KNOWLEDGE MANAGEMENT IN THE DECOMMISSIONING OF NUCLEAR FACILITIES IN BRAZIL

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Introduction

- Management with focus in knowledge consists in identifying and analyzing the existing knowledge
- knowledge management: ability to manage, identify, map, classify, capture, distribute, create, multiply and store knowledge with efficiency, efficacy and effectiveness. *Drucker* [2]
- Mesopotamian peoples - Library of Alexandria
- IPEN - no knowledge management plan
- OBJECTIVE: to evaluate how the knowledge management strategy and science can contribute in the long term for the preservation of information that guarantees the safety of nuclear installations in their decommissioning processes.

The history of IPEN

- 1956 (August) – IEA(IPEN)
- 1957 – the first operation Nuclear Research Reator IEA-R1 – provided by USA (Atoms for Peace)
- 1959 – Division of Radiochemistry – the first uranium concentrate (Orquima business corporation)
- IPEN – R&D – It has technology of produce silicide based dispersion fuel plates (for MTR type research reactors, such as IEA-R1), and fuel based on UO_2 pellets (for PWR type power reactors)
- 1960 – pilot unit for the purification of uranium concentrates - for training and preparing professionals specialized in uranium chemistry

The history of IPEN

- 1960s – another type of fuel began to be studied for application in research reactors of swimming pool type.
- 1964 and 1965 – the fuel elements for the Argonauta Reactor (Institute of Nuclear Engineering - IEN).
- 1968 – Uranium Purification Pilot Plant
- 1975 - Agreement on Cooperation in the Field of Peaceful Use of Nuclear Energy (Germany and Brazil).

The history of IPEN

The gradual process of technology transfer that covered practically the entire cycle, including:

- Prospection, extraction and processing of uranium ores;
- Conversion to UF_6;
- Enrichment through the centrifugal jet;
- Reconversion of UF_6 into UO_2;
- Manufacture of pellets and assembly of fuel elements;
- Construction of 8 nuclear reactors of 1300 MWe over a period of 15 years.

Brazil - to pay Germany the amount of 10 billion dollars, and to intensify its works on prospection, research, exploration and commercialization of natural uranium, with the objective of guaranteeing to supply the nuclear power plants in Germany.

The history of IPEN

At the same time:
- Brazilian Company of Nuclear Technology (CBTN) was transformed into a mixed economy company - Brazilian Nuclear Companies Business Corporation (NUCLEBRÁS) - responsible for the integrated nuclear program. Other subsidiaries have been set up in the various areas of the nuclear fuel cycle.

1979 – Autonomous Program of Nuclear Technology (PATN - directed by the armed forces). IPEN was included as a key component of PATN.

1980 – the Conversion Project (PROCON) was created, an agreement between the Ministry of Mines and Energy and the Government of the State of São Paulo, for the production of UF_6

The history of IPEN

1981 – the agreement with the Ministry of the Navy regulates the participation of IPEN in the development program of nuclear propulsion technology, and defines an area to be assigned for the use of the Coordination of Special Projects (COPESP) – Technological Center of the Navy in São Paulo (CTMSP).

1982 –the first uranium enrichment experiment was performed by ultracentrifugation (centrifuges built entirely in Brazil).

1982 – Government of the State of São Paulo and CNEN decided reintegrate the activities of IPEN in the National Program of Nuclear Energy.

The history of IPEN

1980´s – CELESTE Project - Plutonium Uranium Recovery for Extraction – reprocessing process with the construction of hot cells for handling the irradiated material.

The history of IPEN

- It would produce radioactive waste with a level of activity with a higher order of magnitude than the waste which IPEN had experience with - research and training program on waste management – Researchers were sent to the KfK (*Kernforschungszentrum Karlsruhe*) in Germany to study the storage and immobilization of high-activity liquid waste, and the general management of radioactive waste.

1982 - TERRA Project - a tank park for the storage of liquid waste from the first stage of the fission product extraction. The predictions about the processing capacity of the laboratory 1.5 kg of burned fuel, with 30,000 MWd/ton - few cubic meters of waste – with activity to require cooling during the storage, special transfer techniques and homogenization of the waste, with technologies still absent in the country.

The history of IPEN

1982 – 1997 - PROCON - transferred to the Aramar

- **It required support in the field of analytical chemistry, creation and strengthening of a research group**
- **It acted as a dragging project for other important projects**

1990's – radical changes of the Brazilian nuclear policy

- **Interruption of most R&D fuel cycle activities and shutdown of facilities at IPEN (most of them since 1993) – lack of resources needed to support the research – significant losses for the country**

Since then, IPEN has faced the challenge of dismantling and/or decommissioning these old pilot plants.

The history of IPEN

Some of challenges for the decommissioning and dismantling of these facilities:

- the dispersion of former operators into other activities or retirements
- the lack of reliable data and designs from the premises,
- most of this information resided in the operators' memory,
- the radioactive waste storage capacity is already depleted in IPEN.

The history of IPEN

Many questions related to the data, information, technologies and knowledge generated by these activities led to the following questions:

- Where are they?
- Are they organized?
- What is the safekeeping situation?
- Can they be recovered?

The search for answers refers to the topic of Knowledge Management (KM).

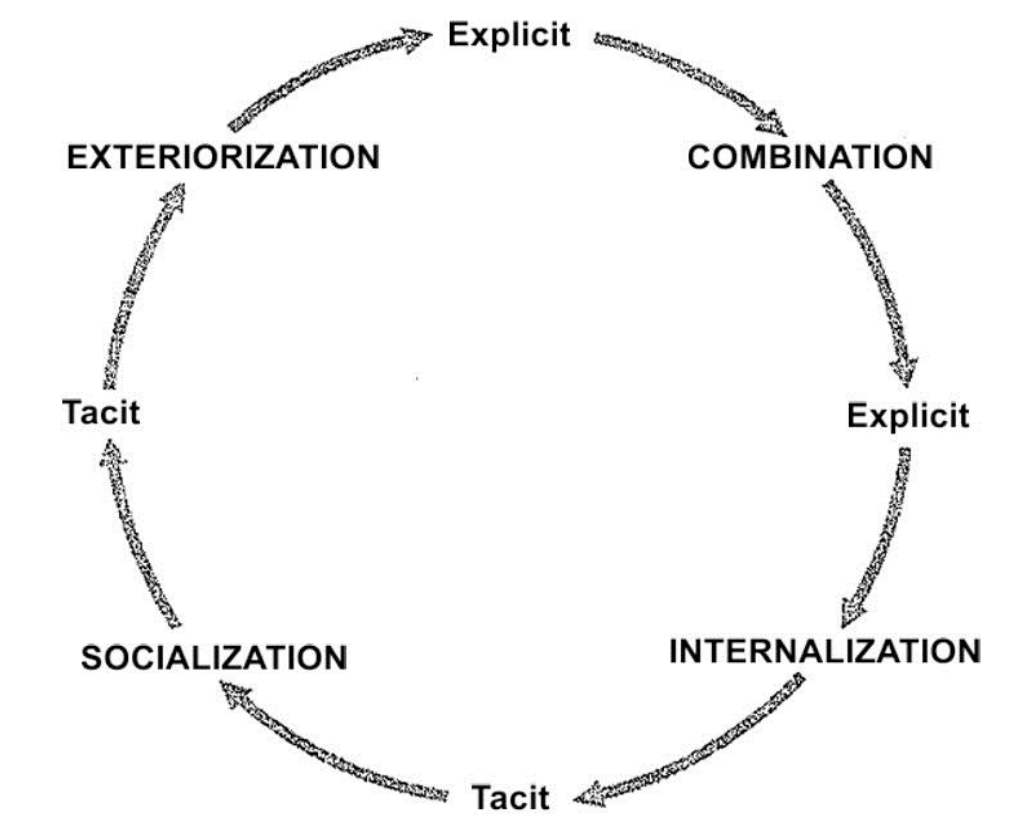
Knowledge Management

- Information is a set of event records within a context. Knowledge is the information that, properly processed, changes the behavior of a given system.

- Knowledge needs management, storage process, care to keep its information, management and channels for its proper dissemination. Knowledge encompasses intellectual human capital, the ability to research and innovate.

- KM is a systematic and intentional process, being supported by the generation, codification and transmission of what is known

Knowledge Management



Organizational knowledge conversion processes

Knowledge Management

Knowledge – two types:

- **explicit is the easiest to be put into words, recorded and documented;**
- **implicit (tacit) is the hardest to be put into words and is acquired with exercise, only by practice – difficult to quantify**

Knowledge Management

KM objectives of the organization:

- Support the generation of new knowledge;
- Identify and map knowledge and information;
- Make data accessible and useful by transforming it into information, sharing the best practices and technologies

Some of the advantages by the adoption of a good KM:

- Competitive advantage, with reduction of cost and production time;
- Greater appreciation of intellectual and human capital;
- Improvement of internal processes and greater fluidity;
- More efficient decision-making processes and better result;
- Improvement of product and service quality.

Knowledge Management

The steps to implement a KM:

- **It identifies the knowledge and defines which knowledge should be preserved.**
- **It transforms this knowledge into processes**
- **It identifies which skills are important for obtaining the best results/optimization.**

Knowledge Management

Some difficulties in implementing the KM:

- **“high” costs**
- **problems in the organizational culture,**
- **implementation of a different culture or way of working,**
- **automation**
- **any kind of change, can lead to much divergence and problems.**

To achieve greater effectiveness:

“the institution should plan and analyze every possible error so that the enterprise does not end up becoming a disorder, causing unnecessary expenses and losses to the organization”

The discussion

(KM) is about knowledge creation, identification, apprehension and sharing. It is about *getting the right knowledge in the right place at the right time*, particularly if it influences an action or decision. (SERVIN, G.)

Data collection (base - processed) x Information (aggregated a nd distributed) x Knowledge

Knowledge is in the human and intellectual capital: people (key point in this management)

The discussion

Our problems:

- **most of the professionals, who participated in activities related to the decommissioned facilities, are in other activities or no longer at IPEN.**
- **no matter the number of documents and information that still exist about the activities performed, it is necessary to recognize that part of the knowledge has been lost.**
- **the intellectual capital is no longer available, that is, implicit knowledge.**

KM, combined with Information Management, is a means and not an end to the success of a strategy.

The discussion

At IPEN:

- **part of the activities and practices established are documented,**
- **difficulty finding them (information classified as restricted or confidential)**
- **there is a challenge in knowing where they are.**

The institution or company that intends to implement KM needs to have clearly defined its strategic objectives and its vision.

this will define the guidelines for which knowledge will be of interest to maintain or preserve.

The discussion

At IPEN this is a different situation:

- **the proposal is to find the knowledge that was developed at that time;**
- **Once found, it is necessary to identify what is really important for the nuclear area;**
- **structure it in order to maintain it available for future generations or businesses.**
- **This will also allow to define profiles and competencies of potential future employees, establishing the minimum knowledge each one will need to develop for business participation (Competency Management).**

Final Remarks

- The decommissioning and dismantling processes would have been benefited today if the information needed to identify the premises, radioactive materials and plant operations planning had been transmitted, or even registered in accessible documents.
- it is necessary for IPEN to evaluate whether its strategic objectives already incorporate the aspects related from what these facilities have aggregated of technologies and knowledge, to clearly establish the need to implement the Knowledge Management, and also elaborate the policy for this.
- The institutions should just consider the future, evaluating over time which information is important, and how it should be stored in a way that could be accessible when needed.

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Thank you for your attention!

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