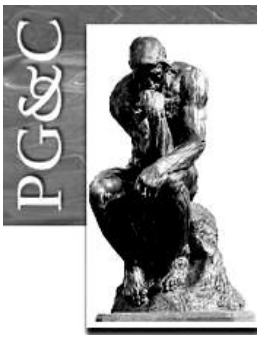

KNOWLEDGE MANAGEMENT AT EMBRAPA: SHARING OUR EXPERIENCE ON THE BUILDING OF A COLLABORATIVE MODEL[1]

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Abstract
This paper investigates and analyses the process of building a knowledge management (KM) model at Brazil's Embrapa (The Brazilian Agricultural Research Corporation). Embrapa is a world class knowledge organization whose mission is to provide feasible solutions for the sustainable development of Brazilian agribusiness through knowledge and technology generation and transfer. The qualitative research strategy used was the study of a single case with incorporated units of analysis and two criteria were observed for the judgment of the quality of the research project: validity of the construct and reliability. Multiple sources of evidence were used and data analysis consisted of three flows of activities: data reduction, data displays and conclusion drawing/verification. The results revealed a robust KM model made of four dynamic axes: (i) strategy (a strategic conception of information and knowledge use), (ii) environment - four different groups of enabling conditions (social-behavioral, information/communication, cognitive/epistemic and business/managerial), sine qua non conditions for successful implementation, (iii) tool box – sets of IT tools and managerial practices and (iv) results – in terms of outputs, being both tangible and intangible assets. The conclusions suggest that a collaborative building of a KM model in a diverse and geographically dispersed organization is more likely to succeed than one that is build and implemented from the top-down perspective. Embrapa's KM Model is more inclined to be a knowledge-based view of organization than merely a KM model. Limitations of the study and suggestions for future research are also discussed.

Keywords: knowledge management. enabling contexts. knowledge-based view of organizations. The SET KM model. Ba. Embrapa.

1 INTRODUCTION

Knowledge creation is a fragile organizational process, particularly towards the nature of knowledge itself: fluid, dynamic, intangible, tacit and explicit, embodied in individual and groups, socially constructed, and constrained by individual and organizational barriers (VON KROGH et al. 1997, 2000). In this paper, knowledge is approached through a constructionist perspective, as human cognition is not an act of representation and not just a machine for information processing and logical reasoning. In the constructionist perspective, cognition is an act of construction and creation (MATURANA; VARELA, 1987), as well as knowledge is tacit,

[1]A first version of this text was published in at the Electronic Journal of Knowledge Management, 2011.

explicit and cultural (CHOO, 1998). Knowledge resides in one's cognition as well as in between creative heads with synergetic purposes (ALVARENGA NETO, 2005, 2008).

Organizational knowledge creation is generally associated with KM, which is a controversial, complex and multifaceted subject. In spite of the fact that the term (KM) is not yet stable, there's been a growing interest worldwide within the past two decades - from academics to practitioners - in the management of organizational knowledge and its related topics, such as "organizational epistemology" (TSOUKAS,2005), "knowledge creation processes" (CHOO,1998), "knowledge-based theory of the firm" (NONAKA et al.,2006), "enabling context and conditions" (VON KROGH et al., 2000)", "knowledge types" (BLACKLER, 1995), "knowledge assets" (BOISOT, 1998), "knowledge taxonomies" (ALAVI; LEIDNER, 2001), and "KM Implementation" (ALVARENGA NETO et.al, 2009), among others.

In our studies within the last ten years, concerning the management of knowledge in world-class organizations, similar topics and approaches have been discussed, but above all, we've stressed out four main concerns: (i) a long standing misinterpretation that considers KM and information management (IM) as synonyms. We shall call this "information reductionism", as the "map is not the territory" (TSOUKAS, 2005). IM is just one of the components of KM, as KM also incorporates concerns as to the creation, sharing and enabling context/conditions for organizational knowledge creation; (ii) a long overlooked topic in the KM literature: KM implementation processes (ALVARENGA NETO et al., 2009); (iii) an empirically under-explored concept: "the concept of ba" or "enabling context", the ontological platform for knowledge creation (ALVARENGA NETO; CHOO, 2010); and finally, (iv) organizational KM models and the processes of building them.

As we tried to address the first three issues at the past ICICKM conferences since 2006, we decided to move on and focus our attention on organizational KM models and the processes of building them. What KM models are organizations using? How solid is their theoretical/conceptual backgrounds? Most important, how are the processes of building KM models being conducted? Is it a collective process or an imposition from the top-down perspective? Are we talking about KM Models or about "Knowledge Based View of Organizations"? What can we learn from the "Knowledge Based Views of the Firm"? On that ground, as we can't answer all of the questions above, our main objective in this paper is to investigate and analyze the process of building a KM model in a world-class organization. For this purpose, we have chosen Brazil's Embrapa - The Brazilian Agricultural Research Corporation. Embrapa is a world class knowledge organization whose mission is to provide feasible solutions for the sustainable development of Brazilian agribusiness through knowledge and technology generation and transfer. Embrapa faces the problem of being a knowledge-intensive organization, whose units are complex, diverse and geographically dispersed over the Brazilian territory. The problems faced are well known, as they seem to be widely discussed in the literature: huge knowledge loss over time, inability to locate knowledge, constant re-invention of the wheel, duplication of efforts, rising costs, among others. For this reason, Embrapa's top-administration wanted to think about organizational epistemology and, thereafter, build its own KM model with full awareness of its identity, culture, history and peculiarities.

The psychologist George Miller (1956) in his famous article "*The Magic Number Seven Plus or Minus Two: Some Limits in Our Capacity for Processing Information*" suggested the inclination human beings have to classify things into seven due to the fact that this magic number reflects the chunks of information we are able to store in our short-term memories. We too, somehow, serendipitously, ended up in this paper with such a "*pernicious Pythagorean coincidence*" (MINTZBERG, 1989), as it is structured around Miller's magical number: (i) this introduction, (ii) a theoretical/conceptual framework for KM - based on the "SET KM Model" (ALVARENGA NETO, 2005, 2008; ALVARENGA NETO et. al, 2009) and

"Knowledge Based Views of Organizations" (GRANT, 1996; NONAKA et al., 2006) – which were utilized as starting points for the constitution of think-tanks within Embrapa, (iii) the study's approach and methodology, (iv) results, (v) conclusions and (vi) references. The results shall be presented in the lines below.

2 A THEORETICAL/CONCEPTUAL FRAMEWORK FOR KM

The theoretical/conceptual frameworks considered in this paper are based on two complementary perspectives, that is to say: (2.1) the "SET KM Model" (ALVARENGA NETO, 2005, 2008; ALVARENGA NETO et al., 2009) and (2.2) "Knowledge Based Views of Organizations" (GRANT, 1996; NONAKA et. al, 2006) – which were utilized as starting points for the constitution of think-tanks within Embrapa. We are fully aware of the many different perspectives presented by different authors pursuing knowledge–based views of organizations, such as Grant (1996), Teece and Pisano (1994), Prahalad and Hamel (1990) and Nonaka et al. (2000, 2002, 2006), but we have also learnt from Scott (2003) that we should combine different perspectives in building our own models and views of the world. Therefore, by utilizing and integrating different concepts – such as ba/enabling context, enabling conditions, the three axes of strategy-context-tool box, common knowledge, knowledge integration, knowledge vision and incentives, among others – we were able to revisit the literature in a comprehensive way to what the state of art is. We'll explore each in the lines below, before discussing the methodology used.

2.1 The "SET KM Model" as a dynamic model to unify the trinity of strategy (knowledge vision) - environment (enabling context) - toolbox (action)

Alvarenga Neto (2005, 2008), Souza and Alvarenga Neto (2003) and Alvarenga Neto, Souza, Barbosa and Neves (2008) proposed a KM integrative conceptual mapping proposition as a result of their researches of multiple case studies in world class organization within the past decade. The multiple case studies involved KM initiatives of 23 international firms, such as 3M, Dow Chemical, Xerox, PricewaterhouseCoopers, Siemens, CTC (Sugarcane Technology Center), Ernst & Young, British Telecom, Microsoft, Novartis and Chevron, among others. This so called "KM Integrative Conceptual Mapping Proposition" was further developed by one of the authors within his work at Fundação Dom Cabral – a Brazilian business school - into a comprehensive KM model used as theoretical framework for executive education and consulting services in many different best-in-class organizations within the Brazilian organizational context such as Embrapa, Anglo America, Mittal Steel, Astra Zeneca, the Linde Group, NEC, Petrobras, Prosegur, Santander- ABN Amro Bank and local state governments, among others. Henceforth, this model is entitled 'the SET KM Model", a dynamic model to drive the KM strategy into action by unifying the trinity (i)**S**trategy (knowledge vision, knowledge as a potential to act and knowledge as a commitment to act), (ii)**E**nvironment (the enabling context for knowledge creation, hereafter "ba") and (iii) Toolbox (the IT tools and managerial practices used to drive the organizational knowledge strategy into action).

As mentioned above, the SET KM Model is grounded on three basic conceptions, as for now explained in details, that is to say: (i)Strategy – a strategic conception of organizational information and knowledge, as proposed by Choo (1998) in his "Knowing Organization Model"; (ii) Environment - the creation of an enabling context or "ba" - the "shared contexts in motion" where organizational knowledge is created, shared and utilized - plus the enabling conditions that should be provided by the organizations to energize and support its different ba types (care, trust, commitment, lenience in judgment, tolerance to 'honest mistakes', openness to multiple and conflicting mind-sets, etc.) as suggested by Nonaka and Konno

(1998), Von Krogh et al. (2000) and Alvarenga Neto (2005, 2008); (iii)Toolbox - the provision of IT tools and managerial practices/processes to drive the strategy into action: intranets, portals, information systems, processes for information management, "yellow pages", best practices repositories, places for face-to-face interaction, front line contact with customers and other external environment's actors, informal circles, storytelling, communities of practice, OJT and other practices of organizational learning, among others.

These three conceptions will be thoroughly discussed below:

2.2 The SET KM Model Part I: a strategic conception for information and knowledge use in organizations

Choo (1998) asserts that the "knowing organizations" are those which use information strategically in the context of three arenas, namely, (a) sense making, (b) knowledge creation and (c) decision making. These three highly interconnected processes play a strategic role as to the unfoldment of the organization's knowledge vision, it's potential to knowledge creation and its commitment into taking knowledge creation to the utmost consequences. Concerning (a) Sense making, its long term goal is the warranty that organizations will adapt and continue to prosper in a dynamic and complex environment through activities of prospecting and interpretation of relevant information enabling it to understand changes, trends and scenarios about clients, suppliers, competitors and other external environment actors. Organizations face issues such as the reduction of uncertainty and the management of ambiguity. (b) Knowledge creation is a process that allows an organization to create or acquire, organize and process information in order to generate new knowledge through organizational learning. The new knowledge generated, in its turn, allows the organization to develop new abilities and capabilities, create new products and new services, improve the existing ones and redesign its organizational processes. This process reveals the organization's "potential to act".

The third component of Choo's (1998) model involves (c) decision-making. The organization must choose the best option among those that are plausible and presented and pursue it based on the organization's strategy. Decision making process in organizations is constrained by the bounded rationality principle, as advocated by March and Simon (1975). Many inferences can be made upon the decision making theory, Choo (1998) lists a few of them: (i) the decision making process is driven by the search for alternatives that are satisfactory or good enough, rather than seeking for the optimal solution; (ii) the choice of one single alternative implies in giving up the remaining ones and concomitantly in the emergence of trade-offs or costs of opportunity; (iii) a completely rational decision would require information beyond the capability of the organization to collect, and information processing beyond the human capacity to execute. The decision-making process results in the organization commitment for action.

It's imperative to take Choo's (1998) strategic conception of the Knowing Organization model and place it in the context of organizational levels/structure as a way to incorporate it into organizational KM (or KM Models, such as the "SET KM Model" presented here) as shown in FIGURE 1 at the end of this section.

Knowing what to do is not enough (PFEFFER; SUTTON, 2000) as the firm must turn its knowledge into action. As one can note in Figure 1, the tactical level "stands/sits" in between the strategic and operational levels. Our argument here is that in between the strategic intentions and visions of top-management, and the chaotic reality of operational level workers, the role of leadership in the tactical level is to create an environment that not only enables, but mainly energizes the creation and sharing of organizational knowledge. Hereafter, the environmental conditions may be translated into the Japanese concept of ba (NONAKA; KONNO, 1998; NONAKA et al., 2006). Therefore, ba is the bridge that links strategy to action

and this re-defines the role of leadership of middle-managers in the means of knowledge enablers or knowledge activists. This conception will be discussed as part II of "the SET KM Model"

2.3 The SET KM Model Part II: "Environment"- the creation of ba or/and an enabling context for organizational knowledge creation and sharing

The concept of ba was first introduced in the management literature by Nonaka and Konno (1998) and further developed and enhanced until Nonaka's et al. (2006) inclusion of the concept into a comprehensive, yet contested (TSOUKAS, 2005; SNOWDEN, 2003), knowledge-based theory of the firm. We argue that knowledge without a context is meaningless. Knowledge needs a context to be created and this context is ba. According to Nonaka et al. (2006), ba is defined as a shared context in motion in which knowledge is created, shared and utilized; it can be physical (office space, dispersed business unit), and/or virtual (e-mail, videoconference) and/or mental (shared ideals and ideas); it can emerge in individuals, working groups, project teams, informal circles and front-line contact with customers; there are four types of ba (originating, interacting or dialoguing, cyber or systemizing, exercising) each of which corresponding to each one of Nonaka and Takeuchi's (1995) SECI model of knowledge creation.

To the concept of ba, knowledge activists should add the enabling conditions (e.g., care, trust, commitment, lenience in judgment, tolerance to 'honest mistakes', manage conversations, among others) that must be provided by the organization to energize and support its different types of ba. It's a *sine qua non* condition to highlight the fact that "ba" and enabling conditions" are not synonyms, but rather complementary concepts. The different types of ba need different types/combinations of enabling conditions. The creation of organizational knowledge is, in fact, the augmentation of knowledge created by individuals, once fulfilled the contextual conditions that should be supplied or enabled by the organization. This is what Von Krogh, et al. (2000) call"enabling conditions" for knowledge creation and sharing. Alvarenga Neto's (2005, 2008) definition of "enabling context" mirrors von Krogh's et al. (2001) and Nonaka's et al. (2006) conceptions:

> […]the propitious conditions created by the organization in order to favour, stimulate and reward sharing, learning, upcoming of new ideas and innovation, tolerance to "honest mistakes" and collaborative problem solving (ALVARENGA NETO, 2005, 2008).

It's Alvarenga Neto's (2008) argument that "ba" and "enabling conditions" are needed in the tactical level – and achieved through middle-managers' leadership - in order to bridge the existing gap between strategy and action. In this context, the understanding of the word "management" when associated with the word "knowledge" should not mean control, but promotion of activities of knowledge creation and sharing in the organizational space. Hence, KM assumes a new hermeneutic perspective – from knowledge as a resource to knowledge as a capability, from knowledge management to a management towards the context where knowledge emerges and is socially constructed. Nonaka and Takeuchi (1995) and Von Krogh et. al (2000) also list other elements that shape the enabling context, namely: creative chaos, redundancy, layout, organizational culture and human behavior, leadership, intention or vision of future and empowerment, not to mention organizational structure and layout, among others.

In a recent publication, Alvarenga Neto and Choo (2010) explored the development of the concept of "ba" in a number of disciplines in order to understand its theoretical evolution

and practical application. Their results point out to the identification of four major groups of enabling conditions – social/behavioral, cognitive/epistemic, informational and business/managerial - which can be singly or freely combined into different knowledge processes – creation, sharing/transfer and use – occurring in different levels of interactions – individual, group, organizational and inter-organizational. Based on these results, Alvarenga Neto and Choo (2010) proposed a decision cube in the form of a framework for designing enabling contexts in knowledge organizations. Their work enhanced our conception of ba or enabling context.

2.4 The SET KM Model Part III: "Toolbox"- the provision of IT tools and managerial practices/processes to drive the organizational knowledge strategy into action

Last but not least, the "toolbox" metaphor assumes that knowledge workers need managerial practices/processes and IT tools to leverage the knowledge that exists solely in one's cognition and "in the magic space" between creative heads in synergy of purposes and action. We advocate that out of people's heads and out of a context (ba), knowledge is not only meaningless, but also equaled to information. KM encompasses in its aegis many themes, managerial approaches/processes/practices and IT tools that concern the use of information and knowledge in the daily activities of the knowing organization. Alvarenga Neto (2005, 2008) highlights a few of these processes and tools encompassed under KM initiative/processes in the firms considered in his studies, which he named the "KM Umbrella Metaphor": 'strategic information management', 'IT', 'intellectual capital', 'organizational learning', 'competitive intelligence', 'communities of practice', among others. These knowledge tools in a knowledge toolbox are orchestrated – solo and collectively – in the daily and creative routines of firms committed to the management of knowledge. The use and emphasis will vary depending on directions provided by the strategic level and coordinated/enabled by middle-managers in the tactical level. For example, if an organization focuses its strategy in the sense making arena - in order to collect and interpret information concerning the different actors of the external environment - it can rely – at the operational level – in specific tools for achieving action coordination, such as competitive intelligence or market research. The same thing applies when the firm focuses on the strategic arena of knowledge creation – communities of practice and spaces/approaches to organizational learning practices are tools that drive the strategic concept "knowledge creation" into action. It's exactly the interrelation and permeability between those many themes that enable and delimitate the upbringing of a possible theoretical framework which can be entitled "the SET KM Model".

Figure 1 illustrates the "SET KM Model" as a multifaceted organizational process that involves (i) a strategy, (b) the creation of an organizational environment or space for knowledge - known as the "enabling context" or the Japanese concept of "ba" - which in its turn is quintessential to bridge the gap between organizational strategy and organizational action and (iii) an operational/action toolbox consisting of IT tools and managerial practices to effectively put the strategy into action. Hereafter, we'll substitute the tactical level for "environment" and the operational level for "toolbox":

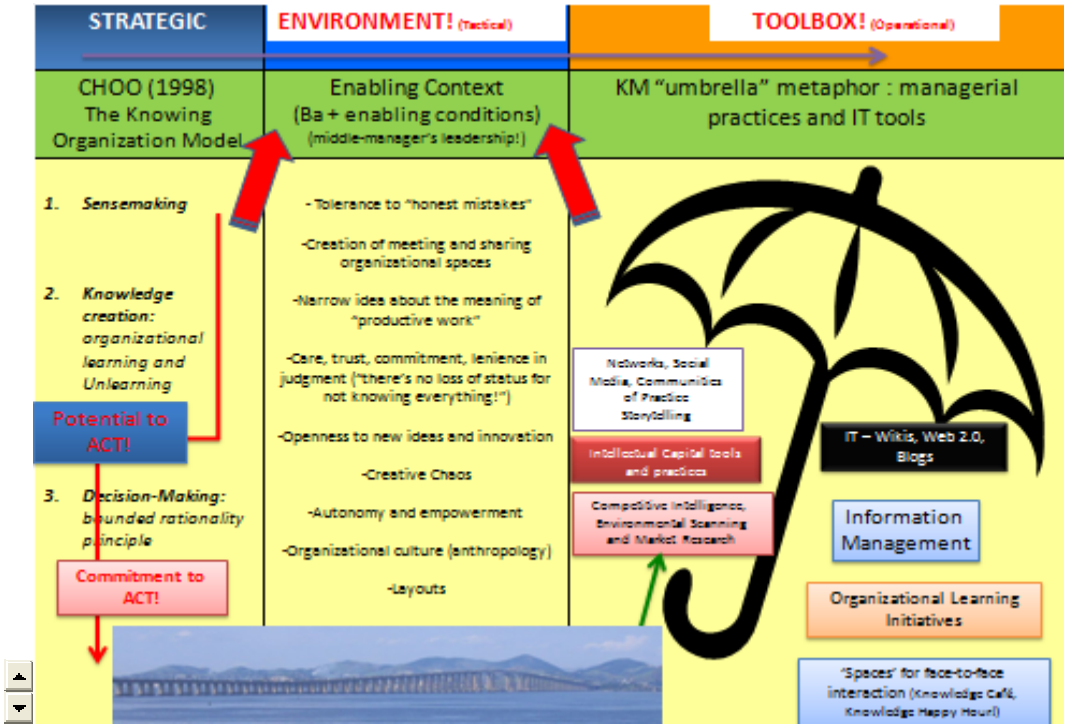

Figure 1 – The SET KM Model
Source: Alvarenga Neto (2008)

Figure 2 updates Alvarenga Neto's (2005, 2008) original "SET KM Model" to enhance the concept of ba into four groups of enabling conditions, going beyond the social-behavioral aspects, as proposed by Alvarenga Neto and Choo (2010).

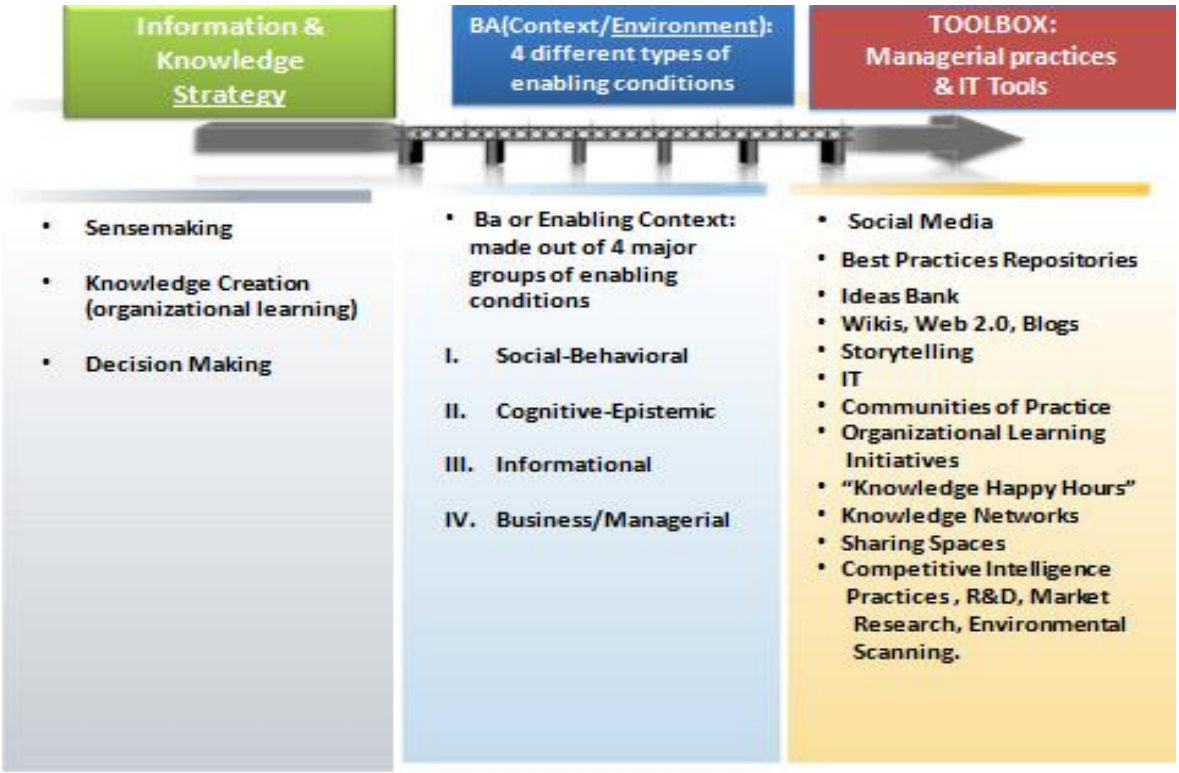

Figure 2: The SET KM Model updated based on Alvarenga Neto & Choo's (2009)
Source: Adapted by Alvarenga Neto and Choo (2010)

3 KNOWLEDGE BASED-VIEW OF ORGANIZATIONS

Grant (1996) suggests that a firm is conceptualized as an institution for integrating knowledge. Therefore, he explores the coordination mechanisms through which firms integrate the specialist knowledge of their members. In clear contrast to earlier literature – including Nonaka's – knowledge is viewed as residing within the individual, and the primary role of the organization is knowledge application rather than knowledge creation (Grant, 1996). Grant (1996) also suggests four integrating mechanisms for integrating specialized knowledge: (i) rules and directives, (ii) sequencing, (iii) routines and (iv) group problem solving and decision making. Although these four mechanisms for knowledge integration are necessitated by the differentiation of individual's stock of knowledge, Grant (1996) affirms that they all depend upon the existence of common knowledge for their operation. Different types of common knowledge fulfill different roles in knowledge integration, e.g. language and other forms of symbolic conversations, shared meaning and recognition of individual knowledge domains, among others. There's a strong link here between Grant's view and one major group of enabling contexts – cognitive/epistemic - identified by Alvarenga Neto and Choo (2010).

Nonaka's et al. (2000, 2002, 2006) propositions for a dynamic organizational knowledge creation theory are synthesized in Figure 3, where ba or enabling context is one of the components of each:

> […] Organizational Knowledge Creation is defined as the process of making available and amplifying knowledge created by individuals as well as crystallizing and connecting it to an organization's knowledge system. […] Organizational Knowledge Creation Theory proposes concepts and relationships regarding organizational enabling conditions and ba, organizational forms, as well as leadership that explain the conundrum of firm differences, and hence provide the building blocks of a knowledge-based theory of the firm. Due to the inter-subjective nature of knowledge, firms differ because organizational knowledge creation gives rise to unique organizational knowledge systems (NONAKA et al., 2006).

Nonaka et al. (2000) enhanced the idea of ba proposed by Nonaka and Konno (1998) in order to understand the dynamic process in which an organization creates, maintains and exploits knowledge. For this, they proposed a model of knowledge creationconsisting of three elements: (i) the SECI Process, (ii) 'ba'- the shared context in motion for knowledge creation and (iii) knowledge assets. Appending to Nonaka and Konno (1998), they assert that knowledge needs a context to be created, since "*there's no creation without place*":

> […] in knowledge creation, generation and regeneration of ba is the key, as ba provides the energy, quality and place to perform the individual conversions and to move along the knowledge spiral. […] knowledge is created through the interactions amongst individuals or between individuals and their environments. […] ba is the context shared by those who participate in ba. […] ba is the place where information is interpreted to become knowledge (NONAKA et al., 2000)

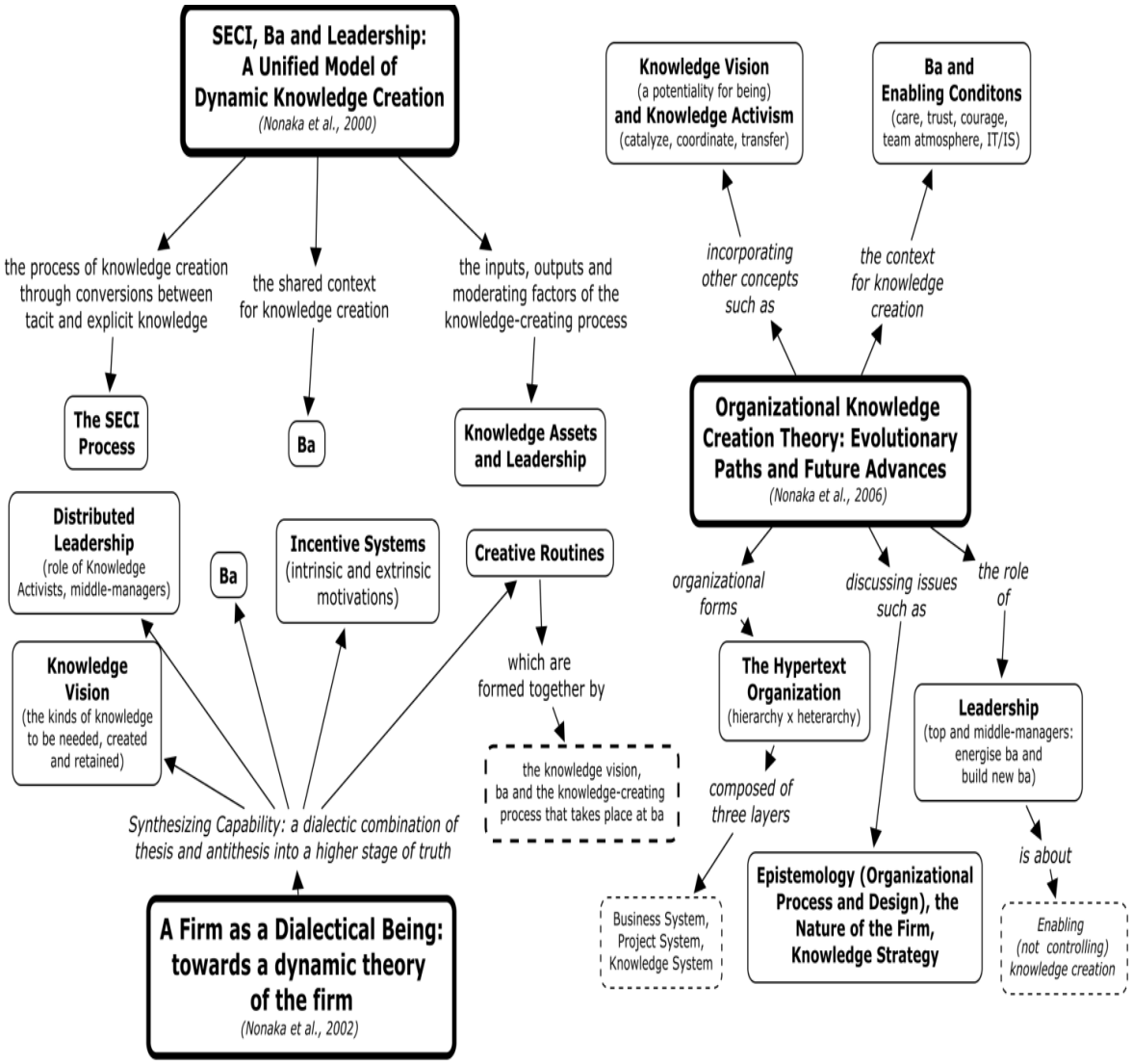

Figure 3 - Synthesis of Nonaka's et al. (2000, 2002, 2006) propositions towards a knowledge-based theory of the firm
Source: Adapted by the authors

According to Nonaka et al. (2006), the context for knowledge creation is ba and a central purpose of organizational knowledge creating theory is to identify conditions enabling knowledge creation in order to improve innovation and learning. Alvarenga Neto & Choo (2010) revisited the post concept of ba, as discussed in the lines above, to analyze and discus the development of the concept of "ba" in a number of disciplines in order to understand its theoretical evolution and practical application. Their findings suggest the emergence of five major categories as ways of grouping their research findings, namely: (i) conceptual/theoretical: where the concept of ba was used for – or as a basis of/part of - new conceptual or theoretical propositions/ discussions; or papers where further theoretical and empirical support was proposed to the concept of ba by Nonaka and colleagues; (ii) social/behavioral: related to norms and values that guides interactions and relationships, such as trust, care, empathy, attentive enquiry and "tolerance to "honest mistakes", among others; (iii) cognitive/epistemic: related to common knowledge or shared epistemic values and commitments; (iv) informational: regarding IM (information management), IT (information technology) and IS (information systems), as well as information/communication processes,

and (iv) business/managerial: related to general organizational issues, such as strategy, processes, structure, support, resources and organizational culture, among others.

We found this literature review to be satisficing for the establishment of think-tanks within Embrapa. As far as it goes, this review served as a starting point for the development of a reasonable repertoire within Embrapa's employees.

4 Methodology

The qualitative research strategy used was the study of a single case with incorporated units of analysis and two criteria were observed for the judgment of the quality of the research project: validity of the construct and reliability. Multiple sources of evidence were used – semi-structured interviews, documental analysis and direct/participant observation - and data analysis consisted of three flows of activities: data reduction, data displays and conclusion drawing/verification (EISENHARDT, 1989, MILES; HUBERMAN, 1994).

Figure 4 represents Embrapa's organizational structure.

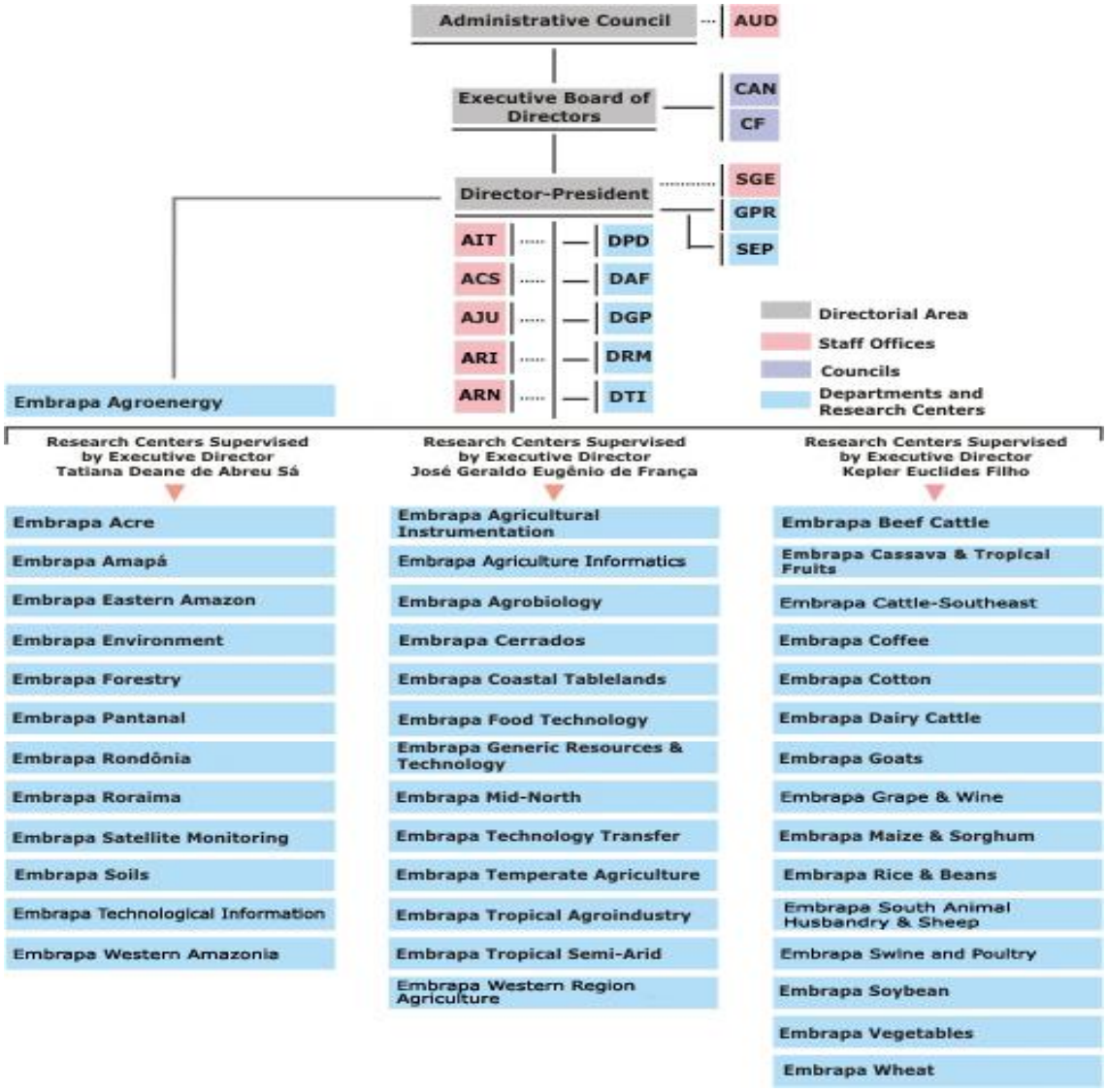

Figure 4 - Embrapa's organizational structure
Source: www.embrapa.braccess

Embrapa's mission is to provide feasible solutions for the sustainable development of Brazilian agribusiness through knowledge and technology generation and transfer:

> […] From the very beginning, on April 26, 1973, Embrapa has generated and recommended more than nine thousand technologies for Brazilian agriculture, reduced production costs and helped Brazil to increase the offer of food while, at the same time, conserving natural resources and the environment and diminishing external dependence on technologies, basic products and genetic materials. Networking through 38 Research Centers, 3 Service Centers and 13 Central Divisions, Embrapa is present in almost all the states of the Union, each with its own ecological conditions. There are 8,275 employees in Embrapa, of which 2,113 are researchers, 25% with master's degrees and 74% with doctoral degrees. Embrapa coordinates the National Agricultural Research System, which includes most public and private entities involved in agricultural research in the country. Embrapa maintains projects in International Cooperation in order to perfect knowledge of technical and scientific activities or to share knowledge and technology with other countries (EMBRAPA).

Embrapa's headquarters is located in Brazil's capital, Brasília, as show in Figure 5:

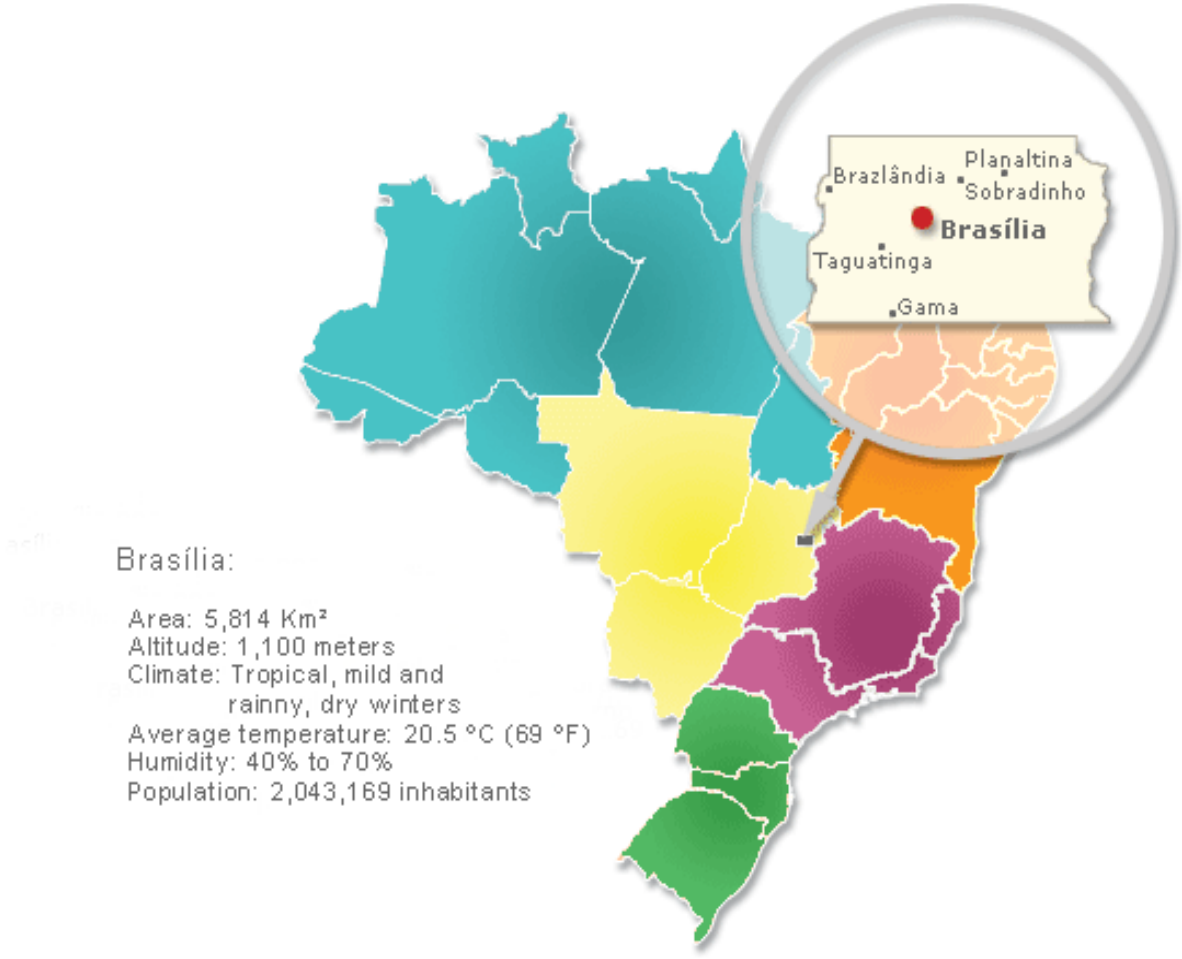

Figure 5 - Embrapa's Headquarters.
Source: www.embrapa.br

Further documental analysis was helpful to understand the role and responsibilities of Embrapa's Board of Directors and Central Divisions, as well as the organization's sensemaking as to what they call "The Great Brazilian National Challenges in Agriculture":

> The Board of Directors and the Central Divisions, located at Headquarters, are responsible for the management of the Institution, which include planning, supervising, coordinating and controlling the activities related to agricultural research and agricultural policies. […] The Great Brazilian National Challenges in Agriculture: Research and Development (R & D) strategic projects conducted a multiinstitutional complex array, requiring a high volume of resources are the main features of the projects that compose the Macroprogram[2] 1 Great National Challenges portfolio, as part of the Brazilian Corporation for Research in Agriculture (Embrapa) System of Project Management (SEG).The SEG was designed to provide the necessary tools to manage the whole life cycle of R & D Projects, as they are: planning, financial resources release, conduction, follow ups and final evaluation. It also provides Embrapa with a better organizational flexibility and transparence in generating technology.The induction and financement of R & D projects occur throught the MacroPrograms (MP) with the purpose to compose and manage a strategic portfolio of projects of high technical and scientific quality, in order to accomplish the institutional goals.We present in this folders' portfolio, the 18 Projects of MP1, representing the greatest themes into the brazilian research scenary, capable to induce the establishment of large research nets. Each one of these projects comprises from 120 to 550 researchers from Embrapa and collaborating institutes. The research nets are clearly enhancing, in a very organized way, the scientific knowledge in agriculture (EMBRAPA).

Macroprogram 1 is composed of 18 projects – listed below - and the description of their strategy, objectives, highlights and impacts are publicly available at Embrapa's *website*:

a. Precision in agriculture
b. Environmental services in agricultural landscapes
c. Alternative agroenergy
d. Functional foods – adding value to health promoting foods important to brazilian agribusiness
e. Technologies for aquaculture
f. BioSeg: biosafety on GM crops
g. High quality beef
h. Science and technology for organic agriculture
i. Conserving the national genetic resources of Brazil
j. Creating tools for plant protection
k. Forests for energy production
l. Measuring the environmental, social and economic impacts of beef industry
m. Nanotechnology, the power of the quasi-invisible
n. Sustainable production of sugarcane for energy purposes
o. Genomics technologies for the development of water-use efficient plants
p. Technologies for biodiesel production

[2]Embrapa's Management System is composed of 6 macroprograms. Macroprogram 1, or simply MP1, relates to Embrapa's greatest national challenges.

q. Genomics for the advancement of animal breeding and production
r. Climatic risks zoning for small farming agriculture, bioenergy and pastures.

Embrapa's utmost importance in the Brazilian and world scenarios is attested by Penteado Filho and Avila (2009) who asses – through bibliometric analysis – the participation of Embrapa's research centers in the periodicals indexed in the Web of Science database from 1996 to 2006. Their results indicate that Embrapa is among the top ten leading Brazilian institutions in the volume of articles published in indexed periodicals, way ahead of the majority of Brazilian universities.

It's exactly for the statements and reasons above – that fact that Embrapa is a "knowing organization – that a KM Model was necessary to drive strategy into action. The results of our study in the building of a KM Model at Embrapa will be presented in the following section.

5 RESULTS

Through documental research and participant observation – strategic plans, macro-processes maps, regional business units' plans, committees and meetings, among others – we found out that KM is a key-issue in Embrapa's strategy. One of its strategic macro-processes points out KM and competitive intelligence as key issues for strategy implementation. For this reason, a committee was established by top-administration to develop Embrapa's KM model. Embrapa's KM committee was fully aware of other organizations' experience and approach to KM models. When a KM model was imposed from the top-perspective or proposed solely by a group of "notables" in the organization, the results weren't exactly inspiring. This awareness was confirmed by semi-structured interviews conducted with strategic/tactical personnel at Embrapa. For this reason, Embrapa's KM Committee opted for the involvement of the whole organization in the process of building a KM Model. They knew that Embrapa had the knowledge and experience to come to terms with an understandable yet simple/concise KM model.

Embrapa's first "KM Workshop" took place in Brazil's capital (Brasilia) in the second semester of 2009. During one week, Embrapa's units' Chiefs, R&D Chiefs, Functional Managers and Directors got together in a hotel/convention center to discuss their strategic KM and the building of a model to represent their collective understanding. Fundação Dom Cabral – a Brazilian business school – was hired to mediate the process and offer a consistent methodology. The proposition had originally three different perspectives:

(1^{st}) an strategic axis - converging to discussions related to strategic information/knowledge use and knowledge vision,

(2^{nd}) a tactical axis - focusing on implementation issues and

(3^{rd}) an operational axis – discussing the managerial practices and IT tools that were *sine qua non* conditions to drive strategy into action. All of the participants were split in 6 different groups to discuss their understanding of the three axes. After they had finished, they were all reunited in the main room to seek consensus. Uncertainty and ambiguity gave place to passionate debates that represented different views of a complex and dispersed organization. After many rounds of "social conflict" and "social consensus", Embrapa's personnel agreed to a KM model of 4 axes, as represented on Figure 6 below:

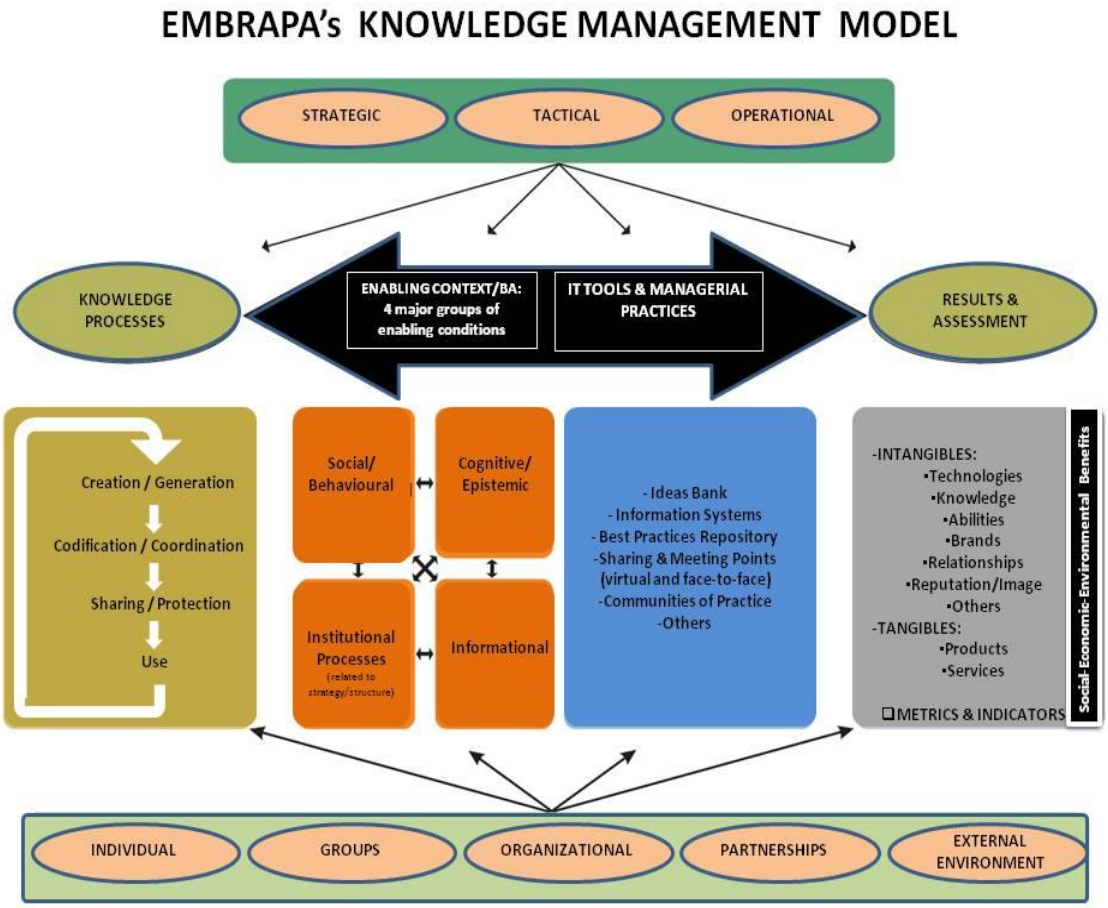

Figure 6 - Embrapa's KM model
Source: Developed by the author

The results revealed a robust knowledge management model made of four dynamic axes:

- Strategy – strategic knowledge procesess, reflecting Embrapa's knowledge vision and strategy:
- *Creation and generation,*
- *Codification of explicit knowledge and coordination of tacit knowledge,*
- *Sharing and protection – by defining different levels of interaction (individual, groups, partnerships, etc.) and understanding that its critical knowledge creation and R&D efforts must also be protected from external leaks in early stages,*
- *Use – use of knowledge to fulfill Embrapa's mission, as demanded by the Brazilian society;*
- Environment - four different groups of enabling conditions (social-behavioral, information/communication, cognitive/epistemic and business/managerial) where adopted (Alvarenga Neto & Choo, 2010), sine qua non conditions for successful implementation. The workshop's participants stressed that special attention should be placed into the enabling conditions of social/behavioral and cognitive/epistemic;
- Tool box – sets of IT tools and managerial practices that should be make operational all over the organization;

- Results – in terms of outputs, being both tangible and intangible assets.

6 CONCLUSIONS

This paper's main goals were to investigate and analyze the process of building aKM model at Brazil's Embrapa. Instead of imposing a KM model from the top-down perspective, Embrapa's top administration and KM Committee decided in favor of a collective building and proposition of a KM model for more successful implementation. The results pointed out for a collective proposal of a dynamic KM model made of four different axes (strategy, implementation, toolbox, results), featuring four different groups of enabling conditions for proper implementation.Embrapa's KM Model is more inclined to be a knowledge-based view of organization than merely a knowledge management model.

We want to stress two main conclusions: (i) managing knowledge in organizations is fundamentally about creating an environment in the organization that is conducive to and encourages knowledge creation, sharing and use; (ii) a collaborative building of a KM model in a complex, diverse and geographically dispersed organization is more likely to succeed than one that is build and implemented from the top-down perspective.Organizations interested in pursuing KM models may wish to be guided by Embrapa's experience. Our main conclusions suggest that.

Our tentative conclusions, coherently with our researches and studies within the past decade, suggest that knowledge as such cannot be managed; it is just promoted or stimulated through the creation of a favourable organizational context. There is strong qualitative evidence of a major shift in the context of the organizations contemplated in this study and cited in this research: from "knowledge management" to the "management of 'ba' and the enabling conditions" that favours innovation, sharing, learning, collaborative problem solution, tolerance to honest mistakes, among others.

Our study is limited, so far, by a single-case study. A few other cases are available in the Brazilian organizational context, like the one conducted by Alvarenga Neto et al. (2009) and also presented in past ICICKM conferences. No general conclusions can be made and, as for future research, we recommend the testing of this proposition in different organizations – of different size and industries.

ACKNOWLEDGEMENTS

I wishe to thank Fundação Dom Cabral (FDC) and EMBRAPA for the enabling conditions that resulted in this research report.

GESTÃO DO CONHECIMENTO NA EMBRAPA:
COMPARTILHANDO EXPERIÊNCIA NA CONSTRUÇÃO DE UM MODELO COLABORATIVO

Resumo

Este artigo analisa o processo de construção de uma gestão do conhecimento (KM) modelo da Embrapa no Brasil (a Empresa Brasileira de Pesquisa Agropecuária). Embrapa é uma organização mundial do conhecimento da classe, cuja missão é fornecer soluções viáveis para o desenvolvimento sustentável do agronegócio brasileiro por meio do conhecimento e geração e transferência de tecnologia. A estratégia de pesquisa qualitativa utilizada foi o estudo de um caso único com unidades incorporadas de análise e de dois critérios foram observados para o julgamento da qualidade do projeto de pesquisa: validade de construto e confiabilidade. Múltiplas fontes de evidências foram utilizadas e análise de dados consistiu em três fluxos de atividades: redução de dados, apresenta dados e conclusão de desenho / verificação. Os resultados revelaram um modelo KM robusta feita de quatro eixos dinâmicos: (i) estratégia (uma concepção estratégica da informação e uso do conhecimento), (ii) ambiente - quatro grupos diferentes de condições propícias (social-comportamental informação / comunicação, cognitivo / epistêmica e

negócios / gestão), condições sine qua non para a implementação bem-sucedida, (iii) caixa de ferramentas - conjuntos de ferramentas de TI e as práticas gerenciais e (iv) resultados - em termos de resultados, sendo ambos tangíveis e intangíveis. As conclusões sugerem que uma construção colaborativa de um modelo KM numa organização diversificada e geograficamente disperso é mais provável de ter sucesso do que aquele que é construído e implementado a partir da perspectiva top-down. Modelo da Embrapa KM é mais inclinado a ser uma visão baseada no conhecimento da organização do que meramente um modelo KM. Limitações do estudo e sugestões para futuras pesquisas também são discutidos.

Palavras-chave: *Gestão do conhecimento. Visão das organizações baseada no conhecimento. Modelo KM SET. Ba. Embrapa.*

Artigo recebido em 03/10/2011 e aceito para publicação em 27/11/2011

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