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## KNOWLEDGE DOMAINS CARTOGRAPHY OF THE RADIOPHARMACY CENTER OF IPEN - A CASE STUDY

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**Abstract.** The present work compiled and organized a methodology that allows to identify, to analyze and to map the important knowledge of an organization, representing them through Knowledge Domains Cartography and evaluating them with relationship to the relevance and vulnerability. Such methodology was applied to the Radio pharmacy Center of the Nuclear and Energy Research Institute (IPEN: Instituto de Pesquisas Energéticas e Nucleares) and the results of the map and analysis of those knowledge they allowed to propose judged appropriate Knowledge Management actions to the Center.

### 1. INTRODUCTION

Knowledge Management is being increasing highlighted in management fora and in the general media. Also the number of organizations is engaged in activities related to this theme growing substantially. One should not that this interest does happen only in the business community but also in governmental and international organisms like the IAEA – International Atomic Energy Agency.

It is natural that the subject also calls for the attention of research and development centers and, that are institutions whose missions lean on fundamentally in the creation and use of the scientific and technological knowledge. The concept of treating organizational knowledge as a valuable strategic asset has become almost a consensus in these organizations. They must efficiently and effectively create, capture, harvest, share, apply, preserve and protect their organization's knowledge.

Management of resources is effective only when the object is known in terms of their relevance, demand, availability, repositories and other pertinent characteristics that can influence its administration. Knowledge Management is not different and, in this case, we need to map the relevant pieces of knowledge and to identify and characterize their attributes and repositories.

An evaluation is also necessary in order to have a coherent Knowledge Management strategy that guarantees the continuity and the development of this resource according to the objectives and goals of the organization in terms of its vision of future. One aspect of evaluation is by assessing the critical character of the knowledge sources, facilitating the identification of those likely to add value and those that could bear risk. Such activities: knowledge identification and evaluation combined with the intended objectives of the Knowledge Management help to unveil possible solutions that correspond to the organizations needs in each case (capitalization and preservation; sharing, appropriation and knowledge creation) and it helps the determination of the different Knowledge Management actions.

### 2. THE CASE STUDY

The IPEN is the largest research institute of the Brazilian National Nuclear Energy Commission (CNEN: Comissão Nacional de Energia Nuclear). The knowledge management for this organism is an important problematic. Brazil has developed considerable amount of knowledge in the nuclear domain, with a long-term investment, during many years of research and through the technological transfer. Now a day, like in other countries, the nuclear area is

enduring long term problems due to lack of research funds, low support from governmental policies and little interest from young students. As a consequence this considerable body of knowledge faces risk of non-preservation and moreover difficulties to leverage in view of undefined future perspectives.

A pilot project has been developed in the Radio pharmacy Center (CR: Centro de Radiofarmácia) of IPEN. This center has been created by the transformation of a typical research unit in to an industrial like production unit with certain aspects of business unit. It was been certified ISO 9001/2000 and has as its mission “to produce and to distribute radio pharmaceutical products for the use of the nuclear medicine (diagnosis and therapy)”. Its employees are workers of the public sector and have a limited autonomy. This center supplies 300 hospitals and clinics in all the country, based on (1). It is necessary to note that radioisotopes and radio pharmaceuticals production is still a state monopoly in Brazil, but interesting enough is that the demand grows of 10% per year (1) and there has never been a problem of unattended demand.

### 3. THE KM PROJECT

The project in the Radio pharmacy Center (CR) took place in several stages:

#### 3.1. Processes study

The knowledge identification was accomplished through the study of center processes and its underlying activities. Different means were used in a complementary mode: documentation review and analysis, interviews with leading personnel of the organization, writing up of summaries and validation with the experts. Processes define how the inputs are worked and how the existent resources are used so that the organizations fulfill its mission, based on (2).

In fact this work has been facilitated due to the through documentation available because of the ISO certification. The Radio pharmacy Center was studied under the logic of its processes and its interfaces, considered as a Strategic Business Unit inside of the possible limits of an unit of IPEN. The Processes of CR have been described in a classic manner using flow diagrams. The macro-processes were identified from the Quality Management documentation (Integrated Management Norms, Operational Procedures, Work Instructions and other documents) and they were decomposed in its respective processes and activities. From this analysis, the process enabling knowledge were identified and characterized.

#### 3.2. Knowledge identification (“enabling knowledge”)

Once the Center processes were understood a discussion with the (knowledge) actors of the processes helped to classify for every activity more precisely which knowledge and operational ability are necessary and sufficient to achieve the adequate outcome of each process. This fine processes analysis permitted to elaborate, for every process, a table relating processes, activities and knowledge (with some supplementary information on products). To be thorough, in this pilot, it was decided to focus on all production and research and development processes. Just a few off-core processes were not included.

#### 3.3. Construction of the knowledge cartography

An interesting problem, for which there is not a widely accept solution, is how to represent the organizational knowledge in a way that produces both a visually friendly and accurate representation of it. In other words how to have a good mirror of the organization intellectual assets.

There are many ways to picture in structured fashion tangible resources of an organization, however knowledge assets are more difficult to represent. The approach used in this work, named “Knowledge Domain Cartography” is based on a classification by domains, according to themes and finalities, that was proposed by Ermine (3,4) and used by Peil et al (5) e Aubertin et al (6).

The construction of the cartography starts with a central node that corresponds to the main purpose of the organization. Then, a set of out flowing axes start from this node, each one representing the strategic knowledge themes, usually associated with the main components of the mission of the organization. Depending on the level of detail that one wishes to show, the main axes can give origin to secondary axes representing sub-themes and those originate branches to represent the knowledge domains. Sometimes even the domains can be further split into sub-domains. Usually a top down approach is used with some charts to show themes and sub-themes and then separated charts to detail each axis (theme) into sub-themes, domains and eventually sub-domains. Sometimes some of centered support axes are used to represent important knowledge not directly connect with the main purpose of the organization but support activities related to it. A more detailed description of the Critical Knowledge Domains Cartography representation was published by Peil (5).

The Knowledge Domain Cartography of the center was represented using eight diagrams. The first one gives a general view of the main axes, or strategic knowledge themes, according to the following denomination: Planning, Production Technology, Research and Development, Quality Control, Radiation Protection and Special Processes; plus a support axis (Norms and Regulations). The next seven are used to detail the domains pertaining to each main axis until the level of domain or sub-domain.

The figure 1 shows the general vision of the Knowledge Domains Cartography of CR.

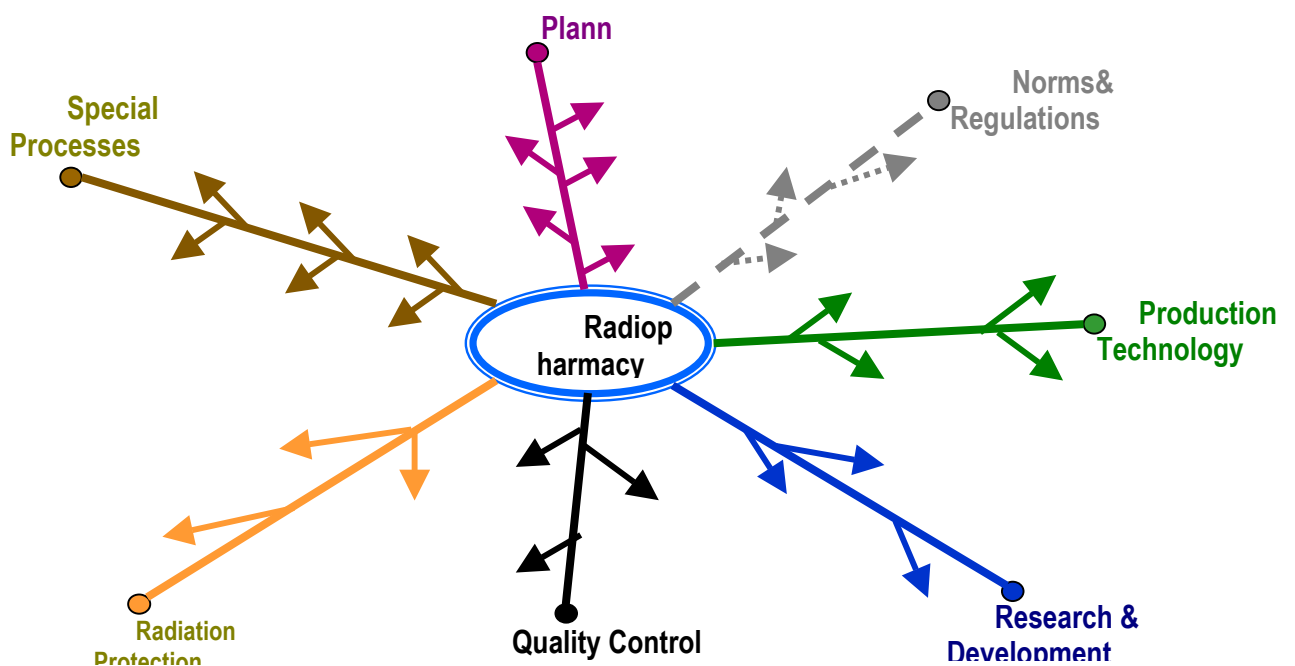


FIG. 1: Knowledge Domains Cartography of CR (general vision)

### 3.4. "CRITICITY" ANALYSIS

A method to determine which knowledge domains or sub-domains are critical is presented in the work. The objective is to assess the relevance of each one of the domains according to the objectives and goals of the organization and its respective degree of vulnerability. This kind of analysis gives important hints to choose the most effective KM solution for each domain. Evaluation criteria should be aligned with goals and needs of the organization. In this work, two criteria were used to "measure" the relevance of the knowledge domains (quality and

complexity of knowledge and importance for the strategic objectives of the organization) and three criteria were chosen for vulnerability assessment (difficulty of knowledge acquirement, capacity of sharing in the context of CR and knowledge rarity). A three-point scale was used for each criteria (0, 1.5, 3).

Questionnaires and a plan of interview have been established to precede the analysis. The choice of the experts that have collaborated in the assessment was based on their leadership, experience, proficiency in knowledge area and representatively.

The compound grade for relevance was an average of its individual criteria and the same was done for vulnerability. A knowledge domain is considered critical if the global note is superior or equal to 1,5 (notes are 0, 1.5 and 3) and one of the criteria has the maximal note. About 30% of domains have been estimated critical.

### 3.5. Setting up of a KM plan of action

A set of actions have been identified that could reduce the knowledge domain “criticity”:

- A knowledge data (video and sound) with critical peculiarities of the processes;
- A knowledge data base of “problems and solutions”;
- A program “RC teaching RC” (meetings and mentoring);
- The virtual communities of practice;
- A KM oriented functional development program;
- An organizational memory;
- An more proactive extranet client;
- A knowledge portal.

A few initiatives are in progress, such as the elaboration of an organizational memory using knowledge books and MASK method (9,10).

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