Knowledge Management In Malaysian Nuclear Agency: The First 40 Years

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ABSTRACT

This paper gives an overview of nuclear knowledge management practices in Malaysian Nuclear Agency (Nuclear Malaysia) in the first 40 years of its operation. Nuclear Malaysia is established in 1972 and its main responsibility is to promote the application of nuclear technology in various socio-economic sectors including industry, medical, agriculture, manufacturing, health, radiation safety and the environment. Nuclear Malaysia's core competency is R & D in nuclear science and technology. The explanation emphasizes on the activities and challenges in implementing NKM at the Nuclear Malaysia and in particular; nuclear knowledge management practices, the needs for Nuclear Malaysia to strengthen his KM activities and the evolvement and development of KM to enhance the ability of the organization.

Keywords: knowledge management, nuclear knowledge management, Malaysian Nuclear Agency

I INTRODUCTION

Malaysian Nuclear Malaysia (Nuclear Malaysia) is a research and development (R&D) organisation, established with the onus of introducing and promoting the use of nuclear science and technology in national development. Since its establishment in 1972, Nuclear Malaysia is developing rapidly, and has become one of the leading national research institutions, which implements various activities including research and technology development, technical services, external relations and human resource development. Nuclear Malaysia's focus is to enhance the country's prosperity through the use of nuclear science and technology.

The Year 2012, marked the 40 years of Nuclear Malaysia. Over the years, Nuclear Malaysia has been formally or informally adopted Knowledge Management (KM) methods such as knowledge loss risk assessment, mentoring, on-job training and debriefing. To a certain extent, Nuclear Malaysia has been successful in knowledge acquisition and exploitation from more advanced countries as well as in knowledge generation and in the knowledge application and diffusion to the socio-economic sectors. Nevertheless, for Nuclear Malaysia to sustain the image, the trusts, the credibility and the professionalism that the organisation holds, as the promoter of the application of nuclear and related technologies for economic development, Nuclear Malaysia recognises the need to implement specific KM which also known as nuclear knowledge management (NKM) in a more structured manner.

This paper deals with the activities and challenges in implementing NKM at the Nuclear Malaysia and in particular;

1) What is nuclear knowledge management?
2) What are the needs for Nuclear Malaysia to strengthen his KM activities?
3) How NKM is evolved and developed in Nuclear Malaysia to enhance the ability of the organisation?

II KM VS NKM

Knowledge can be challenging to define as it involves complex relationships between data and information, and also in the methods and environment with which it is processed and applied by humans. The definition of knowledge used by the International Atomic Energy Agency (IAEA) is as follows;

> *"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 that people carry in their heads."*

Nuclear knowledge is that knowledge specific or relevant to nuclear-related activities, including at least technical engineering knowledge. Nuclear knowledge can have various owners today at

various levels. A wide variety of stakeholders can claim interest in managing, using, applying, developing and sharing knowledge - each with specific objectives, requirements and limitations. The stakeholders for Nuclear Malaysia include:

- Governments, including regulators (e.g. Atomic Energy Licensing Board);
- Designers, vendors, utilities, operators, suppliers, consultants and support organisations (e.g. Tenaga Nasional Berhad);
- Training and academic institutions (e.g. universities, colleges, training centres, R&D centres);
- The public and non-governmental organisations (NGOs);
- International organisations (e.g. IAEA, EC).

III NEEDS OF KM IN NUCLEAR MALAYSIA

The KM needs in Nuclear Malaysia are driven by the following factors: the future for continued successful and safe operation, subsequent decommissioning of existing nuclear facilities and waste management, the design and construction of new nuclear facilities (i.e. gamma green house), the research and development of new nuclear technologies and the growing contribution of nuclear application in medicine, agriculture, environmental, manufacturing and industry in Malaysia.

Nuclear technology, like any high technology, relies on the creation, repository and dissemination of knowledge. However, managing nuclear knowledge is difficult, since nuclear knowledge is unique in many ways: it is complex, involves high development costs, has to account for safeguards and proliferation issues, and requires significant governmental support (IAEA-TECDOC-1510, 2006).

Moreover, nuclear knowledge must be developed and retained over long time frames to service operational nuclear facilities and over even longer time frames to enable global sustainable growth. Special constraints exist due to the dual (peaceful and non-peaceful) nature of nuclear technology, and these characteristics have often led to serious public concerns. As further elucidated below, these unique characteristics make efforts to effectively manage nuclear knowledge most desirable or even mandatory.

A). Complexity

The effective use of nuclear power and other nuclear applications for the benefit of humanity at large requires highly complex and multifaceted knowledge of several disciplines, including many branches of basic science and engineering, law, economics, finance, commerce, management and public communication. The IAEA has outlined that the acquisition of considerable nuclear knowledge is a necessary pre-requisite for any country aspiring to harness the benefits of nuclear science and engineering. The uniqueness of this technology, especially the strict requirements for proper control, necessitates an intensive knowledge base in considerably more breadth and depth than for other technologies. For this Malaysia has signed and bounded to follow Nuclear Non-Proliferation Treaty and other protocols and agreements set by the IAEA.

B). High Costs

Largely due to its complexity, the development of nuclear knowledge is quite costly. In Nuclear Malaysia the nuclear facilities, including reactor, laboratories, pilot plants and many experimental facilities, are large, incorporating highly sophisticated components. Highly specialised multidisciplinary problem solving skills are required nuclear professionals. The development and retention of the necessary human resources required for success are inherently expensive. Due to this cost, a high level of government support and close monitoring of activities is essential during the development, application and transfer of nuclear knowledge.

C). Long Term Development and Utilization

The timescales involved in generating nuclear knowledge are relatively long due to the long gestation periods of nuclear facilities for research and industrial applications. The knowledge developed in each area of application is required to be preserved over several decades and effectively transferred to successive generations of scientists, due to the very long life cycles of many nuclear facilities. For example, in the year of 2012, the one and only reactor in Malaysia is celebrating its 35th birthday and still in the operation. However, the scientist who initiated, constructed and developed the reactor is approaching retirement age in one or two years more.

D). Importance of International Cooperation

Nuclear knowledge has been used successfully in the past by many countries as a catalyst for socioeconomic development. It is becoming increasingly clear that a wide range of benefits can be obtained from the appropriate use of nuclear power and other nuclear applications. Malaysia has always considers the international and regional technical cooperation programs such as the International Atomic Energy Agency (IAEA), Regional Cooperative Agreement (RCA) and Forum for Nuclear Cooperation in Asia (FNCA) as one of the important mechanisms for Malaysia to acquire knowledge and technology from more advanced countries. Some specialised technologies are acquired through other mechanism such as bilateral cooperation and expert mission (Daud, 2004).

E). Balance between Sharing and Protection

The inherently dual nature of nuclear technology necessitates constraints on the sharing of nuclear knowledge. In contrast to knowledge in other scientific domains, the sharing and use of nuclear knowledge are restricted due to concerns about nuclear safeguards and proliferation.

Implementing effective knowledge management systems is beneficial not only to the safety of facilities personnel and the general public, but also for improving the public perception of the nuclear industry as well as enhancing the performance of facilities. Thus an appropriate balance between nuclear safety and safeguard requirements needs to be established in managing nuclear knowledge. A major nuclear safety challenge is to foster a global knowledge sharing culture to achieve the motto that 'a safety improvement anywhere is an improvement of safety everywhere' (IAEA-Proceeding Series. (2006)

F). Government Involvement

Owing to the long term return on investment compared with other industries, as well as safety, security and non-proliferation issues, a high level of government involvement and close monitoring of activities is essential during the development, application and transfer of nuclear knowledge. This involvement is necessary not only to underwrite a large portion of the development cost but also to manage nuclear liability, nuclear safety concerns and the prevention of nuclear knowledge misuse under all circumstances. Furthermore, the implementation of nuclear technology requires some changes in national policy and nuclear governance needs strong support from the government.

IV EVOLUTION AND THE DEVELOPMENT OF NKM IN NUKLEAR MALAYSIA

The first knowledge management efforts in Nuclear Malaysia began in the late 90's driven primarily by the Human Resource and Training Division (HRD). Experts from IAEA and private consultants were invited to the organisation to brief and explain about the KM process. In addition to that a community of practice was also developed consist of members from other divisions in Nuclear Malaysia. This initiative was supported by the top management, followed by other KM activities.

Besides that, Nuclear Malaysia actively involved in KM activities in the international arena. Taking a step ahead, in answering the IAEA resolutions at 46th & 47th General Conferences – emphasized importance of preserving & managing nuclear knowledge, Nuclear Malaysia and other 15 international organisations has initiated efforts to establish Asian Network for Education in Nuclear Technology (ANENT). The First Coordination Committee Meeting was held on Feb 2004 in Malaysia. The objective of ANENT is to facilitate cooperation in education, training & research in nuclear technology through; sharing of materials for education & training, exchange of students, teachers & researchers, establishment of reference curricula, mutual recognition of degrees & credit transfer and communication with other networks & organisations.

Apart from that, the NKM activities also embedded in the divisions' activities in Nuclear Malaysia. It becomes an integral part of all activities at the project, group, divisional and organisational levels. The key elements which lead to the successful of NKM implementation centring on people, processes and technology are then listed and described in detail. Obviously, the most important component being people; supported by processes or methods to find, create, capture and share knowledge; and technology to store and make knowledge accessible allowing people to work together without being located together.

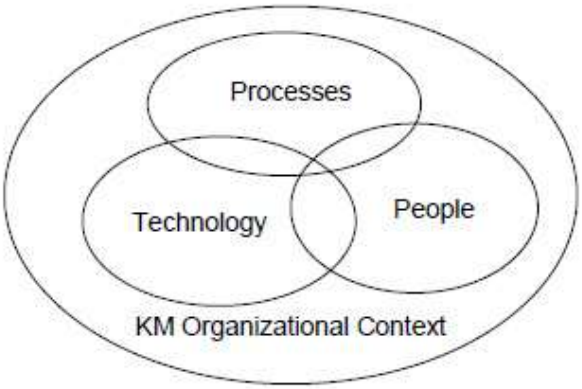

Figure. 1. The Oeganisational Context for KM

A). People

People are the key component in any knowledge management initiative, and success depends upon their willingness to share and reuse knowledge. In Nuclear Malaysia 'people' refers to the scientist and nuclear operator. Several elements that contribute to success of NKM in Nuclear Malaysia include:

- **Human resource planning and processes**

To achieve this, HRD has initiated a comprehensive workforce planning (career path for scientist) and succession planning to meet current and future human resource needs. These plans identify planned retirements and vacant positions as well as the required staffing levels needed to support business strategies. It includes attrition data, development plans, succession plans and current work force requirements. There are long term plans typically looking forward five or more years. Meanwhile, succession plan provides a methodology for identifying and developing employees to ensure that key positions can be filled with qualified internal candidates (or when necessary, that candidates can be recruited externally) in advance of actual needs.

- **Training and human performance improvement**

To develop competence in workers and improve safety and efficiency by identifying and correcting performance gaps. Training consists of formal classroom, field work, computer based and on the job instruction. Indeed, Nuclear Malaysia received international experts for knowledge transfer and experience sharing through training sessions, workshops, and lectures for related fields. This approach not only benefit Nuclear Malaysia but also other government agencies and the private sectors.

- **Tacit knowledge**

To support tacit knowledge in organisation, the activities of capturing, retaining and transferring have been developed and implemented. It focuses on people to people interactions for activities such as expert elicitation, mentoring, communities of practice (e.g. reactor interest group), peer teams, public talk, and social knowledge capturing (e.g. Nuclear Malaysia Get Together).

- **External collaboration, networking and benchmarking**

Collaboration and benchmarking are effective ways to share knowledge, support continuous improvement, and identify best practices. Collaboration is the process of bring people together with different knowledge and skill sets to accomplish specific objects. On the other hand, benchmarking is the practice of comparing features and performance of an organisation, department or function with those of other organisations and standards. Over the decades, Nuclear Malaysia has conducted collaboration with local and international counterparts such as universities, research institutions, government agencies and international bodies.

B). Process

Established operational processes are essential to safely operating and maintaining nuclear facilities. Therefore, the management of nuclear knowledge comes in all stages of nuclear facilities cycle and it involves large volume of information both from external and internal sources. The information is in various natures, namely, policy, financial, resolutions, strategies and action plans, projects proposals and meeting reports. All the organisation information is deposit in a repository managed by Information Management Division. Some of the information is then being analysed and reproduced in a publication manner.

C). Technology

Technology or tools are one of the important factors in KM process and strategy. As Yanev and Cherif (2004) mentioned;

"To this end, many international organisations have initiated a range of knowledge management projects and programs. The primary focus of these efforts has been on developing new applications of information technology to support the digital capture, storage, retrieval and distribution of an organisation's documented knowledge but also capturing valuable tacit knowledge existing within peoples' heads, augmented or shared via interpersonal interaction and social relationships".

According to IAEA-Energy series (2007), the global presence and availability of the Internet has, in the past 10–15 years, an exciting and profound impact on how scientific and technical information is exchanged between peers. Publishing a report on the web is technically simple and, compared to a traditional publication in a scientific journal, cost-effective and fast. To answer the IAEA call, Nuclear Malaysia has made some publications available electronically via the organisational website. For example the Jurnal Sains Nuklear is no longer available in hardcopy as it is now known as eJSNM.

Apart from that, Nuclear Malaysia has developed few systems and platform for knowledge sharing among all staffs include:

<u>IT tools supporting Information, file and document management.</u>

- Manual process using Shared folder (Documents)
- Electronic Seminar Management System
- Portals (Localweb, Intranet , Internet, Ms Sharepoint Portal)

<u>Other IT tools supporting organizational KM initiatives</u>

- Electronic Seminar Management Support System (eSEMs)
- Technical Helpdesk Support System (k-helpdesk)
- Service Center System (eClient & eSSDL)
- Library System

<u>Malaysian Government initiatives (eGovernment)</u>

- Human Resource Management Information System (HRMIS)
- Electronic Procurement-based System (ePerolehan, eSPKB)
- Electronic Asset Management System (MyAsset)

V KM CHALLENGES

Nuclear Malaysia has indentified challenges in implementing NKM in the organization. The challenges include;

1. Ageing Workforce

In the context of the ageing of the workforce, a key component is the identification of not only the individuals that are about to retire, but also the knowledge and the knowledge transfer capabilities that they will take with them. As a substantial number of first generation scientist are expected to retire in two years time, knowledge transfer is actively done in order to capture and retain knowledge they have had gained throughout working in Nuclear Malaysia so much, so that they can be passed on to the younger scientists.

2. Globalization

Another relevant factor is globalization, which facilitates greater mobility of nuclear professionals who often carrying important tacit knowledge with them. At this moment, globalization is not a threat for Nuclear Malaysia, but it is a challenge that requires some attention.

3. Stagnation of Nuclear Phase

Throughout the 1960s and 70s great strides were made as utilities ordered and built new nuclear plants. However, the 1980s and 90s were decades of stagnation for the nuclear industry. A few serious accidents in nuclear power plants, slowing demand for electricity and the loss of public support, primarily based on concerns about safety and cost, were the prime factors. The loss of public confidence affected not only nuclear electric generation but other areas of nuclear science as well. This stagnation indirectly impacted the process of knowledge transfer in Nuclear Malaysia. The government has stopped the recruitment exercise in the late 80s until 90s, and bounced back beginning year 2000. Therefore, Nuclear Malaysia is having generation gap situation; the seniors and the juniors with at least 15 years experience differences.

4. Nuclear Education

The stagnation also caused a loss of attractiveness of nuclear science and technology to the younger generation — resulting in low enrolments on nuclear engineering programmes and a subsequent widespread concern that the natural processes of transferring nuclear knowledge from one generation to the next could be seriously interrupted. In Malaysia, only Universiti Kebangsaan Malaysia (UKM) has dedicated faculty for science nuclear. Other local universities has either diluted their curricula by combining programmes or offered nuclear-related degrees as part of a more general science programme.

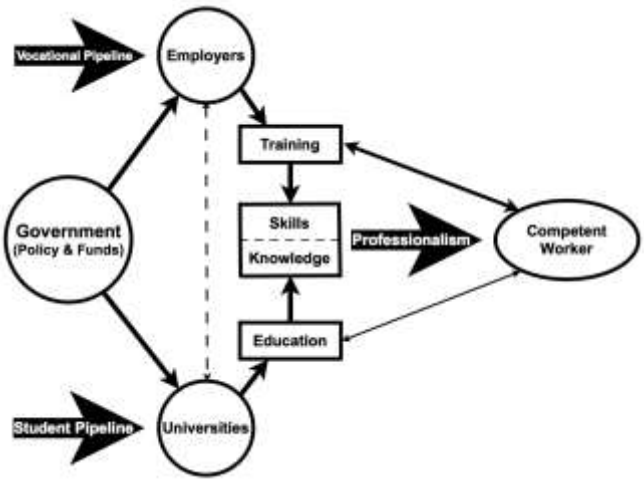

Figure 2. Government-university-industry interaction to produce competency.

A simple model can be derived based on the involvement of government, academia, and industry. It shows the important of close co-operation exists among education, industry and government. Nuclear Malaysia has taken few initiatives to improve the situation by persuading local universities to offer programmes on nuclear and related technologies. One of it is by analysing local universities capabilities in offering nuclear related education. In 2009 Malaysia has received a KM visit by IAEA. Their roles are to offer advice on the preservation and enhancement of nuclear knowledge and in facilitating international collaboration in education and training. According to IAEA Knowledge Assists Mission (Visit) To Malaysia Report produced by IAEA (2009),

> *"(Malaysia) appear to have an adequate infrastructure to support nuclear medicine and other (non-power) nuclear applications. This includes a regulatory framework for dealing with nuclear technology, and educational, training and research facilities to support ongoing nuclear related activities."*

VI WAY FORWARD

Developing and implementing effective KM programs is fundamental to keeping in pace with the actual and future needs for nuclear KM. In the first 40 years of Nuclear Malaysia, KM is not a main priority but it appears in many activities. Various transformation and initiates are implemented to ensure the growth of KM in the organisation. IAEA has given tremendous supports to Nuclear Malaysia to develop KM for global and collaborative innovation.

The Cabinet's decision on 26 June 2009 to include nuclear power as an alternative source for electricity generation post 2020 was the starting point of the development of nation's nuclear power programme. As a newcomer country, building the human, educational and industrial infrastructure will be a significant challenge. Together with this, Malaysia should also develop national policies for NKM. Such policies at the national level will prove beneficial in meeting these challenges by providing strategic and consistent direction to all stakeholders.

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