

A CONCEPT MAP AIDING THE KNOWLEDGE MANAGEMENT TO BUILD THE COLLECTIVE KNOWLEDGE IN A NUCLEAR ORGANIZATION – A CASE STUDY: IEN

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ABSTRACT

This paper's proposition is to build and apply a tool to aid the knowledge management based in the intellectual capital as a value and competitiveness aggregator for a science, technology and innovation public organization in the Brazilian's nuclear area – the “Instituto de Engenharia Nuclear – IEN”.

It will be presented the hole survey of the finalistic activities and what has been considered the intellectual capital to be developed and strategically valued in its decision making practices.

It was also surveyed the inter relations between the stakeholders, hereby the maintainer (CNEN), federal government, support foundations, public employees and contributors, in many different aspects focusing the continuity of research and development (R&D) activities and its results.

As it's going to be detailed, the tool has been designed based in the concept map methodology using the Cmap tools software. The hole cognitive basis used here was constructed under disclosed and recognized knowledge models about knowledge, knowledge management, knowledge transference and intellectual capital.

1. INTRODUCTION

Nowadays, many research institutions in the Brazilian's public area are facing difficulties when making their finalistic activities and effectively contributing in the knowledge building of several business and industrial economy areas. The problems that impact not only the private companies like resource scarcity, free competition and even a knowledge gap in the management area, also impact public organizations.

To use concepts and tools which are going to help their ressignification processes for the 21 ambient [3], an ambient of dynamical changes - technological and cultural – has being a challenge.

We understand that, for those public institutions, the organization of relevant information, which are going to help the scientific production configurations and availability, are extremely important to align its future to the social country demands.

To also understand the logical building (what knowledge is being created, where and by whom) in a systematic and easy accessed way is a crucial key for those organizations.

1.1. Goals

The objective is to model a tool to aid the access, organization and knowledge building in a science, technology and innovation public organization in a way to optimized its performance and competitiveness in its area. The tool also intends to help the institution in its decision making practice relatives to its strategic objectives.

To help this objective we're going to develop the model using the concept maps methodology and the building of tool will be done using the IHMC Cmap Tools.

The chosen institution is the Instituto de Engenharia Nuclear – IEN – a federal research and development institute of the Comissão Nacional de Energia Nuclear – CNEN – which is linked to the Ministério de Ciência e Tecnologia – MCT. Its core competences are defined in its knowledge centers: Nuclear techniques application, Teaching, Chemistry and nuclear materials, Waste, Innovative and advanced reactors and Radiological protection [8].

1.2. Based theory

1.2.1. Knowledge

According to Nonaka and Takeuchi [6], knowledge is an attitude's function and it's related to action. While information is the data reading, knowledge is the data reading flow according to agents beliefs, intentions and action. So, knowledge is an interpreted information and, fundamental to say, always a human action.

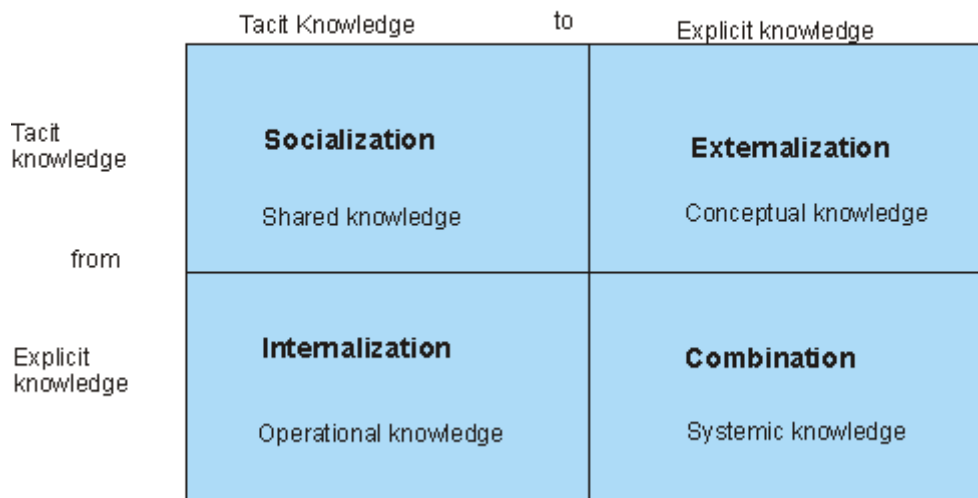
It's important here to differentiate tacit and explicit knowledge.

The tacit knowledge is related to the agent, the individual. The one taken by the person and, many times, isn't clear enough to the organization. It's experience and practice.

The explicit knowledge is the one which the organization can capture and make available. It's codified and can be reproduced in a formal way.

The interaction among tacit and explicit is explained by Nonaka and Takeuchi on their model of knowledge conversion and can be visualized on picture 1.

Model of knowledge conversion



Picture 1 – Model of knowledge conversion
Source: Nonaka and Takeuchi [6]

1.2.2. Knowledge management

There is an authors' thought [9] which affirms that knowledge can't be manageable, in fact people must be trained to reach it. In this way the term management implicit control and these processes would be intrinsically uncontrolled. The idea here is to promote the creation and not the control.

To Figueiredo [2] knowledge management is the one which will promotes the creation of mechanisms and procedures to stimulate the competences and aid to share the relevant knowledge in all required levels.

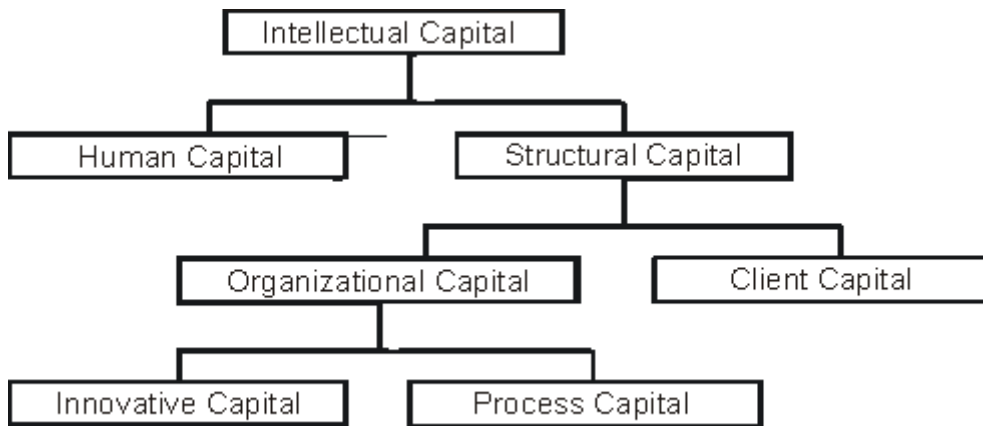
Anyway, the different ideas can be considered complementary, rather than antagonic, and both consider strategic all inter-relations among knowledge creation and its use creating value in and for the organization.

1.2.3. Intellectual capital

Intellectual capital is the addition of each person in an organization that could represent competitive advantage.

According Klein and Prusak [5] it is the intellectual material which was formalized and captured to produce a higher valuable asset.

Also talking about intellectual capital, Edvinsson and Malone [1] present intellectual capital as a set of elements which can be better seen and understood in the picture 2.

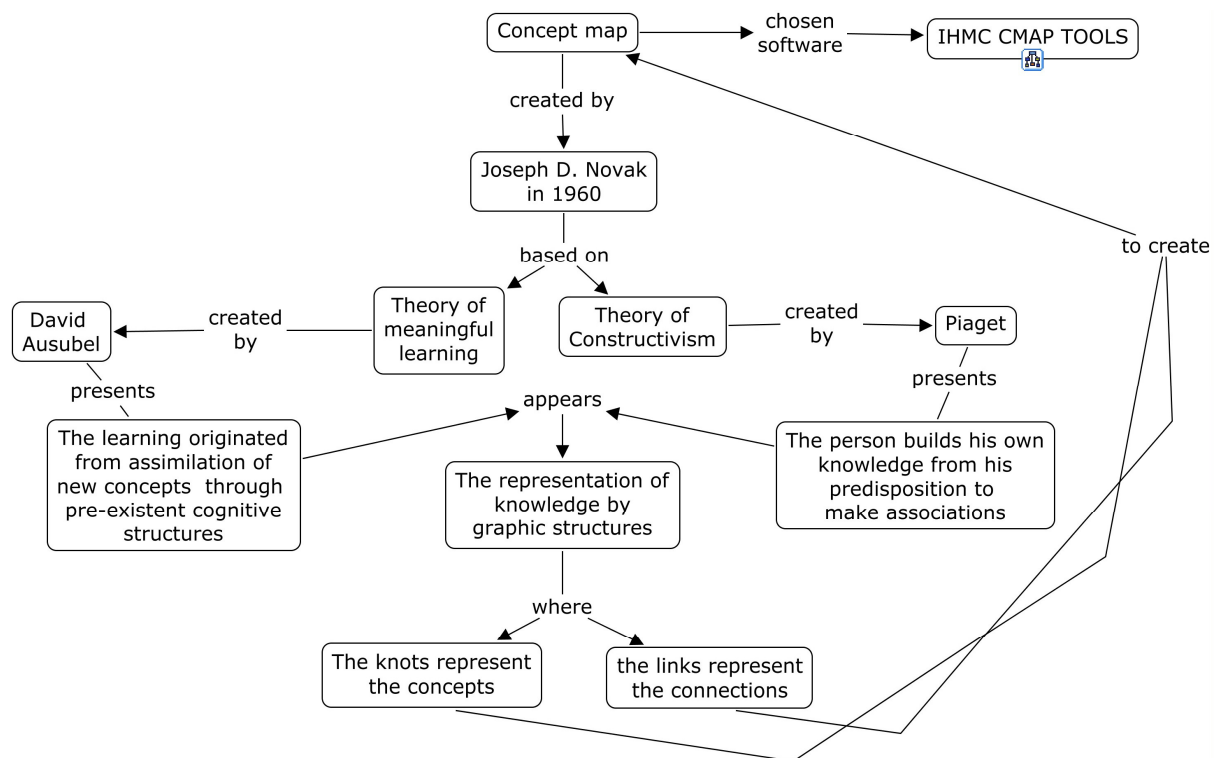


Picture 2 – Intellectual capital - Division
Source: Edvinsson and Malone [1]

1.2. Concept Maps

This method was created by Joseph D. Novak [7] and the focus was to develop a tool that could help the building of collaborative learning.

The following structure is a concept map and can better detail Novak's technique.



Picture 3 – Concept Map technique

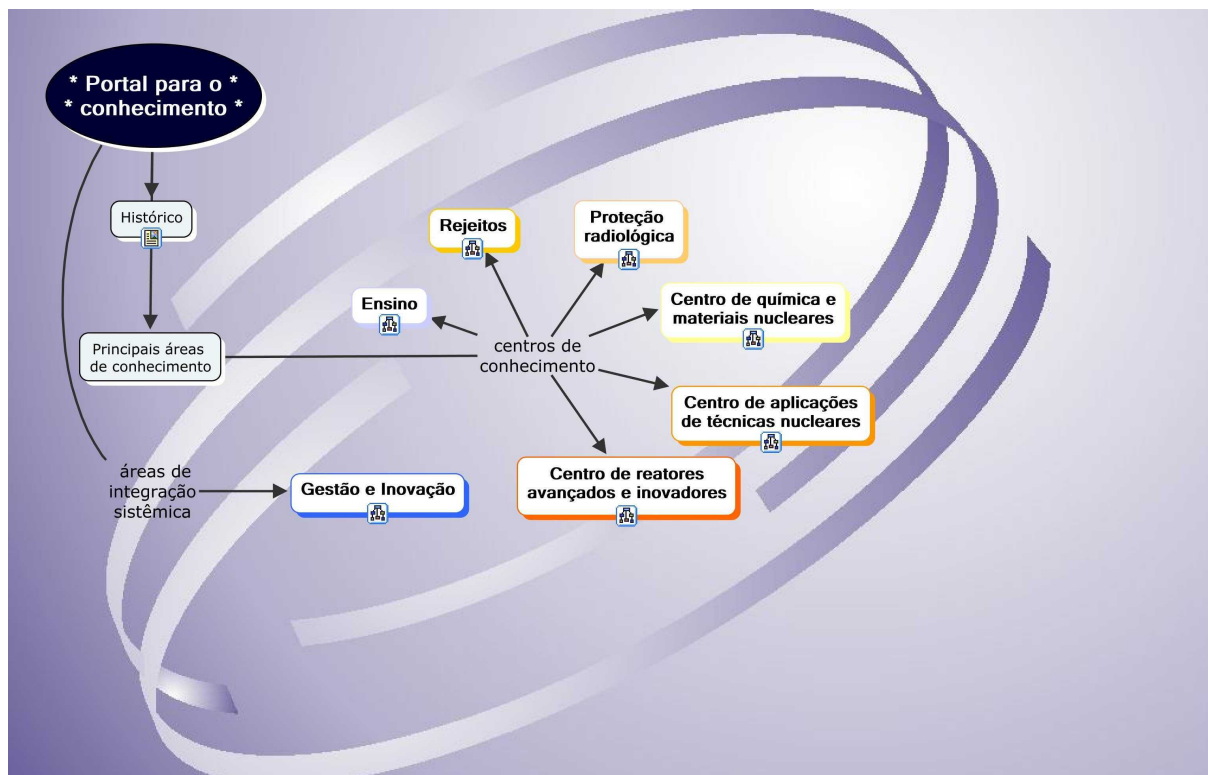
As can be seen in the picture above, the software chosen was the IHMC Cmap Tools, version 4.10. It's a software to construct, navigate, share and criticize knowledge models represented as concept maps (www.ihmc.us).

2. MODELING THE TOOL

We begin this part defining IEN as a Technological and Scientific Institution – ICT – a enterprise in the public area which has in its institutional mission, among others, to execute basic or applied research in the scientific and technologic areas (Law number 10.973, December 2004).

To model the map was observed the following: find the explicit knowledge – here the annual scientific production and the processes classification linking to the area, systematizing the received information. The searching of organization's tacit knowledge, disposing the information: mapped processes and their goals, linking each staff to its process and providing a view of all individuals and their surveyed information also linking to their processes staff.

All general information like profile, history and main areas were surveyed and included in the tool, modeled in a way to be easily understood (picture 4).



Picture 4 – The tool's presentation

One important step was to verify the organizations structure and how the CNEN's and federal's programs were included. The system SIPLAT (work plan system) that organizes and disposes the Brazilian Nuclear Program in the institutional system called SIGRES (institutional management system) were the data basis which the information was available.

To classify and map all IEN's processes, linking to the main areas and those main areas to the knowledge centers was a way to demonstrate a part of the structural capital of the organization.

Crossing the institutional information that has included IEN's Balanced Scorecard (based on Kaplan and Norton's Methodology) [4] professionals' experience and the information available in the systems *SIPLAT* and *SIGRES* we were able to find the explicit knowledge as its scientific production.

Then we have searched the tacit but, of course, we only have found marks and points to this knowledge. So we have tried to help, showing the individual information, as it can be seen above:

Charges and responsibilities – Presented through the specific laws:

Law number 8.112 – *Regime Jurídico Único*, to regulate the labor relations for the public service.

Law number 11.778 – To regulate students stage.

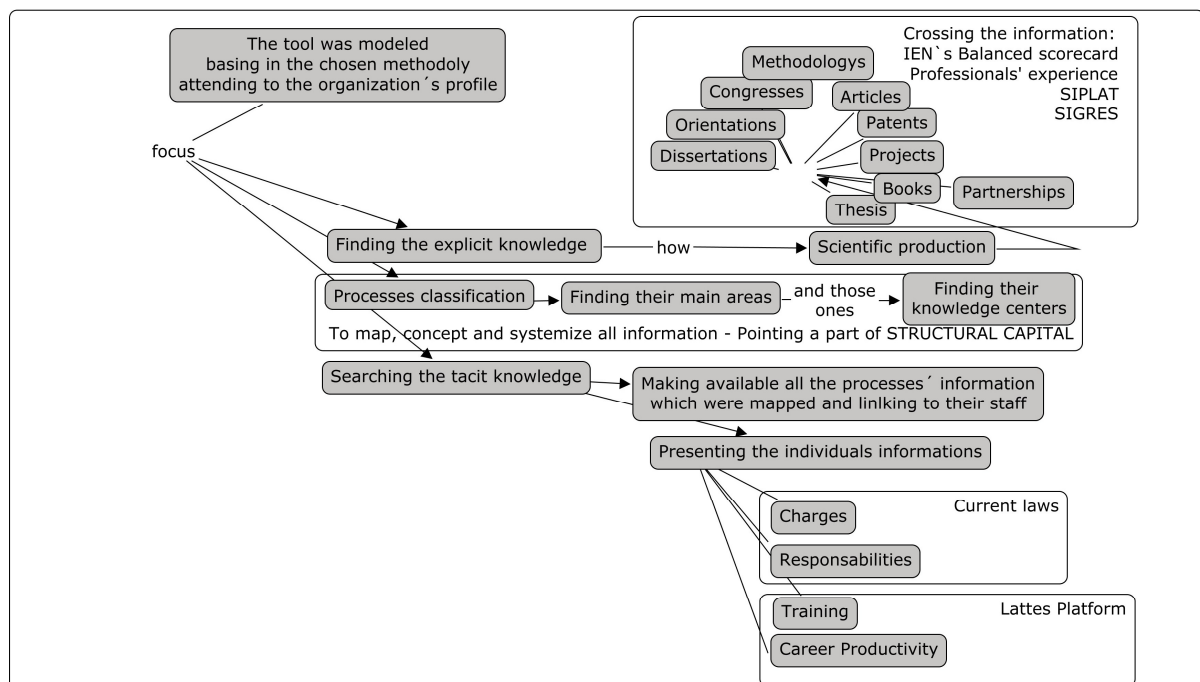
Law number 6.494 – To regulate students stage – university degree.

Law number 8.691 – To regulate the career plan for the science and technology area.

Law number 10.973 – Innovation law

Lattes Platform – In this platform we can find the curriculum of the professionals and written by themselves. This platform is available on the web – <http://lattes.cnpq.br/> - and each individual has a different code.

The following picture demonstrates the whole scheme and their links that were used to model the tool.



Picture 5 – Modeling the tool

3. RESULTS

According the modeling were elaborated the following maps:

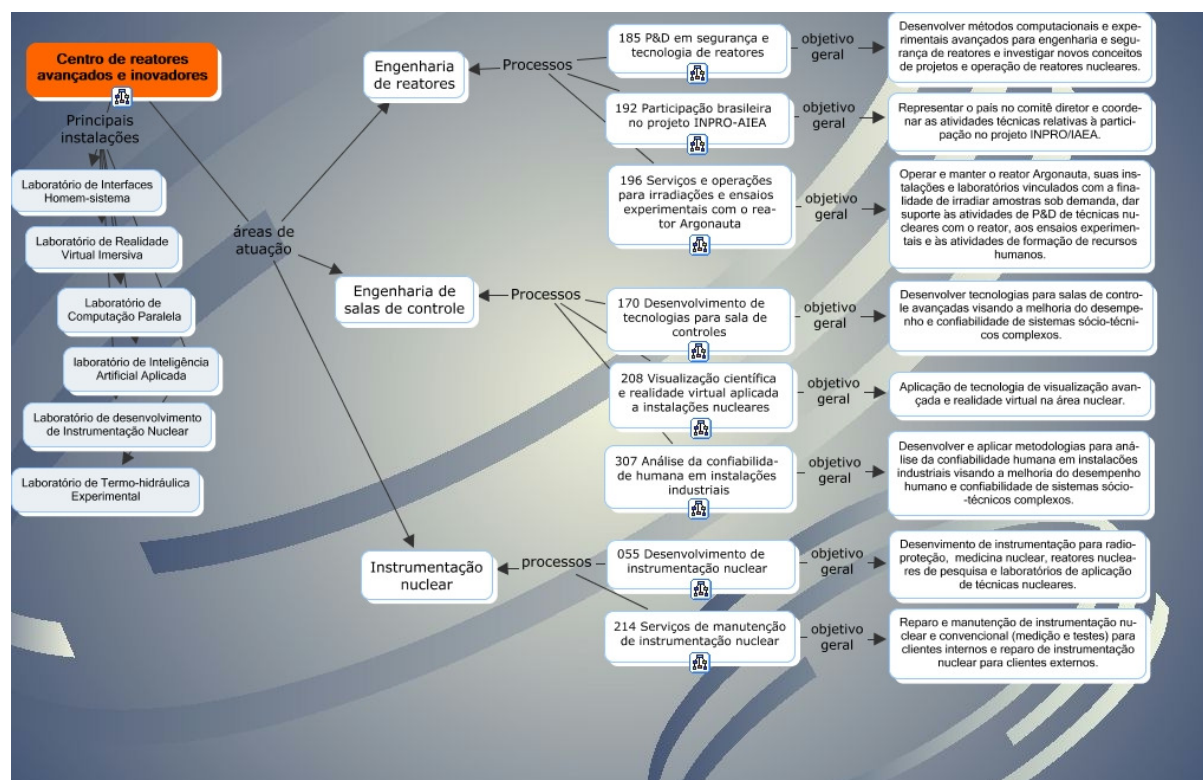
- Six knowledge centers and one area of systemic integration with their main installations.
- Twelve actuation areas.
- Twenty-five processes – twenty-two finalistic and three management and innovation.
- Twenty-five processes staff.
- Twenty-five maps of scientific production by process and seven maps by knowledge centers.

Were linked to the several maps:

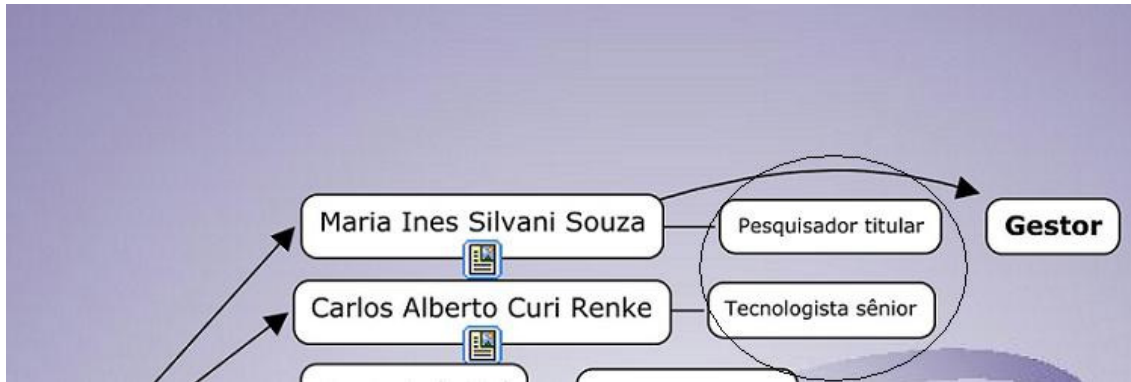
- Ninety-eight links to the Lattes.
- Were linked to the scientific production maps sixty-four work congresses and seventeen articles
- Also eighteen thesis and twenty-eight masters dissertations
- All the projects belonged to institutional *caderno de projetos* (a portfolio of projects), a total of seventeen projects.
- Twenty-two partnerships distributed on seven processes.
- Fourteen orientations distributed on five processes.

All the knowledge centers can be seen on the starter page of the tool (picture 4), baptized *Portal do conhecimento* (knowledge gate). To visualized the actuation areas and/or processes the user just clicks on the available links to open each one (picture 6).

Each process presents links to its staff and scientific production by year.



Picture 6 – Center of Advanced and Innovative reactors



Picture 7 – Staff process (a detail)

4. CONCLUSIONS

Basing in the hole survey and after finishing the structure was possible to understand what the organization has considered strategic and what was directly linked to its competencies and social responsibilities.

We conclude that the organizational intellectual capital has been easily found in the mapped processes called finalistic and management and innovation. This conclusion is not static but reflects the institution's moment and what it's considered strategic facing its goals.

About the tool we visualize good learning and use possibilities. Its uses would cross the organization and always open to modifications and customizations to empower the information and its uses.

To know the organizations intellectual capital is extremely necessary. Many actions must be done yet, but, we believe, the input was done by this developed tool.

The strongest difficulty will be always with the tacit knowledge and how to creates forms, not to control, but to integrate, use and those be transformed into a competitive advantage for the organization.

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