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NUCLEAR KNOWLEDGE PRESERVATION

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ABSTRACT

The nuclear technology has encouraged the world development and brought a number of benefits to society. These benefits occurred in important social sectors such as Agriculture, Industry, Health Sciences, Environmental Sciences and the production of energy. The research in the nuclear area is justified, accordingly, as an important factor for science development, technology and innovation. Despite the importance of nuclear energy, there is a collapse in the generation, transmission and sharing of nuclear knowledge. The threat of regression in this area is evidenced by the difficulty of generating new knowledge and practices regarding the maintenance of some critical areas. This project focuses its attention on studying, specifically, the lack of young engineers and technical professionals to replace the older, considered this, an alarming situation. Therefore, it is necessary to identify and record the key skills of experienced workers, through a set of tools to elicitation (capture) this knowledge, as expertise is mainly with people, and is lost when they leave the organization. Against, the Knowledge Management provides methodologies for the process of stimulating the creation, collection and knowledge dissemination process, in order to achieve strategic objectives. This study aims to contribute to the building of a model for the Brazilian nuclear knowledge preservation and, therefore, contributes to the maintenance and innovation of activities in this area.

1. INTRODUCTION

The nuclear technology has promoted the world-wide development and brought a number of benefits for the society. These benefits have occurred in several important social sectors such as Agriculture, Industry, Health Sciences, Environmental Sciences and in the production of energy. The results of applying this technology – some of them not so well-known for the society – have promoted the improvement of the quality of life and contributed significantly for the advancement of basic sciences.

Concerning the Agriculture sector, the irradiation of agriculture products, allows the elimination of bacteria, fungus, and microorganisms without influencing the taste and the nutritive value of the foodstuffs. It allows also the storage of foods, in perfect conditions, for a long period. Besides, the study of insect behavior, using radioactive tracers, and its sterilization through gamma radiation, makes easy the control of agriculture infestation insects without environmental contamination with chemical products.

Concerning the Medicine sector, the use of radioisotopes and radiopharmaceuticals allows to predict previously illness and to choose the best treatment for the patient providing more chances for patient's recovery. Regarding pharmaceuticals products, the radiation can be used for the sterilization of simple and surgical materials

The generation of electrical energy is the most well-known sector of the nuclear technology, composing its significant part of the energetic matrix of several countries. Even facing several critics regarding the impact that this technology could cause, the difficult questions related to the nuclear energy are being solved. Nowadays, the generation of energy by nuclear power plants is considered ecologically one of the questions that can bring less impact to the environment. One of the important advantages for nuclear energy production is the lack of gases release considered to be responsible for the increase of the global heating atmosphere.

Regarding another perspective, the development of nuclear area is strongly linked to the advancement of basic sciences such as Physics, Chemistry, Geosciences, Environmental Sciences and also in Human Sciences, such as Law Science. In this context, the researches on nuclear area are justified as an important factor for scientific and technological development, as well for innovation. This results in a significant contribution for science progress as a whole.

Despite the importance of nuclear energy, it is observed a collapse in the generation, transmission and sharing of nuclear knowledge. The threat of regression in this area becomes evident through the difficulty of generating new knowledge and the maintenance of practices related to some critical areas. An important symptom is lack of interest regarding this area that has been spread out – university courses have been closed and specialists without transferring its knowledge have been retired.

The evidence of the risk concerning the disappearing of critical knowledge is demonstrated by some national and international organism's reports, congresses on the Knowledge Management and the under-mentioned significant experiences related to the area.

Several recent meetings on Nuclear Knowledge Management have been continuously sponsored by the International Atomic Energy Agency (IAEA), the regulatory Organism of United Nations (ONU), such as: the technical meetings in November 2003 and in June 2004, hold in Vienna; the International Conference on Knowledge Management: Strategies and Information Management, Development and Human Resources in September 2004, hold in Saclay, France; and the Nuclear Workshop on Knowledge Management, in August 2005, in Trieste, Italy.

Nevertheless, these problems have not been recently identified. A decade ago, the Organization for Economic Co-operation and Development has demonstrated, in its Annual Report (OCDE, *in Portuguese*, 1999) the need for the maintenance and investments in the nuclear area, for the 21st Century. This subject was reported in IAEA Annual Report, in 2003, demonstrating the concern with the aging of the nuclear specialists and with the lack of universities offering courses in this area.

As a result, this report has shown some strategies to be followed for the preservation of the nuclear knowledge, such as:
- integration of sources of information in a nuclear knowledge portal;
- promotion of an institutional training network in nuclear energy;
- documents and manuals for nuclear knowledge preservation ;
- preservation focused on knowledge projects;
- spreading of nuclear energy benefits;
- availability of curricula of specialists in the area

Another important publication to be mentioned on education and training in the nuclear area, was published by the Nuclear Energy Agency (NEA) in 2000, emphasizing the question of the nuclear knowledge preservation and identifying several features of the problem, such as: the decreasing number of institutions of superior education offering courses in the nuclear area; the declining of the number of students looking for this area; the lack of young researchers to replace the researchers in process of retiring; research installations being closed and not replaced; and finally, the significant fraction of graduated persons not engaged in activities of the nuclear area.

The IAEA Report (2006), on the management of the risk of losing nuclear knowledge in organizations, presents some examples of situations that influence the industry and create the need of management of this knowledge. Among the objectives of the Report are worth to be mentioned: to draw the attention to the need of Knowledge Management, to the potential loss of nuclear knowledge and abilities and to provide processes and tools to conduct evaluations to predict the risk of loss of undocumented nuclear knowledge, caused for technicians retiring.

Germany, for example, has suffered with the difficulty of recruiting professionals, after a political decision to extinguish, gradually, the nuclear energy. This political decision led to a strong declining in the registration in academic programs related to nuclear engineering. These factors, combined with specialist retiring, for a long period, creates a lack of qualified workers in the nuclear power plants, leading to the loss of expertise in this sector.

The lack of workers who withhold the critical knowledge for operation and/or internal security of nuclear power plants represent loss of the collective memory, beyond being a threat for the safe operation of the installations.

From the above-mentioned problems on the question of the nuclear knowledge preservation, this project concentrates its attention in analyzing, specifically, the problem of the lack of young engineers and technicians to replace the oldest professionals; being considered this subject an alarming situation.

According to IAEA, the aging of professionals working in the nuclear area is at around 50 years old, that is, they are very closely to enter in the retirement process (RODÍGUEZ-RUIZ, 2006). And there are no young qualified technicians to replace them.

It becomes necessary, therefore, to identify and register the essential abilities of experienced workers, through a set of methodological tools to capture this knowledge (RODÍGUEZ-RUIZ, 2006), since the specialized knowledge is, mainly, with persons and it is lost when they leave the organizations. This knowledge can be preserved, through the transmission for the new generations (STANCULESCU, 2004 apud RODÍGUEZ-RUIZ, 2006).

It is clearly, for the occurrence of the number of reports, congresses and events promoted for international organizations, as the ONU, that this is a concern that has demanded diverse initiatives in world-wide scope for knowledge retention, emphasizing the importance of politics to the nuclear knowledge preservation. This is a complex and multidimensional problem, presenting some challenges.

Considering this question, the organizations involved have used several tools, searching to obtain solutions to this problem. Among them, the Knowledge Management, in the

Information Science field, offers methodologies for the process of stimulating the creation, collection and dissemination of the knowledge, that is, for the development and administration of organization knowledge, with the purpose to achieve strategically objectives. This area, therefore, offers tools that allow the analysis of the question of the nuclear knowledge preservation.

Moreover, through the use of bibliometrical laws it becomes possible to identify the existing collapse areas and, in the literature, the methodologies that can offer solutions for this problem.

The National Nuclear Energy Commission (CNEN) is used as an empirical study in this research. CNEN, a federal autarchy attached to the Ministry of Science and Technology, besides investing in research for the development in this area, it makes efforts to participate in actions dealing with to the enlargement of the safe use of nuclear energy, bringing benefits for the population.

This study aims to contribute to the building of a model for the Brazilian nuclear knowledge preservation and, therefore, for the maintenance and innovation of existing activities in this area. It is believed that the moment is propitious for the development of actions of preservation of the acquired knowledge, so that the researches and projects can continue in progress, promoting the development of Science and Technology (C&T) area and, consequently, the quality of life of the populations in a world-wide scope.

2. JUSTIFICATION AND OBJECTIVES

It can be said that science is determined by external reasoning that can confuse or stimulate its evolution. According to Rosenberg's vision (1982 apud ALBUQUERQUE, et al., 2002, p. 227, *translation*) "the economic factors determine, to some extent, the progress of science, expressing as the technological progress precedes and stimulates the scientific progress".

Some decades ago, the Brazilian nuclear politics searched technological autonomy through great investments. The CNEN, through a Germany agreement, sponsored a Human Resource Program for the Nuclear Sector (PRONUCLEAR), for the formation of researchers and a technical staff. This program granted scholarships in Germany and Brazil, with the objective of qualifying professionals to act in the Brazilian nuclear area (SCHMIEDECKE; PORT, 2008).

However, projects as PRONUCLEAR have not been continued. However, with the Brazilian Nuclear Program (PNB) retaking, this sector lives an important and historical moment and the nuclear area tends to change. Even with adjustments to be done, some decisions had already been taken and, among them, we can underline the following ones: the retaking of Angra3 construction; construction of more 4 new nuclear power plants, in a site to be determined; construction of a definitive waste repository of low and media activity, until 2018; and, the creation of Brazilian Nuclear Regulation Agency.

The PNB retaking will bring, as consequence, the increase of the Brazilian competitiveness in a market of high technology and of great financial turnover. The beginning of the activities of the nuclear power plant Angra 3, foreseen for 2013, will enlarge the production of the nuclear industry, causing profit for the Brazilian economy. As a favorable fact to be pointed out is that

Brazil already possesses the sixth bigger world-wide reserves of Uranium (BRASIL NUCLEAR, 2007, p.3).

Who generates knowledge, possesses consequently competitive advantage and, with the PNB retaking, Brazil intends, for a long and average period, to get some conquests. The benefits for the population, already previously mentioned, will be still bigger, provided that the PNB retaking will bring a favorable environment for the innovation.

Ahead of the scenario of optimism with the PNB retaking, it is important to point out that the investments already made in this area can serve as a basis for a new scenario. In this context, the nuclear knowledge reuse will only be possible if this knowledge will be adequately captured and registered.

The preservation of the Brazilian nuclear knowledge is essential, therefore, since it allows, beyond the exchange of information, the maintenance of the services nowadays performed by CNEN technicians, in the research, education and inspection sectors. The choice of the subject of nuclear knowledge preservations is justified, therefore, for the its importance for the Science and Technology (C&T) area as a whole and specifically for CNEN, as a research, foments and nuclear regulation body.

The problem of the nuclear knowledge preservation presents many aspects, but none of them exhausts completely the subject. Even comprising several knowledge areas and involving many methodologies, it is observed a trend for solutions in conformance to Information Science field.

Even in this Science, it is possible to observe the possibility of facing the problem according some approaches. This question, due to its complexity, and involving many variables, searches solutions that can occur through the application of methodologies of several disciplines concerning Science of the Information scope.

Among the possible approaches, it can be observed: Users Studies, allowing to verify the need of information and training of the professionals; the Representation, that through conceptual maps and onthologies permitting the systematization of an area; the Knowledge Management, making possible, through a systematic process, to generate, codify and dissemination the knowledge, inside of an organization; and, the Informetrics, allowing the identification of the risk areas.

It is believed that, among the presented approaches, the Informetrics and the Knowledge Management can offer important tools to assist to equalize the problem. The Informetrics, for allowing the study of the measuring the number of publications in C&T area, can help to identify areas of risk to be extinguished. The Knowledge Management for the fact to make possible the use of the Knowledge Elicitation, with the application of techniques as, for example, verbal protocol and interviews, for the capture of the nuclear knowledge ready to be lost, allowing the maintenance and transfer of nuclear knowledge and abilities.

For definition, Information Science deals with "scientific questions and professional practices addressed to problems of effective knowledge communication and its registers among the human beings, in the social, institutional or individual context of the use and the need of information" (SARACEVIC, 1996, p .47, *translation*). In addition, “it is a discipline that investigates the properties and the behavior of the information, the forces that governing its

flow, and the ways to process it to optimize its accessibility and use" (BORKO, 1968, p. 3). The definition of this Science is directly related with the question of the knowledge preservation, so, it is believed that this research can bring contributions for the area.

The application of this study, therefore, will bring benefits to the nuclear area with a Knowledge Elicitation model. It should be mentioned that the results achieved with this research could also be used in other areas, serving as a support for the creation of politics of knowledge preservation in another area in the country, corroborating to cause benefits to the society as a whole.

Therefore, the general objective of this project is to identify methodologies to the building of a Knowledge Elicitation model for the nuclear area. And, the specific objectives are: recover and review the main national and international initiatives dealing with the problem of preserving the nuclear knowledge; review the literature in the specific area and another correlated areas; present an information model making easy the identification of risk areas of nuclear knowledge loss; contribute for the structuring of a Knowledge Elicitation model for CNEN; and, propose recommendations for politics of nuclear knowledge preservation in Brazil.

3. THEORETICAL AND CONCEPTUAL CONSIDERATIONS

Concernings the fundamentals for the execution of this research, it is noted, as already mentioned, that a theoric and practical body of knowledge has been consolidated in this area - that it is spread out for several sectors, but mainly supported by the Information Science, and that will be of great help in the confection of the work.

In relation to the theoric fundamentals, it is of great importance a revision of literature regarding the identification of quantitative methodologies and also in the area of the Knowledge Management and of Knowledge Elicitation technique, for believing that such principles will assist in the analysis of the problem.

The practical fundamentals, supported by reports of the experiences of success in organizations becomes essential, for presenting, when possible, regarding the area of nuclear knowledge preservation, the use of Knowledge Management and Knowledge Elicitation for the capture of the tacit knowledge of professionals.

Moreover, the application of quantitative methods in Information Science allows the mapping of areas of the knowledge in risk, provided that bibliometrics indicators used for researchers, admit identifying:

> the number of people receiving academic or scientific titles, the number of patents registered for scientists, the number of published scientific articles, the number of scientists who have scientific articles published, the number of cited bibliographical references in scientific articles, the citation number received for scientific article, the number of aids addressed to research received by the scientists and the amount from resources addressed to activities of research supported by agencies (TAUBES, 1993 apud SILVA; BIANCHI, 2001, *translation*).

The Bibliometrics, the Scientometrics and the Informetrics have as objective to measure scientific knowledge, however, considering different aspects. Quantitative indicators of these

areas have been widely used for the understanding of C&T dynamics, beyond being an excellent tool for the elaboration of politics and for taking of decisions (SANTOS, 2003).

On the other hand, the Knowledge Management, as previously said, will be of great value, since it allows to stimulate the creation, collection and dissemination of the knowledge. Davenport and Prusak (1998, p. 20, *translation*) affirmed a decade ago, that the organizations need "'to know what they know" and to use effectively this knowledge [...] [and that] due to the geographic dispersion of many these organizations it is especially difficult to locate the existing knowledge and to arrive close to it, when necessary".

Nonaka and Takeuchi (1997) have brought great advances for the understanding of the knowledge in the companies and the theory of knowledge creation, developed by them, is a resource for the resolution of problems in the area of Management. The success of the Japanese companies, according to the authors, is due to the capacity of organizational knowledge creation, representing the capacity of the company in creating new knowledge, spreading it in the organization and incorporating it to systems, products and services. This process respects the individual, the collective relationship and the diverse operational levels inside of a company, and is directly linked to creative and innovative results.

Data, information and knowledge are intangible assets and, if they have not been registered, can cause problems for the activities of an organization. Beyond the knowledge that "can be found in books, manuals, database, files, being easy of being codified and being transmitted", also called of explicit knowledge, it exists the technical knowledge, that is, tacit, that allows the development of technologies in the nuclear area. This knowledge is undocumented and "is generated in the intellect of each one, being specific for one determined situation. It is difficult of being codified, being the consequence of experiences" (PAULA; CIANCONI, 2007, p. 56, *translation*).

The book "Knowledge Management and E-learning in the practice", published by Terra (2003), presents 39 cases on the application of the Knowledge Management in different organizations as Caixa Econômica Federal (CEF), Brazilian Company of Agropecuary Research (EMBRAPA), Brazilian Electrical Power Plant (Eletrobras), among others companies. In the case of the EMBRAPA, the choice of the Management occurred due to the value that the knowledge and the human capital has for the company "[...] and that most important part of the human capital, the tacit knowledge, is acquired by persons" (FRESNEDA, 2003, p. 23, *translation*).

The adoption of models of Knowledge Management offers benefits, as the maximization of abilities to prevent errors; the previous perception of problems; the efficient learning through attempts and errors; and the minimization of the loss of the knowledge.

According to the purpose, the Strategic Knowledge Management seeks "to study the Elicitation, the transfer and the use of a particular kind of knowledge, searching the best understanding of the strategic knowledge" (GASPAR; MIRANDA, 2006, p. 159, *translation*). It is believed, therefore, that the Elicitation is an effective methodology for the capture of the knowledge.

The preservation of the tacit knowledge is essential provided that only 10% of the organizational knowledge can be registered (CHAKRABORTY, 2003 apud RODRÍGUEZ-

RUIZ, 2006, p. 5). It becomes necessary to meet ways for the capture of nuclear knowledge capable of disappearing.

The Knowledge Elicitation is an interesting resource that has being used for the companies. In the sector of nuclear energy, the expression "Elicitation" means to extract the knowledge of sources where the knowledge is stored (RODRÍGUEZ-RUIZ, 2006). According to the author

> It is clearly that the nuclear industry has conducted important researches in the reactors area in the last 50 years. Most of this knowledge is tacit and is a risk to lose this knowledge with the retirement of experienced professionals (RODRÍGUEZ-RUIZ, 2006, p. 2, *translation*).

According to Cordingley (apud GASPAR; MIRANDA, 2006), the Knowledge Elicitation represents a stage of knowledge acquirement, a process of "extraction and formalization of the knowledge of an expert to be used in a specialist system". This process is divided in three steps:

> a) the decision of which knowledge is necessary, what it is equivalent to the stage of definition or initial knowledge analysis; b) knowledge elicitation, corresponding to the stage of knowledge attainment from specialists, mainly, and the interpretation of this knowledge; c) representation of the knowledge, the final stage of knowledge codification in the internal language of the system (CORDINGLEY apud GASPAR; MIRANDA, 2006, p. 397, *translation*).

On the other hand, the authors Carvalho and Castro (2004, p. 5, *translation*), affirm that the Elicitation, that consists of the selection and capture, is a phase of the Stage of Capture and of the Knowledge Creation and has for objective "to know the better organizational dynamics, to identify necessities, from consultation to the representatives of each group of users [...], documents of the domain, knowledge of the domain and market research". It can be observed that the term "Elicitation" possess different concepts and an analysis will be made to identify which concept is appropriate in the objective considered in this project.

Considering Rodríguez-Ruiz (2006) article, some techniques of knowledge retention can be studied and applied, through: the structuralized process of interview and documentation of the experience of older specialists; verbal protocol (that it consists of gathering the experiences and thoughts of the oldest professionals); strategic planning before the retirement of the employees; and the establishment of relationship with advisers, allowing that less experienced employees work under the supervision of older ones.

According to IAEA (2006), a good program for the preservation of the nuclear knowledge must present: the planning of the work force, initiatives of recruitment, programs of training, plans of succession and development of leaderships and the Knowledge Management.

Some experiences, mentioned below, have proved that Knowledge Management and Knowledge Elicitation actions can help in the question of nuclear knowledge preservation. Among the main experiences have to be mentioned: the Thermonuclear (Eletronuclear), Electricité de France, British Nuclear Fuel and Tennessee Valley Authority. This latter, was a successfully project implanted in the United States that consists of three steps for the identification of the risk factor: 1. conduct of risk assessment, 2. plan's determination and implementation, and 3. monitoring and evolution (IAEA, 2006).

The project of the Tennesse Valley Authority has been also considered, by Rodríguez-Ruiz (2006), as the most important project of knowledge retention. This institution has developed

and co-coordinated a process to identify and to capture the undocumented knowledge of the employees quite ready to be retired. This process has allowed to the identification knowledge and abilities at risk. The areas where risk of loss of knowledge is immediate have been investigated. Moreover, what would be the cost (necessary effort and time) and viability to recover knowledge and lost abilities.

Another interesting experience has been reported in Rodríguez-Ruiz article (2006), that is the presentation of a matrix for the retention of the nuclear knowledge, using, as tool, the Knowledge Management. This matrix is specifically projected to identify and to hold back the key knowledge, in this specific case, the electric power plants knowledge. The main areas of knowledge are defined, in the same way, the probable calculation of the loss of knowledge and the implementation of practices of retention.

In the above-mentioned experience, it can be verified that the knowledge to be restrained is classified in accordance with its nature (tacit, explicit, abstract and practical). It is important to detach that employees of diverse levels in the organizations possess different visions in relation to the company where they work. Therefore, the matrix considers all the knowledge agents. It is necessary to make the fusion of interpersonal and cognitive abilities of the different groups, so that, the tacit knowledge can be recovered.

Another project that must be pointed out is the Tacit Knowledge Elicitation of Electric Power Research Institute (EPRI). This project was structuralized in two phases. In the first one, the sources of tacit knowledge have been identified. In the second phase, the objective was to make the knowledge to emerge. Several techniques of Elicitation, as cognitive analysis, critical incidents, protocols of voice and simulation, have been developed.

The EPRI's Report Guidelines for Capturing Valuable Undocumented Knowledge for Energy Industry Personnel is an initiative that presents results of projects of Knowledge Elicitation specialized in the sector. Many organizations are interested in the initiative of the EPRI's and one of them is the Brazilian Eletronuclear Enterprise, which has developed an initiative based on this program (RODRÍGUEZ-RUIZ, 2006, p. 7).

The NASA Glenn Research Center project is also considered a successful case. Six engineers, all of them prepared to be retired, have taken part of a project that resulted in an organized model of the knowledge, that has being used for training new employees (COFFEY; ESKRIDGE; SANCHEZ, 2004).

Consequently, programs of knowledge retention need to be initiated with the objective to capture and to understand the professional's abilities. And so, be careful about the necessary training to replace engineers and scientists who are being retired and for capturing the best practices and valuable undocumented before being lost (COFFEY; ESKRIDGE; SANCHEZ, 2004, p. 1). There are some techniques for tacit knowledge acquirement, like Brainstorming, among others.

In the end of the IAEA's Management Report (2006), there are a strategical boarding and a plan of action guiding the organizations addressed to invest in planning of capture of knowledge, consisting of: Guidelines for knowledge retention; Guide of knowledge risk identification; Plan of knowledge retention, with examples of plans of knowledge retention for engineers; and, self-valuation of the employees as process for knowledge retention.

Thus, it is believed that the Knowledge Elicitation can assist in the capture of undocumented knowledge and, consequently, in the creation of politics for the preservation of the nuclear knowledge.

4. METHODOLOGY

The methodological procedures are divided in the following steps:

4.1. Contextualization of the problem

As a first step, the ratification of the problem consists of the presentation of official documents, that point out to the world-wide crisis of the knowledge in the nuclear area, as it has been already previously mentioned, as the International Atomic Energy Agency (IAEA), Organization for Economic Co-operation and Development (OCDE) and Nuclear Energy Agency (NEA) reports.

4.2. Revision of literature

Considering the postulations upon which the presented problem is based and the proposed objectives, a revision of literature, of the specific area and similar areas will be carried out, searching to present and to conceptualize the subject.

4.3. Survey and analysis of the actions adopted in the Knowledge Management area

This survey aims at to get information on the strategies adopted in the area of Knowledge Management for the capture of the tacit knowledge. Recently, programs of retention of the knowledge have been implemented with the intention to detect the necessary abilities for the replacement of specialized professionals. The Knowledge Elicitation appears as alternative for the capture of practical and undocumented knowledge, before being lost forever.

4.4. Revision of the main national and international initiatives

The main national and international initiatives are searching for to review the problem of the preservation of the nuclear knowledge, revisiting the experiences of institutions that have used methodologies for the knowledge capture. It is intended to analyze the need of companies, through visits, and the confirmation of the importance of the capture of undocumented knowledge.

4.5. Identification of the knowledge areas at risk

With the intention to facilitate the identification of knowledge areas at risk in CNEN, an information model will be developed. The Informetrics, as theoretical basis, will be taken for measuring the intensity of knowledge in the nuclear area, based upon: the Lattes Platform (professionals and research groups); CNEN human resources, for identification of the technicians in process to be retired; the professional profiles of the Selective dissemination of information service, of the Nuclear Center of Information (CIN/CNEN); and other sources to be identified during the research process.

4.6. Contributions for the structuring of a Knowledge Elicitation model

Concerning CNEN, aiming at to contribute for the structuring of a Knowledge Elicitation model, methodologies, manuals and applied practices of Knowledge Elicitation will be reviewed, in a national and international level, searching for the identification of tools for the construction of a nuclear Elicitation Knowledge model. This will occur through the development of an archetype for the capture of this knowledge, taking into account empirical tests applied, as interviews.

4.7. Proposal for politics of nuclear knowledge preservation

Finally, after the result obtained by the above mentioned research and with the purpose of assisting futures investments in this area and other areas of knowledge, recommendations for politics of preserving nuclear knowledge in the country will be proposed, giving importance to the question of the knowledge transfer for the next generations.

5. CONCLUSIONS

The tacit knowledge of professionals in the nuclear area allows to the maintenance of activities and the development of new technologies, bringing many benefits to the society. However, it is evident there is a collapse in the generation, transmission and sharing of nuclear knowledge.

There are many reasons. Among them, it is the problem of the retirement of specialists, without transferring its knowledge to young researchers. The project seeks to identify the essential skills and risk areas of nuclear knowledge loss.

As a result, expected a model that makes possible the capture and register of this knowledge, being this, therefore, a model for the Brazilian nuclear knowledge preservation.

Thus, this study seeks to cooperate for the maintenance and innovation of the activities in this area, and, therefore, may be used in other areas, thereby, serving as a support for the creation of politics of knowledge preservation in several other areas of knowledge.

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