# Transfer of Knowledge Management Methods and Tools

# from and to the Nuclear Industry

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**Abstract**

*“There is a knowledge management life outside the nuclear industry also”*

The discipline of the knowledge management was firstly introduced in Japan by the leading technology companies like Toyota, Canon, Honda, Mitsubishi, Sharp and others. It means outside the nuclear industry. The nuclear industry organizations including the IAEA started to deal with the knowledge management about ten years later and adapted those approaches, methods and tools developed and used in other industry organizations. After more than fifteen-years of its programmatic existence of the nuclear knowledge management in the IAEA, the trend is turn round in many topics. The nuclear industry organization have more and more good practices to share to other industries. Meanwhile the world leading companies working in a quickly changing market environment still developing and using KM practices which can be useful also in the “slowly-changing” nuclear industry environment. In this article we would like to pay attention - through some examples - for the importance of the benchmarking with companies outside the nuclear industry for further safe and reliable operation of nuclear facilities and educate and train the next nuclear generation.

**1. The starting points**

The discipline of knowledge management (KM) was developed by Ikujiro Nonaka in 1991. [1] Professor Nonaka was mentioned first time that “… *one sure source of lasting completive advantage is knowledge*”. He defined also the activities of a knowledge-creating company. Later among other leading researchers Hirotaka Takeuchi from Hitotsubashi University, Japan, Thomas H. Davenport from Babson College continuing research works in the area of knowledge management. Since than many leading companies started to implement their management systems focusing on managing their competitive knowledge, like Toyota, Canon, Honda, GE, Mitsubishi, Sharp, Microsoft and many others. *“These companies have become famous for their ability to respond quickly to customers, create new markets, rapidly develop new products, and dominate emergent technologies”* [1]. During the first ten year of knowledge management history, different approaches were developed through numbers of research projects and implementation of practices of leading organizations. There are three main perspectives:

**Techno-centric:** focusing on technology, ideally those that enhance knowledge sharing and creation [2] [3]

**Organizational:** focusing on how an organization can be designed to facilitate knowledge processes best. [4]

**Ecological**: focusing on the interaction of people, identity, knowledge, and environmental factors as a complex adaptive system akin to a natural ecosystem [5]

In the early years of 2000 the market oriented and market depended organizations realized and understand that their knowledge is a valuable, or better to say most valuable resource and has to be used for the further development of new technologies, to preserve and increase their intellectual capital, market shares and in some cases even for the stabilizing existence of the organization. They have used a mix of above mentioned perspectives and the International Atomic Energy (IAEA) adapted later the same approach, but mainly based on organizational perspective.

The motivators for use of knowledge management methods and tools were different in the nuclear industry. IAEA started to deal programmatically with nuclear knowledge management (NKM), in the late 90’s and the Nuclear Knowledge Management Unit was established in 2000. This section was (is) the focal point for the IAEA Member States to collect, share and distribute knowledge management initiatives. The first International Conference on Managing Nuclear Knowledge: Strategies and Human Resource Development was organized in 2004 [6]. In the early 2000 the staff of the first NPPs reached their retirement age and they have to prepared for the knowledge transfer to the new generation. This was the key issue that time for the nuclear industry. The first supporting tool was published by the IAEA in 2006, based on the leading practices of the Tennessee Valley Authority: Risk Management of Knowledge Loss in Nuclear Industry Organizations [7]. The approach of the NKM was first published in 2006. Later that year the TECDOC-1510 summarized the commonly used knowledge management practices and tool of the organizations participating in the preparation of the publication. [8] In this publication were described the first approaches commonly used by many nuclear organizations: the people-process-technology model and also the widely used Frauenhofer Reference Model for knowledge management [8]. Both models/approaches are still used to describe the interconnections of the knowledge management to human resources, culture, leadership and others. IAEA promoting to use integrated models where the knowledge is one of the resources of the organization and it is embedded into management processes and into the day-today activities. The knowledge management methods and tools should support the strategy of the company through the knowledge processes: identify-create-capture-manage-share-apply-develop-embed. The approaches giving the best value to the nuclear industry organization are the mixed adaptation of “all” suitable KM practices, methods and tools depending on their organization development, main technical issues, place in the nuclear fuel cycle, etc. But none of the methods can be successful without full support of the senior managers and without a clear indications of the leadership for safety.

**2. KM methods, tools and approaches used during the last year in Hungarian institutions and companies (examples from outside the nuclear industry)**

The Knowledge Management Subcommittee of the Hungarian Academy of Science regularly organizes conferences for sharing the knowledge in the area of knowledge management [9]. Many companies and researchers visiting these conferences to introduce new and renewed (!) trends and to get impulse from the other industries. These meeting gives floor for the PhD students of the Hungarian Educational Institutions to share their research result and check/validate their topics. Many topics, approaches are similar or identical to those what IAEA disseminating also. Some examples of those topics which could be useful/or already used in the nuclear industry [9]:

* Ethical labyrinth in the period of knowledge acquisition and sharing of knowledge management system
* Loss of tacit knowledge through retirement
* Building up enterprises in knowledge area
* Knowledge Community – the oldest and the most modern way of keeping traditions alive
* Knowledge codification in practice – experiences gained in ontology-based e-learning system’s application
* How much is the intellectual capital worth? - The value enforcement model of intellectual capital
* New ways of knowledge sharing and knowledge culture at the Hungarian Television
* Best practice methods and solutions of developing KM systems and knowledge communities
* An online (network) club for e-learning educator researchers – a sysadmin-less galaxy
* Value creation problems of knowledge-intensive organizations
* Change of organizational culture – knowledge sharing: consciously developed processes?
* Regular training – how can employment be increased through knowledge management tools?
* Organizational knowledge management with the support of e-learning tools

Many of the above mentioned examples, methods can be one-to-one used (of course after adaption to the organizational structure/culture) also in the nuclear organizations.

Another recent example - which probably will have a wide acceptance in all organizations needed extensive training - a new method in the e-learning, supported with a powerful pc/tablet/smart phone tool: Adaptive eLearning Solutions [10]. The SkillToolKit by SkillDict Ltd. is a competency based adaptive e-learning solution to support knowledge management and human resources management. The solution has two components:

* preparation of the support for KM and HR
* competency based adaptive e-learning tool to improve the efficiency of the training management

The adaptive e-learning tool can improve the efficiency as:

* it’s based on a practice-oriented, modern digital pedagogical method
* it’s realized the “Big Data” in e-learning, through a very detailed tracking of the learning processes
* based on the tracking data, the instructors will able to optimize the e-learning courses and to design much more focused classroom sessions and practical trainings
* it solves the general “curriculum actualization” problem of e-learning courses, with “on-the fly” editing solution

The Hungarian Television (a state company) faced similar problems as they have in the nuclear industry. In the relatively young business brunch the group of founder staff reached their retirement age. The risk of knowledge loss increased by the appearance of the commercial TV channels their brain-drain, as they were needed increased number of skilled and competent experts. The HR management decide to establish a number of community of practices as the main stream of the development project. Ten different COPs started to work jointly to collect, to process and share the valuable knowledge elements. The project gave results not only in the area of knowledge preservation but there were opened new innovative ways of working based on the assimilated knowledge. A good example of those is the so called “one man cast” program: based on the accumulated knowledge one expert fulfilled all the functions needed for editor, camera-man and cutter. This new method opened new possibilities in the

redaction with its flexibility and cost effectiveness.

A Hungarian Utility company started a KM Project because of its the aging workforce. They developed an own method for knowledge mapping and knowledge loss risk analysis. The corrective actions were based on the knowledge loss risk values and also included calculations of the return of investment.

**3. KM methods and tools developed/used currently in Hungarian nuclear organizations**

Besides the IAEA safety requirements, supporting methodology, the requirements of the Hungarian Atomic Energy Agency the new version of the ISO 9001:2015 standard was published in 2015. [11] The new standard contains beside others two major changes: the risk-based thinking ([11] 4.1., 4.2., and 6.1) and the organizational knowledge ([11]7.1.6). The risk-based thinking is not new for the organizations following the NKM methodologies as one of the “best sellers” is the publication on knowledge loss risk assessment [7]. The IAEA recently revised the publication and added many new case studies (will be published in second half of 2016).

The organizations who are in the process of revision of their certification of ISO 9001 and wishing to implement knowledge management methodology, the IAEA NKM Publications definitely will help.

Many of the subcontractors working in the nuclear industry are certified under the ISO 9001:2008, they have time to fulfil the new requirement latest until September 2018. (If their revision certification will be earlier than certainly earlier).

Some of the leading subcontractors already received their revised certification and with that they are most probably will meet the IAEA NKM recommendations also. To be sure on the IAEA NKMS running a service for Member States called Knowledge Management Assist Visit (KMAV) [12]. The ten years’ experience of providing this service recently was published by the IAEA. [13]. This new publication contains also assessment tools for

* Nuclear Power Plants and Utilities
* Research and Development Organizations and
* Nuclear Education Institutions

All those tools can be used in other industries as well with minor adaptations.

Paks NPP Ltd has a long history in use of knowledge management practices and IAEA support services. Paks NPP was the second nuclear operator who implemented a KMAV in 2005. After many years of formal/informal activities in the KM, in 2015 a formal KM project and appointed a Knowledge Management Expert, who coordinate the KM related activities and directly reporting to the HR Director of the NPP. One of the first task they have started to implement is the knowledge preservation of retiring staff. They are using MS SharePoint® to store, organize, share, and access information from almost any device. It supports the document and knowledge sharing, internal communication, networking communities of practice.

**4. Conclusions**

The short historical review about the birth of the knowledge management and those small examples above showed that there is a knowledge management life outside the nuclear industry also! Our recommendation is open your doors – of course paying attention for the security of information and nuclear security – and share your experiences with knowledge creating companies and KM practitioners. Visit their organizations adapt their methods and tools according to your needs.

**Benchmark! Share your (N)KM experiences and the world will be safer.**

**5. References**

[1] NONAKA, I.: The Knowledge Creating Company, Harvard Business Press, Boston, Massachusetts, (2008)

[2] ALAVI; M, LEIDNER, D. (1999). "Knowledge management systems: issues, challenges, and benefits". Journal Communications of the AIS archive, Volume 1. Article No. 1 (1999).

[3] ROSNER, D.; GROTE, B.; HARTMAN, K.; HOFLING, B.; GUERICKE, O. From natural language documents to sharable product knowledge: a knowledge engineering approach. In Borghoff, Uwe M.; Pareschi, Remo. Information technology for knowledge management. Springer Verlag. (1998). pp. 35–51.

[4] ADDICOT, R.; MCGIVERN, G.; FERLIE, E. (2006). Networks, Organizational Learning and Knowledge Management: NHS Cancer Networks. Public Money & Management 26 pp: 87–94. (2006).

[5] MARCU, Daniel; OKUROWSK, Mary Ellen. Building a Discourse-Tagged Corpus in the Framework of Rhetorical Structure Theory. University of Pennsylvania. (Retrieved 19 April 2013)

[6] INTERNATIONAL ATOMIC ENERGY AGENCY, International Conference on Managing Nuclear Knowledge: Strategies and Human Resources Development (Proc. Int. Conf. Saclay, 2004), IAEA, Vienna (2006).

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

[8] INTERNATIONAL ATOMIC ENERGY AGENCY, Knowledge Management for Nuclear Industry Operating Organizations, IAEA-TECDOC-1675, IAEA, Vienna (2012).

[9] Tudásból várat. Tudásmenedzsment elméleti és módszertani megközelítésben, MTA VSZB Tudásmenedzsment albizottsága, Budapest (2011)

[10] SKILLDICT: eLearning Solution, <http://www.skilldict.com/> (2016)

[11] INTERNATIONAL STANDARD - Quality management systems - Requirements ISO 9001:2015, Published in Switzerland

[12] INTERNATIONAL ATOMIC ENERGY AGENCY, Planning and Execution of Knowledge Management Assist Missions for Nuclear Organizations, IAEA-TECDOC-1586, IAEA, Vienna (2008)

[13] INTERNATIONAL ATOMIC ENERGY AGENCY, Knowledge management and its implementation in nuclear organizations, NG-T-6.10, IAEA, Vienna (2016)