

A knowledge transfer program for engineering students at master level at the UPM

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Abstract. From an initiative of IAEA in 2011, the UPM has created a Nuclear Knowledge Management Seminar which is included as a part of the education in both the Master in Nuclear Science and Technology and the Master in Power Generation at UPM.

1. Introduction

Nuclear technology, developed over more than fifty years, comprises a broad set of branches of knowledge such as mechanical engineering, nuclear physics, automation, etc., Figure 2. During the operational experience of existing reactors it has been developed a vast knowledge that is needed to manage adequately to allow the present and future generations make use of this technology.

The IAEA has selected some universities to train teachers for the implementation of a course of nuclear knowledge management in different countries (Albania, Mexico, Russia, Czech Republic, Spain, etc.). Around 20 teachers with different backgrounds received a training course in Karlsruhe (Germany) in December 2011, including a representative of the UPM (Prof. G. Jimenez), Figure 2. Another edition was held in November 2012 for new teachers.

Motivated by the previous initiative, during the month of March and November 2012, it was held at the Department of Nuclear Engineering at the UPM's first two editions of "Knowledge Management Seminar in the nuclear sector" which was attended by students of Master of Nuclear Science and Technology and the Master in Power Generation respectively. The scope of those seminars is to create a culture of knowledge management in the new generations entering the field of nuclear engineering. This culture will facilitate the necessary knowledge transfer, which shall be given by the more experienced. This transfer is key to ensuring the highest standards of safety of existing nuclear facilities and for optimizing those reactors whose construction will be in the future

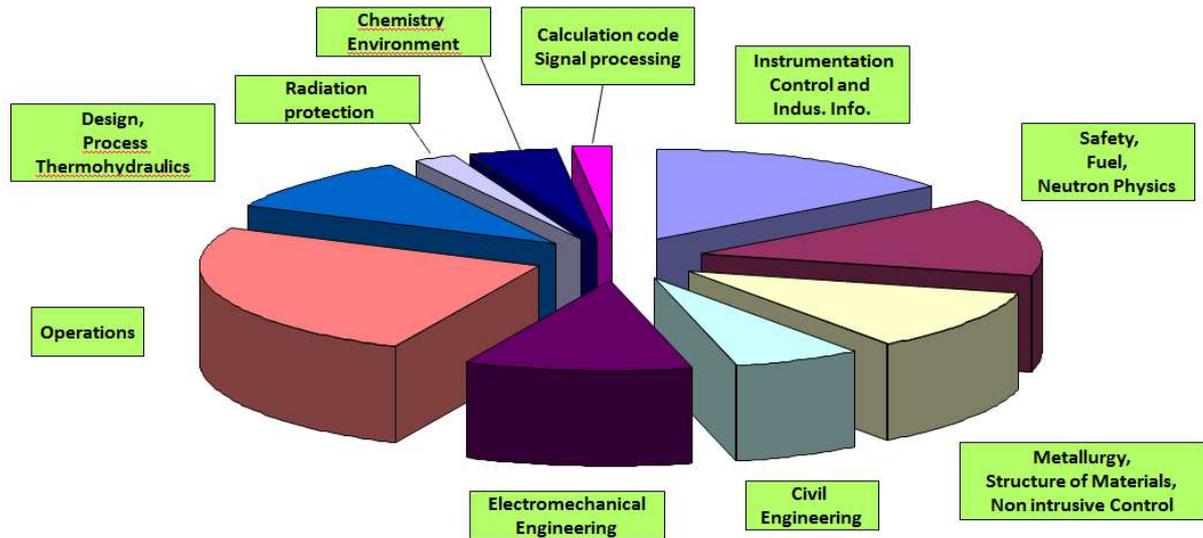


Figure 1. Nuclear energy knowledge domains. Source: IAEA



Figure 2. Picture of the IAEA Regional Workshop on KNOWLEDGE MANAGEMENT FOR NUCLEAR ENGINEERING COURSES in November 2011.

2. Implementation of the NKM education at UPM

The scope of the initiative was to create a knowledge management culture in the new generations coming to the nuclear area. It will make easier the needed knowledge transfer with the experienced generations.

Therefore, it was decided to incorporate the education in NKM at Master level, in the Masters related with Nuclear Energy:

- First “Nuclear Knowledge Management Seminar” (March 2012)
 - > Master in Nuclear Science and Technology
 - Equivalent to 1 ECTS
 - 15 students
- Second “Nuclear Knowledge Management Seminar” (October 2012 and November 2013)
 - > Master in Power Generation
 - 4 hour “hands-on-training”
 - 15 students

2.1. Method

What has been transmitted to the Master students? Practical tools to improve the NKM in the day by day in their work in order to create a knowledge management culture.

How to adapt the NKM theory to the master students? The UPM has developed a KM theory called WOL theory (I have WOn the Lottery).

The nuclear area has a NKM problem caused by the senior generation retirement that is happening and it will be the case for the next years. It has been identified and measured in the Knowledge Retention metrics, for example. But, it has also another NKM problem: the younger generation of people change job more frequently than the older generations. The WOL theory takes into account this fact, proposing a new metrics for the un-projected cases, Figure 3.

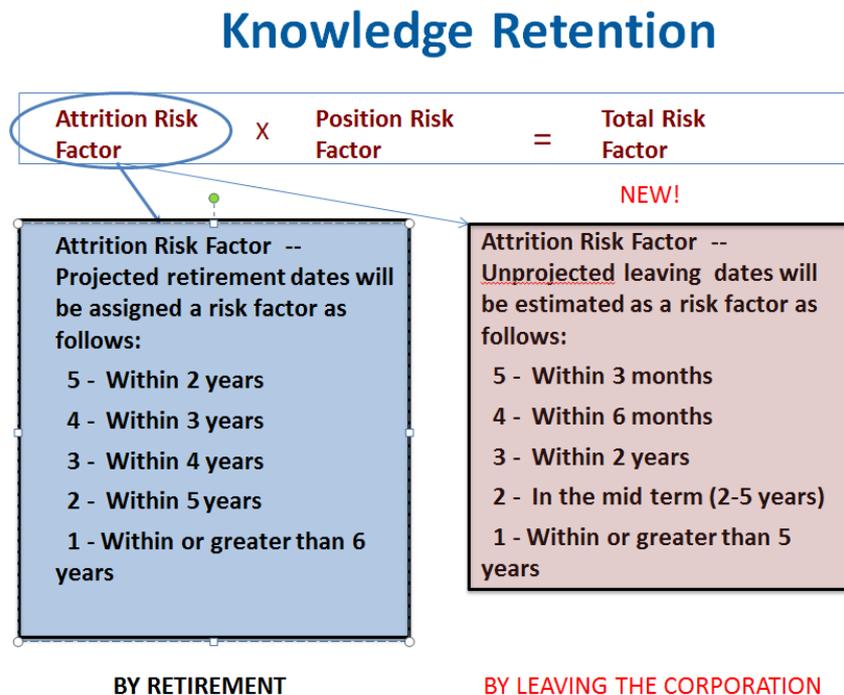


Figure 3. Knowledge Retention proposed metrics from UPM-WOLT theory

In the Seminars, it has been detected that the assistants are more involved in the education of NKM taking into account this WOL theory, as they see the problem closer to their own state, as they are mainly young students.

With this in mind, in the Seminars, the students are taught with a set of practical tools to improve the NKM in the day by day in their work:

- How to make their everyday work to be more traceable:
 - Knowledge Organization Systems (KOS)
- Identify, inside the corporation, the people with critical knowledge (independent on the age!)
 - Evaluate the risk of losing that knowledge
 - Planify the strategy of knowledge transfer
 - Avoid that all the critical knowledge of one are is concentrated in one person (knowledge islands)

A practical exercise is also set up, to put into practice the knowledge acquired. One example used is the next one:

The students are set into groups of 4. Each group represents a technological company, with different combinations of experienced and non experienced people (2 people over 60 years, 3 people less than 30 years, 1 person of 40 years, 1 person of 50 years and 2 persons of 37 years). The boundary conditions are: budget restrictions and low work load. They have to set up a NKM plan to avoid knowledge loss in the mid and long term.

3. Conclusions

The feedback from the students has been very good from the fist course. They feel that KM is a real issue in the technology-based industries and especially in the nuclear one.

Once they feel the problem is applicable to them, they show interest on learning tools to avoid knowledge loss in their present of future job position.

The experience of implementation has been a quite enrichment experience, as it is not usual to teach “competence” skills in a nuclear engineering area.

In the future, the NKM is pretended to be a competence subject at the Master level by itself at UPM.