Nuclear Knowledge Management

Glossary of Terms[1]

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

Knowledge Management itself is defined as an integrated, systematic approach to identifying, managing and sharing an organisation's knowledge, and enabling persons to create new knowledge collectively and thereby help achieve the objectives of that organisation. Knowledge Management helps an organization to gain insight and understanding from its own experience. Specific activities in knowledge management help the organization to better acquire, store and utilize knowledge.

Adaptive learning

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

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

See *Double-loop learning*.

After-action review

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

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

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After-event review

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

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

Appreciative inquiry

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

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

Articulation

The process of making tacit knowledge explicit. Also termed Externalisation. See *Explicit knowledge* and *Tacit knowledge*; see also *Internalisation*.

Artificial intelligence

1. The ability of a computer or other machine to perform those activities that are normally thought to require intelligence.

2. The branch of computer science concerned with the development of machines having this ability.

Asset management

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

Comment: Approaches such as the balanced scorecard can be employed to assure appropriately distributed attention to the whole of an organisation's resources. In the nuclear industry, the combination of increased retirements and a more difficult recruitment environment requires even greater attention to

achieving and maintaining such a balance. Well-planned knowledge management programmes can contribute to meeting such challenges.

See *Balanced scorecard, Intangible assets*, and also *Intellectual assets*, and *Knowledge assets*.

Attrition

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

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 organisational 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 organisations 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 organisation, department or function with those of other organisations and standards.

Comment: The following axioms should be considered in benchmarking:

- What works well for a given organisation in one situation may not work well in another organisation 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 organisations with fundamentally different aims can produce surprisingly useful insight about another organisation.

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 organisation'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 organisational change is often a senior line manager who regularly monitors the plans and progress in implementing change, and helps to overcome barriers to change.

Chief Information Officer (CIO)

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

Chief Knowledge Officer (CKO)

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

Coaching

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

Comment: The role of a coach is to create a supportive environment that will develop the ability of those being coached to perform existing tasks better or new tasks. In the nuclear industry, coaching is a legitimate and effective teaching tool for situations like on-job training (OJT); however, it is to be avoided during the process of confirming acquired competences. For this reason, some utilities prohibit OJT instructors/coaches from also serving to evaluate the effectiveness of the learning by trainees on given tasks. Coaches may be from within or from outside an organisation. See also *Mentoring* and *Reverse Coaching and Mentoring*.

Codification

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

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

Collaboration

A generic term to describe teamwork or group effort.

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

Communities of practice

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

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

Concept maps

Tools for organising 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 organisation'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 organisation's documentation.

Comment: The IAEA report *Configuration management in nuclear power plants* (IAEA-TECDOC-1335, January 2003) presents a basic approach to configuration management; it considers experience gained from discussions at meetings organised on the subject, and from organisations 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 organised, so that quality information can be delivered to the user.

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

Corporate memory

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

Comment: Corporate memory becomes a critical concern when there is sufficient migration of personnel from an organisation 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 organisation's personnel and their tacit knowledge becomes evident. In the nuclear industry corporate memory is particularly important in ensuring that the design basis for the NPP safe operation is effectively maintained. See *Tacit knowledge*.

Critical knowledge

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

Customer Relationship Management (CRM)

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

Data

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

Database

A collection of information organised in such a way that a computer program can quickly select desired pieces of data. Relational databases are organised 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.

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

Document

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

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

Document management

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

Comment: The IAEA report *Information Technology Impact on Nuclear Power Plant documentation* (IAEA-TECDOC-1284, April 2002) 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. The TECDOC includes examples that demonstrate successful implementations at NPPs and also discusses issues related to the application of IT at NPPs and the trends for applications of IT at NPPs as well as the technology itself.

Double-loop learning

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

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

E-Business

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

E-Learning

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

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

Events

Activities, occurrences, or incidents – planned or unplanned – that have significance to society, organisations 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 organisation.

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 organisation 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 organisation. See *Knowledge harvesting*.

Expert system

A data processing system that provides for solving problems in an expert manner within a given field or application area, by drawing inferences with the aid of a knowledge base developed from human expertise. An expert system is a branch of artificial intelligence. See *Artificial intelligence* and *Knowledge base*.

Expertise directory

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

Experts directory

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

Explicit knowledge

Knowledge that can be easily expressed in documents.

Comment: Examples that contain explicit knowledge include NPP documentation and databases such as a website, an operational manual, records or a report of research findings. See also *Tacit knowledge* and *Implicit knowledge*.

Externalisation

An alternative term for Articulation. See *Articulation* and also see *Internalisation*.

Extranet

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

Generative learning

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

Good practice

See *Best practice*.

Groupware

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

Human assets

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

Implicit knowledge

The knowledge or know-how that people carry in their heads. Compared with explicit knowledge, implicit 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 judgement. Also termed Tacit knowledge. See *Explicit knowledge*.

Comment: 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.

Information

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

Information audit

A method of reviewing and mapping information within an organisation.

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 organisation, 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 organisation's information resources with the aim of improving the performance of the organisation. 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 organisation or institution.

Intangible assets

The non-physical assets or resources of an organisation.

Comment: Examples of intangible assets in the nuclear industry include the skills and knowledge of plant personnel, and the reputation of the organisation (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 organisation has the right skills at the right time and at the right cost. The plan is a standardised and consistent methodology for overall human resources planning, driven by strategic and business objectives.

Intellectual assets

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

Intellectual assets management

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

Intellectual capital

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

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

Intellectual property

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

Internalisation

The process of absorbing explicit knowledge and making it tacit. See *Explicit knowledge* and *Tacit knowledge* and see also *Externalisation*.

Intranet

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

Know-how

Skill or competence derived from knowledge and experience.

Knowledge

The acquiring, understanding and interpreting of information.

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 judgements 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.

Knowledge is often used to refer to a body of facts and principles accumulated by humankind over the course of time. *Explicit knowledge* is contained in documents, drawings, calculations, designs, databases, procedures and manuals. *Tacit knowledge* is held in a person's mind and has typically not been captured or transferred in any form (if it were, it would then become *explicit knowledge*).

See *Explicit knowledge*, *Information*, *Intellectual assets* and *Tacit knowledge,* and see also *Critical knowledge* and *Implicit knowledge*.

NOTE: The term knowledge is defined and used somewhat differently in the sphere of personnel training. For detail on this very specialised application, see the Terms in the Field of NPP Personnel Training incorporated into IAEA-TECDOC-1358 *Means of evaluating and improving the effectiveness of training of NPP personnel*. July 2003.

Knowledge assets

Those parts of an organisation'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 organisation possesses, the organisation 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 organisation, including an analysis of its knowledge needs, resources, flows, gaps, users and uses.

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

Knowledge base

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

Comment: An organisation 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 organisations 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 organisation.

Comment: Many organisations have created knowledge broker roles such as a 'Knowledge Co-ordinator'. '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 organisation and making it available.

Comment: More than ever before, organisations 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, organisations 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 organising and presenting content effectively

- new skills to help personnel understand what knowledge to capture, and how to document it, in order to maximise its usefulness to others

- revised goals and expectations that make knowledge capture a high-priority in everyone's job

- efficient systems and tools that centralise knowledge content and make it easy to store, access, and maintain.

See *Knowledge transfer*.

Knowledge center

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

Comment: A knowledge 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 *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 organisation.

Knowledge harvesting

A set of methods for making tacit knowledge more explicit - incorporating people's knowledge into documents, to enable it to be more easily shared with others. See *Explicit knowledge, Tacit knowledge* and see also *Codification*.

Knowledge loss risk assessment

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

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

- Identify expert incumbents who possess critical knowledge and skills.

- Conduct a risk assessment based on two factors: time until retirement and position criticality.

- Determine the most appropriate method(s) for addressing potential knowledge loss through attrition.

- Establish knowledge retention plans that meet continuously changing business needs.

- Provide a process to review results and ensure knowledge retention plans are monitored and evaluated.

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

Knowledge management

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

Knowledge management solution

A solution to a knowledge management problem, or the use of knowledge management techniques to solve an organisational 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 organisation intends to implement knowledge management principles and practices in order to achieve organisational objectives.

Comment: There are many strategies used to preserve knowledge. Primarily, the activities to be deployed largely depend on the nature of knowledge: tacit knowledge requires greater efforts to preserve knowledge than explicit knowledge. While tacit knowledge can be preserved only by transferring it to successors or simply other people (a so-called personalisation 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: personalisation strategies (knowledge transfer) and codification strategies (knowledge articulation/elicitation). See *Articulation, Codification, Explicit knowledge* and *Tacit knowledge*.

Knowledge mapping

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

Knowledge officer

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

Knowledge portal

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

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

Knowledge preservation

A process of maintaining an organisational 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. Organisations that intentionally manage their experiences for them to be available for the future have to master three basic processes of knowledge management:

1. select, from the large number of organisational events, persons or experts and processes, only those that are worth preserving;

2. store their experience in a suitable form;

3. ensure the setting up and operation of the organisational 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 organisation, and methods to be used for addressing potential knowledge loss through attrition, and the process that will ensure that the plan is continually updated to meet changing business needs. See *Attrition* and *Critical knowledge*.

Knowledge transfer

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

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

Learning histories

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

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

Learning organization

An organisation whose key personnel view its future success as being based on continuous learning and adaptive behaviour. The organisation, 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 summarised in databases. See *Database* and *Storytelling*.

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

Leverage

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

Mentoring

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

Comment: The role of a mentor is to transfer from the mentor to the mentee 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 organisation. See also *Coaching* and *Reverse coaching and mentoring*.

Multi-skill assistance

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

Comment: In the nuclear industry some organisations have established multi-skilled teams for maintenance work, where each team has the collective skills needed to complete their assigned work. Often team members provide cross-training for other team members on simpler tasks in their discipline for team

members to be individually assigned to a broader range of tasks. Also termed Peer Assistance.

Network

1. A connection of two or more institutions that enables them to share information resources.

2. A wide variety of systems of interconnected components. Specific examples include:

- social networks, business networks and entrepreneurial networks,

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

Comment: The Asian Network for Education in Nuclear Technology (ANENT) supported by the IAEA is a new partnership for co-operation in human resource development and research in nuclear technology as a key strategy for capacity building, nuclear infrastructure development and better use of available information resources. The ANENT was established in February 2004, to promote, manage and preserve nuclear knowledge; to ensure the continued availability of talented and qualified manpower in the nuclear field in the Asian region; and to enhance the quality of the human resources for the sustainability of nuclear technology. Universities, research 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 *Knowledge Portal*.

Organisational culture

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

Comment: In knowledge management, an organisation'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 organisations use organisational culture surveys, which help managers to know the extent to which the organisational climate supports the sharing of knowledge.

Organisational learning

The ability of an organisation 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 organisational learning cannot take place without individual learning, individual learning does not necessarily produce organisational learning. Organisational learning occurs when an organisation becomes collectively more knowledgeable and skillful in pursuing a set of goals.

Organisational memory

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

Organisational silo

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

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

Peer assistance

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

Portal

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

Position criticality

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

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

Position disposition

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

Post-job briefing

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

Pre-job briefing

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

Records management

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

Comment: A means of helping an organisation 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 organisation to decide which records to keep and which to destroy and how best to organise them all. See also *Document management*.

Reverse coaching and mentoring

A relationship by which senior individuals in an organisation 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 organisation, this is a critical strategic consideration as the demographic profiles of the work force 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 organisation; to enhance diversity initiatives; to facilitate the learning by more senior personnel of new skills from less senior personnel (such as computer utilisation and understanding the jargon of younger employees and their peer groups).

Review

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

Root cause analysis (RCA)

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

Comment: Events rarely have a single root cause. Thus, it is critical that a Root Cause Analysis (RCA) team does not "jump to judgement" 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.

Silo

See *Organisational silo*.

Single-loop learning

An alternative term for Adaptive learning. See *Adaptive learning* and also see *Double-loop learning*.

Skills directory

See *Expertise directory*

Socialisation

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

Comment: One way of implementing socialisation is by storytelling. However, the transfer of tacit knowledge through socialisation, without the creation of explicit knowledge in the process, is a rather limited form of knowledge creation. Because of this, the nuclear industry has structured training programmes to achieve not just tacit-to-tacit knowledge creation, but also explicit-to-explicit, tacit-to-explicit, and explicit-to-tacit knowledge transfer. See *Explicit knowledge*, *Storytelling* and *Tacit knowledge*.

Social network

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

Comment. Effective knowledge-sharing is a key to success in most organisations. Social network analysis can document how knowledge is currently shared within the organisation 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 organisation. It can also identify pools of knowledge within the organisation and can document how accessible it is to others. See *Knowledge*.

Storytelling

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

Comment: Civilisation 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 utilised extensively for a variety of purposes. See *Learning histories* and *Tacit knowledge*.

Succession planning

A methodology for identifying and developing employees to ensure that key organisational 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

An alternative term for Implicit knowledge. See *Implicit knowledge*.

Taxonomy

A hierarchical structure in which a body of information or knowledge is categorised, 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 organise information in systems, thereby helping users to find it.

Thesaurus

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

Undocumented knowledge

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

Comment: Undocumented knowledge can be tacit knowledge which may be very difficult to elicit, such as clues that an experienced field operator uses to anticipate problems at an NPP, or knowledge that can easily be externalised, such as an engineer’s informal calculation of the basis for the minimum

required feedwater flow that has never been included in the appropriate plant system description document. See *Tacit knowledge*.

Virtual

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

Virtual team

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

White pages

A structured directory, usually in electronic form, of people within an organisation. It often forms the basis for an expertise directory. See *Expertise directory*.

Work force planning

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

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

Yellow pages

A directory in the form of a database that includes details of people's skills, knowledge, experience and expertise so that users can search for people with specific know-how. Also termed Expertise directory, Experts directory and Skills directory. See also *White pages*.