and workforce planning;
- Knowledge loss risk management to address ageing workforce, potential loss of critical skills, recruitment policy and succession planning;
- KM processes for transferring knowledge from supply chain, outsourcing services;
- KM related to training, qualification of personnel and competence development;
- Work team composition and knowledge sharing;
- Records and data management best practices;
- Capturing decision rationale, recreation of design basis, capturing new knowledge; IT systems for design, modifications and maintenance data (Content Management, Enterprise Resource Planning, Portals, Collaboration Tools, Plant Design Modelling, others);
- Knowledge capture, preservation and transfer techniques (including tacit knowledge capture);
- Knowledge mapping and ontology design;
- Organizational culture for knowledge management, learning and development;
- Internal and external collaboration (including clients);
- Establishing Communities of Practice (CoPs);
- Design knowledge management and competence development over the facility lifecycle for new build NPP.

## I.2. NUCLEAR POWER PLANT (NPP) OPERATORS

Operators of NPPs can request a KMAV to cover any of the areas above in the generic list. Other topics of particular relevance to NPPs include:

— KM to support transitioning from NPP operation to decommissioning;
— KM for new build and the introduction of new reactor types to the organization;
— KM to support Safety Aspects of Long Term Operation (SALTO) with focus on human resources and competency development, and KM practices for aging management and life extensions;
— KM to support modifications, power up-rates and the introduction of new fuel;
— Design basis, requirements management and integrated configuration management for future trends and needs of data usage;
— Traceability, rationale and assumptions of operational and maintenance design changes
— KM and its contribution to nuclear safety and security for NPPs;
— KM and its contribution to improved organizational performance;
— KM and radiological protection aspects for NPPs;
— Lessons learned from NPP operating experience and reported external events;
— KM to support the long-term radioactive waste management.

## I.3. NUCLEAR REGULATORS

Nuclear regulatory organizations are generally independent, government appointed bodies primarily responsible for nuclear licencing and ensuring the safety of the public. They have a diverse range of knowledge needs and good KM practice is essential for this vital role.

Nuclear regulators can request a KMAV to cover any of the areas above in the generic list. Other topics of particular relevance include:

— Capacity building and competency development for the regulatory environment;
— KM of records and historical legal information and guidance pertinent to licencing;
— KM of safety cases for nuclear facilities (present and historical).

## I.4. NUCLEAR TECHNICAL SUPPORT/DESIGN/CONSULTANCY ORGANIZATIONS

Technical support organizations cover a range of support activities in the supply chain from nuclear facility design through to nuclear safety risk analysis and many other consultancy support activities. They are government and/or privately owned. In addition to the generic list, the following areas may be of interest for a KMAV:

— Competence frameworks and competence management of staff;
— Managing design knowledge throughout the nuclear facility lifecycle;
— KM and the use of advanced Plant Informational Models (PIM) or Building Information Modelling (BIM) to support the design process;
— Search and re-use of information/data for nuclear plant design and safety;
— Capturing and preserving design rationale;
— KM and its contribution to nuclear safety analysis.

## I.5. NUCLEAR R&D ORGANIZATIONS

Nuclear R&D organizations have KM needs similar to technical support organizations but have more of a focus on innovation and applied R&D. Additional topics that a KMAV could help with include:

— KM to support the innovation process;
— The use of research reactors and similar facilities to extend the knowledge base;
— External collaboration strategies with academia and other R&D organizations;
— Mitigating the reliance on single experts ('Singletons').

## I.6. NUCLEAR DECOMMISSIONING MANAGEMENT ORGANIZATIONS

Decommissioning organizations address the physical decommission of nuclear facilities which often includes design, construction and temporary work activities. Long term care and maintenance of facilities (with nuclear fuel and waste removed) is also often within scope. Such organizations have varied KM needs depending on its particular role and programme. A KMAV can help in many ways over and above the generic benefits above, e.g.:

— Tacit knowledge capture from operators (of now non-operational facilities) to recover layout and spatial knowledge of the plant;
— Competence development and re-training of workers to help transition from operating to decommissioning roles;
— Information rationalisation – disposing of operational information not currently/presently required for the decommissioning and long-term storage phases.

## I.7. NUCLEAR WASTE MANAGEMENT ORGANIZATIONS

Nuclear waste management organizations have a particular interest in very long-term preservation of knowledge that is different to other nuclear organizations. KMAV support can be provided in the specialist areas of:

— Preservation and retrieval of records, knowledge and organizational 'memory' across generations;
— Stewardship for long term preservation of knowledge and risk mitigation of knowledge loss;
— Advanced knowledge-centric informational systems for waste inventory datasets and records;
— Preservation of historical legal knowledge and decision rationale;
— Continuity of knowledge on nuclear material content of the repository;
— Identification, markers and archives for deep geological repository sites.

## I.8. NUCLEAR EDUCATION & TRAINING PROVIDERS

Nuclear education providers are generally universities offering nuclear engineering courses. Training providers are organizations and some universities which provide specialised training for employees. Their KM needs and approaches are often different to other nuclear organizations. Specific areas where a KMAV may help include:

— Establishing curriculums for nuclear education courses;
— Benchmarking KM performance and certifications with other educational establishments;
— Providing specialised courses or modules on KM;

— Establishing specialised nuclear services within the organization, or in support to other government agencies;
— Educational performance improvement through KM;
— Succession planning and knowledge transfer from professors to teachers;
— Supporting KM for explicit knowledge (e.g. retention of just-in-time training materials).

The IAEA can also provide additional services to educational and training providers outside the KM area. Such services include assessments of performance and maturity relating to the delivery of nuclear engineering educational and training. The criteria for such a visit, as described in References [20] and [21], pertain to the following main areas:

(1) Policy, strategy, vision and mission of the educational organization;
(2) Capacity to deliver nuclear engineering programmes;
(3) Educational Curricula;
(4) Outcomes of the programme;
(5) Quality and accreditation;
(6) Human resource policy;
(7) National and international dimensions;
(8) Collaboration with industry.
A separate maturity model is available to support such visits.

### I.9. HYBRID ORGANIZATIONS

Some larger organizations may have a purpose to or a programme that covers many of the organizational types discussed above. In such cases a KMAV can help with each of the separate functions (e.g. design, R&D, consultancy) as with single function organizations. The KMAV can also help with communication issues in such hybrid organizations to assist improved internal collaboration between teams.

### I.10. NATIONAL NETWORKS OF NUCLEAR ORGANIZATIONS, AGENCIES OR BODIES

A KMAV can be arranged to provide assistance to National Networks of Nuclear Organizations, Agencies or Bodies as with the separate entities described above. In such circumstances several visits may be needed to cover the various entities and locations and to formulate a common strategy if this is required. In addition to the generic benefits discussed above, networks will benefit from a KM approach that addresses communication and collaboration activities between entities.

## APPENDIX II
## KNOWLEDGE MANAGEMENT MATURITY ASSESSMENT TOOL DESCRIPTION

### II.1. INTRODUCTION

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 eight organizational or functional categories, to facilitate the self-assessment process, viz:

1. Policy and Strategy for KM;
2. Human Resource (HR) Processes for KM;
3. Training and Competence Development for KM;
4. Methods, Procedures & Documentation Processes for Improving KM;
5. Technical Solutions for KM;
6. Approaches for the Capture/Transfer of Knowledge;
7. Organizational Culture to Support KM;
8. Internal/External Collaboration for KM.

The tool has been created based on the functionality in Microsoft Excel with each of the eight criteria above represented within a separate worksheet. Each of the 8 worksheets contains two groups of columns: 'Extent currently utilized' and 'Extent desired'. Each column of these groups corresponds to ratings as follows:

0 - Not utilized
1 - To a little extent
2 - To some extent
3 - To a great extent
4 - To a very great extent

The intention is to complete the worksheets to derive a gap-analysis of current and desired performance along with potential improvement options

### II.2. TAILORING THE EXCEL WORKBOOK FOR A GIVEN ORGANIZATIONAL TYPE

The Team Leader or Facilitator is required to amend the Excel workbook prior to each use by removing (deleting rows) for those organizational types not relevant to the organization to be assessed. This should be completed for all sheets in the workbook. The "Organizational Type" column should also be removed prior to use. It should be noted that some organizations (hybrid organizations) can comprise of more than one organizational type.

### II.3. MATURITY ASSESSMENT PROCESS

The maturity assessment can be carried out in a number of ways, e.g:

1. In a group workshop environment - A facilitator takes answers and comments from a group of attendees simultaneously at the workshop. Scoring and comments are captured by the Facilitator and input directly into the workbook as the workshop progresses. This method can take up to 3 to 4 hours to complete.

2. By distribution of the Excel workbook to candidates after an initial briefing. This method requires a Facilitator to explain KM basics, terminology and maturity methodology to a group of individuals in a workshop. Attendees then complete the workbook questions and comments "off-line" in their own time and return the results back to the Facilitator. The Facilitator collates the information for presentation in the following days. Returns of completed workbooks are usually anonymous to encourage open and accurate feedback.

3. By use of configurable IT survey tools (e.g. Survey Monkey) - Some organizations have the capability to take the maturity assessment questionnaire and distribute this to staff internally using IT survey tools and the organization's intranet. Collated information is made available to the Facilitator for subsequent analysis and presentation. The information is best captured anonymously.

In each of the above examples, experience suggests that collating returns from similar roles/grades in the organization provides demographic and cultural information that is useful for subsequent KM implementation.

An example from the KM maturity model of the criteria on Policy and Strategy for KM, along with relevant charts is included in the pages that follow.

| 1. Policy & Strategy For KM | | | Note: Typical 10 participants representation for illustrative purposes only | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Key words | KM Criteria | Organizational Type | Extent currently utilised | | | | | Scoring | Extent should be utilised | | | | | Scoring | What is Missing/Weaknesses? | Suggestions for Improvement |
| | | | | 0 | 1 | 2 | 3 | 4 | | 0 | 1 | 2 | 3 | 4 | | | |
| 1.01 | Organizational strategy wrt. KM | Is implementaton of the KM principles a part of the organization long-term strategy and aligned with its business objectives? | ALL | | 5 | 3 | 2 | | 1.7 | | | 3 | 5 | 2 | 2.9 | | |
| 1.02 | KM policy | Does an appropriate written KM Policy /Strategic Plan exists? | ALL | 1 | 6 | 2 | 1 | | 1.3 | | | 1 | 2 | 7 | 3.6 | | |
| 1.03 | Integration of KM procedures | Are KM processes/practices/methodologies embedded in the integrated management system? | ALL | 2 | 3 | 4 | | 1 | 1.5 | | | 4 | 6 | | 2.6 | | |
| 1.04 | Communication of KM policy | Is the KM policy pro-actively communicated to all staff in the organization? | ALL | | 7 | 3 | | | 1.3 | | | 2 | 5 | 3 | 3.1 | | |
| 1.05 | Responsibilities for KM implementation | Are sponsors and process owners for formulating and implementing KM in the organization clearly identified? (Is there clear ownership of KM processes and issues?) | ALL | | 2 | 1 | 6 | 1 | 2.6 | | 1 | 1 | 2 | 6 | 3.3 | | |
| 1.06 | Continuous learning | Does the organization's strategic focus supports continuous learning (development) to improve individual and organizational performance? | ALL | | | 5 | 5 | | 2.5 | | | 4 | 6 | | 2.6 | | |
| 1.07 | Safety culture / KM alignment | Is the organization's KM policy aligned with continued emphasis on a strong safety culture? | ALL | | | 1 | 7 | 2 | 3.1 | | | | 6 | 4 | 3.4 | | |
| 1.08 | Security of knowledge & information | Does the organization have a written information security policy based on industry best practices or national or international standards? | ALL | | | | 3 | 7 | 3.7 | | | | 1 | 9 | 3.9 | | |
| 1.09 | IP policy | Does the organization have an Intellectual Property (IP) policy covering internal & external IP aspects? | ALL | | | | 1 | 9 | 3.9 | | | | | 10 | 4.0 | | |
| 1.10 | KM project management | Are KM programmes and projects managed with governance, controls and processes according to established best practice? | ALL | | 4 | 4 | 2 | | 1.8 | | | 3 | 5 | 2 | 2.9 | | |
| 1.11 | KM effectiveness | Are key performance indicators (KPIs) used to help monitor and guide KM performance and effectiveness? | ALL | | 2 | 3 | 5 | | 2.3 | | | 3 | 6 | 1 | 2.8 | | |
| 1.12 | KM resources | Are adequate resources (financial, human, IT etc.) allocated for KM implementation? | ALL | | 3 | 3 | 4 | | 2.1 | | | 4 | 4 | 2 | 2.8 | | |
| 1.13 | Access to knowledge | Does the organization give the necessary information and knowledge access to employees to allow them to perform their assigned duties? | ALL | | 2 | 3 | 5 | | 2.3 | | | 3 | 7 | | 2.7 | | |
| 1.14 | Knowledge sustainability | Does KM contribute to long term sustainability of organizational safety and operational performance? | ALL | | | 6 | 4 | | 2.4 | | | 2 | 6 | 2 | 3.0 | | |
| | | **Average** | | | | | | | 2.3 | | | | | | 3.1 | | |

*FIG. II-1. KM maturity model self-assessment on policy and strategy for KM*

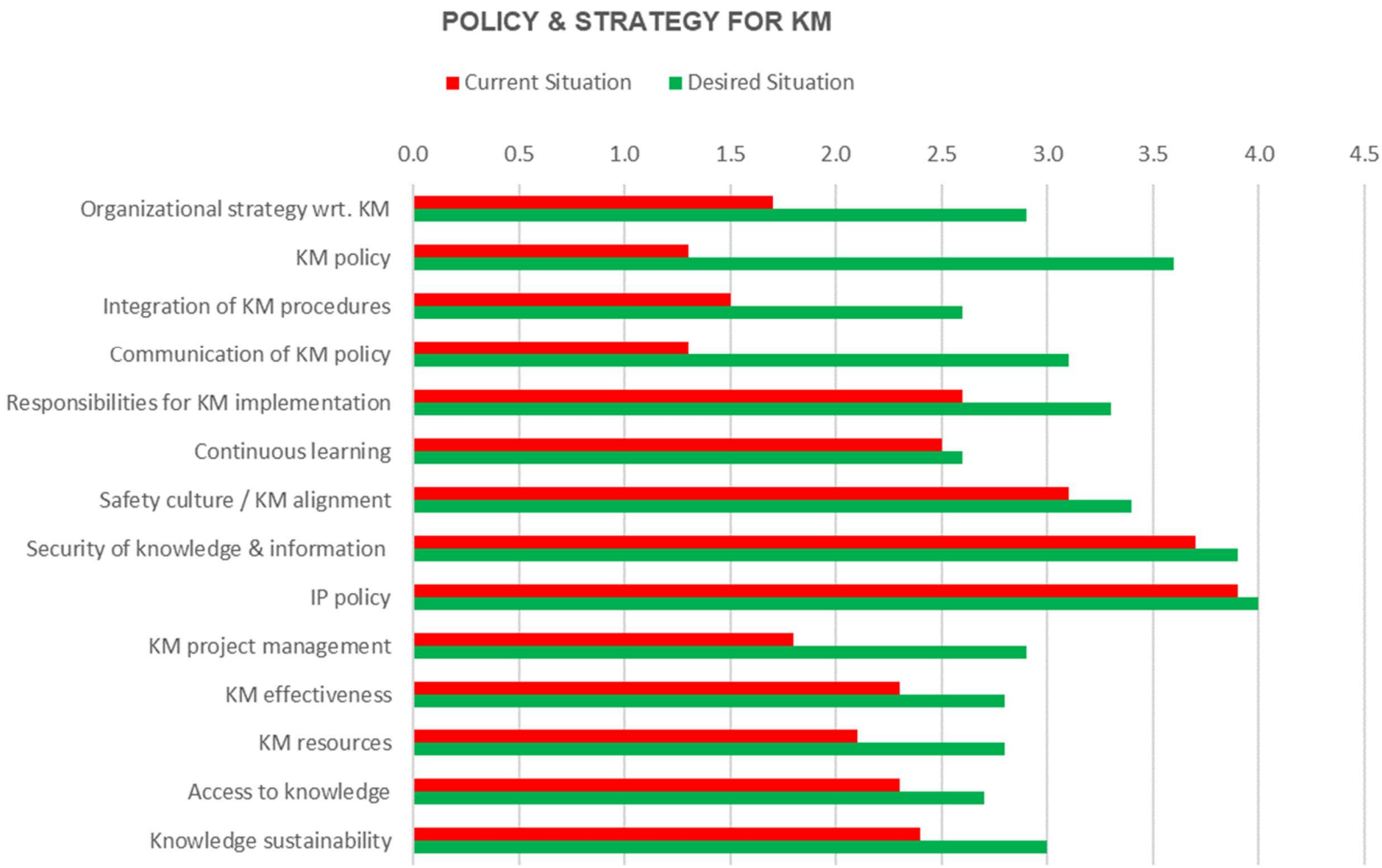


*FIG. II-2. Bar chart depicting the outcomes of the self-assessment on policy and strategy for KM*


*FIG. II-3. Spider chart depicting the outcomes of the self-assessment on policy and strategy for KM*

## APPENDIX III
## SUGGESTED END-OF-VISIT REPORT CONTENTS

The following content is suggested for each End of Visit Report. The report will have six main sections as detailed below with Appendices as required and that typically include detailed information captured during the visit.

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

### III.1. EXECUTIVE SUMMARY

### III.2. ADMINISTRATIVE INFORMATION

*This section contains project information related to the visit 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*

### III.3. TERMS OF REFERENCE

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

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

### III.4. 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.*

### III.5. 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.*

### III.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 visit.*

### III.7. RECOMMENDATIONS TO THE IAEA

*This section contains recommendations to the IAEA that are received from the Counterpart, Experts or other parties involved with the visit. 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.*

### III.8. 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 IV
## KNOWLEDGE MANAGEMENT ASSIST VISIT FEEDBACK FORM

The text below is the suggested content of a feedback form that can be implemented in spreadsheet format or by online applications created by the IAEA team or host organization.

Dear Participant:

Many thanks for taking the time to fill out this feedback form. Your feedback will help the IAEA to improve the effectiveness of the KMAV in assisting the Member States with their KM needs.

KMAV Title:

KMAV Location and Date:

Host Organization:

Name (optional):

Please rate the questions 1 to 11 using a scale of 1 to 5, where:

- *1 being the weakest (very bad, disagree) and 5 being the strongest (very good, agree)*
- *if you rated with 1 or 2, please provide an explanation*

1) Technical content of the KMAV was relevant:

2) Preparation of the KMAV:

3) Quality of presentations and other materials:

4) Conduct of the agenda:

5) Presentations and discussions were focused and useful:

6) KMAV duration:

7) Your specific expectations on the KMAV were addressed:

8) The Experts of the KMAV Team demonstrated thorough knowledge and understanding of their subjects:

9) The KM self-assessment tool was beneficial to your organization:

10) The KMAV was applicable to the needs of your organization:

11) A follow-up KMAV is advisable:

Please provide text input:

12) Additional issues that were not addressed or have not been included in the agenda:

13) Main strengths and weaknesses of this KMAV:

14) Recommendations for future KMAV:

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## 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.*

**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*. (See also *double-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.

**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. (See also *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. (See also *lessons learned* and *root cause analysis*)

*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.

**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. (See also r*oot cause analysis*)

*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.

**acquisition**

Knowledge may be acquired and represented for inclusion in a knowledge model. Acquisition can be performed by eliciting knowledge from a domain expert, inducing knowledge from examples, porting knowledge from databases, and by other methods. (See also *knowledge acquisition*)

**articulation**

The process of making tacit knowledge explicit. Also termed *externalization.* (See also *knowledge* and *internalization*)

**artificial intelligence**

The ability of a computer or other machine to perform those activities that are normal 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). (See also *balanced scorecard, intangible assets*, *intellectual assets*, *knowledge assets*)

*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.

**assumption**

A potential (internal or external) factor that could affect the progress or success of the project. Mostly, an assumption is a condition that needs to be present for the project to produce the intended result. An assumption that needs to be in place before a project commences is referred to as a *pre-requisite.*

*Comment*: in the context of KMAV events, the pre-requisite is in a form of an Advanced Information Package (AIP).

**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. (See also *mentoring* and *reverse coaching and mentoring*)

*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.

**codification**

The process of converting people's knowledge into a form to enable it to be communicated independently of those people. (See also *knowledge harvesting*)

*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.

**cognition**

The act or process of knowing (Webster, 1986).

**cognitive engineering**

A term applied to the professional field concerned with the development, analysis and evaluation of systems which interact with human cognitive functions.

*Comment:* in the nuclear industry, cognitive engineering encompasses, for example, semantic contents of the target domain, behaviour and performance, and implications of changing cognitive-related aspects of the target domain**.**

**cognitive science**

The field which investigates the details of the mechanisms and processes of human intelligence (such as learning, memory, recall, decision making) to determine the procedures and functions which produces and utilizes that intelligence.

**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.

**competence**

The capacity and capability of an individual to perform with a desired effectiveness – the ability to deliver quality work within a particular domain.

**competence mapping**

Competency mapping is a mapping process which creates a map of individual competency or organizational competency, i.e. a competency map. The process may focus on existing competency, required competency or competency needs of future depending on the objectives of the mapping and the expected usage of the map. Competency mapping is a tool for competency management to inform the competency related decisions and actions.

**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. The content management, as implemented in nuclear organizations, can be document-centric, data-centric, knowledge-centric, or a combination thereof.

*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. (See also *organizational memory, knowledge*)

*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.

**counterpart**

The institution or individual in the Member State that manages the KM project/event and thus plays a primary role in project planning and implementation. This term is not the same as *end user*.

**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.

*Comment:* the critical knowledge encompasses multiple aspects, such as: (i) the type of knowledge (either understanding, expertise or skill) involved in performing an activity, (ii) how the knowledge is used and in which contexts, (ii) limits and constraints that prevent that knowledge to be applied fully or realized in a context-specific situation, (iv) expected value added of improving the situation or releasing the knowledge constraints, or by applying the knowledge differently (ability to create new knowledge).

**customer relationship management**

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 set of facts, concepts, or instructions that can be formalized in a manner suitable for communication, interpretation, or processing by people or by automatic means, to produce information**.**

**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 centres 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 analysing 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. (See also *attrition*)

*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.

**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. (See also *adaptive learning*, *appreciative inquiry* and *root cause analysis*)

*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.

**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 computer-based 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.

**end user**

Individual, group or organization that uses the KM results and benefits from it.

**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. (See also *knowledge harvesting*)

*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.

**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 also *artificial intelligence* and *knowledge base*)

**explicit knowledge** (See *knowledge)*

**externalization**

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

**feedback**

The transmission of findings generated throughout the project cycle and the evaluation process to parties for whom it is relevant and useful so as to facilitate learning. This may involve the collection and dissemination of findings, conclusions, recommendations and lessons from experience.

**generative learning** (See *double-loop learning*)

**goals**

Goals include formal statements describing the focus and intent of management efforts, incorporating specific targets actions and timeframes. They are generally policy driven.

**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 also *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.

**host organization** *(*See c*ounterpart organization*)

**implicit knowledge** (See *knowledge*)

**indicators**

Indicators are tractable metrics that can be used to monitor status and trends of the key attributes of a system / or program, and to assess whether the systems and/or programs are leading to the achievement of management goals (See also *ranking indicators*, *performance indicator*)

**impact**

The long term positive or negative, intended or unintended effects on end users, to which a project contributes in tandem with other factors, either directly or indirectly. Impacts can be economic, socio-cultural, organizational, environmental or technological.

**information**

Data that has been organized within a context and translated into a form that has structure and meaning. The role of information is primordially description. Information is used by *knowledge* to interpret or reason about that meaning in a particular circumstance or context (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** (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. (See also *intellectual property* and *knowledge assets*)

*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.

**intellectual property**

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

**internalization**

The process of absorbing explicit knowledge and making it tacit. (See also *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**

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. (See also *information*, *intellectual assets* and *critical knowledge*.)

*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 skilful 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.

**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. (See also *information audit*)

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

**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 also *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. (See also *knowledge transfer*)

*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.

**knowledge centre**

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

*Comment*: A knowledge centre 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 also *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 also 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. (See also *attrition, critical knowledge, knowledge retention plan* and *position criticality*)

*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.

**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.

*Comment*: 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. (See also *articulation, codification,* and *knowledge*)

*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).

**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 also *knowledge assets* and *knowledge flows* and *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. (See also *communities of practice* and *knowledge repositories*)

*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.

**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 also *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. (See also *knowledge*)

*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.

**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. (See also *knowledge* and *storytelling*)

*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.

**learning organization**

An organization whose key personnel view its future success as being based on continuous learning and adaptive behaviour. The organization, therefore, becomes renowned for creating, acquiring, interpreting and retaining knowledge and then modifying its behaviour 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 also *database* and *storytelling*)

*Comment*: Lessons learned normally highlight strengths or weaknesses in planning, design and implementation that affect outcomes, objectives and impact of a project or activity. 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 (OPEX) 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 also *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. (See also *coaching* and *reverse coaching and mentoring*)

*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.

**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 largescale 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 centres, 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 also *knowledge portal*)

**organizational culture**

A mixture of an organization's traditions, values, attitudes and behaviours. In short, 'the way things are done around here'. Different organizations can have very different cultures. (See also *culture*)

*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 skilful in pursuing a set of goals.

**organizational 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** (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** (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 a*fter-action review*)

**records management**

Processes relating to the generation, receipt, processing, storage, retrieval, distribution, usage and retirement of an organization's records. (See also *document management*)

*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.

**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 p*eriodic review*)

**risk**

Is the probability that an event or condition may adversely affect the achievement of the project. Risks are composed of factors internal and external to the project, although emphasis is generally placed on those factors outside the project management team's direct control.

**root cause analysis**

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** (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. (See also *storytelling* and *knowledge*)

*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.

**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. (See also *knowledge*)

*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.

**stakeholder**

An agency, organization, group or individual that has a direct or indirect interest in the KM implementation.

**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. (See also *learning histories* and *knowledge*)

*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.

**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. (See also *knowledge*)

*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.

**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. (See also *attrition*, *institutional knowledge* and *succession planning*)

*Comment*: This information addresses potential gaps between current and projected workforce needs. It takes into account diversity and labour 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.

## ABBREVIATIONS

| | |
|---|---|
| CV | Curriculum Vitae |
| IAEA | International Atomic Energy Agency |
| INIR | Integrated Nuclear Infrastructure Review |
| IP | Intellectual Property |
| IRRS | Integrated Regulatory Review Service |
| IT | Information Technology |
| KM | Knowledge Management |
| KMAV | Knowledge Management Assist Visit |
| KPI | Key Performance Indicators |
| NPP | Nuclear Power Plant |
| OSART | Operational Safety Review Team |
| PESTLE | Political Economic Social Technological Legal Environmental |
| SALTO | Safety Aspects of Long Term Operation |
| SWOT | Strengths Weaknesses Opportunities Threats |

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