

Understand the Dynamic Theory of Organizational Knowledge Creation: roots and future

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Abstract

After the Wars, it was necessary the companies reinvented their process and for this to create a new perspective including products and services. In 1986, Ikujiro Nonaka and Hirotaka Takeuchi received a challenge to describe product development in Japan companies. The result was "The new new product development game". After that, Nonaka and Takeuchi wrote about their observations in this process and published many articles, presenting in 1994 the Theory of Organizational Knowledge Creation. In this context, the aim of this study is to review the Nonaka and Takeuchi documents, building a timeline and understand the concepts and the future for the Theory of Organizational Knowledge Creation. Firstly, we search the articles from Nonaka in the Scopus database. Secondly, we started reading the article "Dynamic Theory of Organizational Knowledge Creation" published in 1994 for Nonaka. Based on their references we returned for the search results and read the articles. Next, we read the articles published after 1994 and comprehending their link with the Theory of Organizational Knowledge Creation. Although the Theory of Organizational Knowledge Creation is recognized and diffused in the academy and in the organizations that study or implant the Knowledge Management, it is noticed that few authors deepen the knowledge to understand the fundamentals of the theory or, of fundamental reasoning. It is evident the concern of Nonaka and his co-authors to seek facilitators for the modes of knowledge conversion, to facilitate the practical application of the modes of knowledge conversion.

Keywords: Knowledge Creation; Knowledge Conversion.

1. Introduction

After the Wars, it was necessary the company reinvented their process and for this, they need to create a new perspective including products and services. About 60's the world was divided in Occident and Orient. In Occident, the companies in the USA work hard to improve the quality, and the same occurs in the Orient, with the Japan companies.

The innovation process is constantly in all companies in the world. The renewal was very important in industrial society, when the growth and improvement are quick [1]. To sum up, highlight the complexity and uncertainty involved. In the literature different degrees of complexity was defined, in their viewpoint, the complexity is connected with the people involved in this process [2].

Mansfield [3] wrote an article talking about speed and cost of industrial innovation in the USA and in Japan,

highlight their rivalry. Before that, in 1986, Ikujiro Nonaka and Hirotaka Takeuchi received a challenge to describe product development in Japan companies. The result was “The new new product development game”. In this article, they used the rugby game metaphor and they're "passing the ball" movement to describe the speed and flexibility of Japanese companies in the development process.

After that, Nonaka and Takeuchi wrote about their observations in this process and published many articles, presented in 1994 the Theory of Organizational Knowledge Creation. In this context, the aim of this study is to review the Nonaka and Takeuchi documents, building a timeline and understand the concepts and the future for the Theory of Organizational Knowledge Creation.

2. Methods

Firstly, we search the articles from Nonaka in the Scopus database, in “author search” using “No-naka, Ikujiro”. The results appointed 57 documents. Opening this result, we had read the title and abstract of them.

Secondly, we started reading the article “Dynamic Theory of Organizational Knowledge Creation” published in 1994 for Nonaka. Based on their references we returned for the search results and read the articles.

Next, we read the articles published after 1994 and comprehending their link with the Theory of Organizational Knowledge Creation. Appendix 1 shows the selected articles for reading.

2. Dynamic Theory of Organizational Knowledge Creation: Roots and Future

In 1988, Nonaka, in his article "Self-renewal of the Japanese Firm and the Human Resource Strategy", draws attention to the paradigm shift that was occurring in Japanese industries. The author points out that the pattern of mass production of the Industrial Revolution needed to be neglected and that industries would require a creativity-centric model so that they could meet the needs of consumers [4].

This challenge was centered, then, in the Human Resources sector that, in the North American industries, already worked to develop intrapreneurship in their teams.

In 1988, now in his article entitled "Toward Middle-Up-Down Management: Accelerating Information Creation" Nonaka describes the paradigm changes in the Honda company when a group of young designers was hired to develop a new car model, City. For this project, the senior managers gave autonomy to the new team and, with this, it was perceived the need of the attention to information processing in the structure of the organization, the process of creation of significant information and the need for the attention to the quality of the information to the detriment of their quantity. These aspects also highlight the need for interaction between people and inductive and holistic methodologies [5].

According to Nonaka [5]:

The emergent, or critical, property of information creation at the individual level is autonomy. This level is characterized by action and deliberation: Only here is it possible to deliberate and act autonomously. Autonomy begins to be realized when individuals are given the freedom to combine thought and action at their own discretion, and are thereby able to guarantee the unity of knowledge

and action.

Following, [5] emphasizes that on a group level, with interaction based on open and frank dialogue, it is possible to create perspectives and consequently new information. "The dynamic, complementary process that results in a shift to a new point of view requires interaction—a dialogue or debate—among people." [5].

During this process of interaction, individuals with their autonomy interpret and reinterpret information individually, while the possibility of open discussion will result in the emergence of coherence between information and will generate "group thinking".

Another point considered in [5] concerns the organizational level. The author reinforces the need for an alignment between the individual, group and organizational levels and cites as an example the fact that, if at the individual level individuals have autonomy and at the group level there is an established open dialogue, it is necessary that the organizational level provides the right support with the correct distribution of resources. Otherwise, where the organizational level promotes competition between groups and favors resources with one or the other, the creation of new information will tend to be compromised.

In Nonaka's article "Creating Organizational Order Out of Chaos: Self-Renewal in Japanese Firms", 1988, the author talks about self-renewal of Japanese industries and the creation of order and chaos in organizational environments. Among the topics discussed, the author talks about the creation of meaningful information, that is, semantic information. For the author, semantic information provides real meaning for information, providing quality and allowing a change in the actions and perceptions of individuals. "Once semantic information is created, it naturally seeks similar meaning in an elastic effort to self-organize. Thus, information generates information"[6].

In order for companies to keep active the creation of information, they must remain active and fluctuating between chaos and order, in order to achieve self-organization of the teams and cooperation to resolve existing discrepancies. new information created to be transformed into knowledge [6].

In 1989, authors Nonaka and Yamanouchi [7] reinforce the fact that information creation keeps organizations renewable and that the most typical way to products and/or new strategies.

In this article, "Managing Innovation as a self-renewing process", the definition is that creating information is different from processing information. For the occurrence of the first it is necessary to pay attention to the quality of the information and its semantics, whereas, for the information processing, it is enough to have the syntactic information [7].

Advancing concepts in 1990, Nonaka [8] in his article "Redundant, Overlapping Organization: A Japanese Approach to Managing the Innovation Process" introduces the concept of "information redundancy", which defines how:

Information redundancy refers to a condition where some types of excess information are shared in addition to the minimal amount of requisite information held by every individual, department (group), or organization in performing a specific function. While this excess information could be considered needless or superfluous from a standpoint of efficiently processing information in quantity, from a qualitative standpoint this excess information enriches the meaningful functions of the organization. When excess information is shared within the organization, it clarifies the meaning

of the specific requisite information held by distinct individuals and groups. In addition, this excess information both increases the reliability and induces an expansion of the significance of such requisite information. Information redundancy stimulates the creative powers of information and is linked to the generation of information with new meanings [8].

The information redundancy is related to the number of people involved and the flexibility in the process of building new products and/or strategies. The author exemplifies describing the cases of setting up companies such as Honda, Xerox, and Matsushita Electric.

In addition to the focus of information redundancy between sectors, the author highlights the importance of this item in inter-organizational projects and exemplifies citing the case of creation of the Mazda New RX7 (P747), with a design developed by Mazda and execution of Hiroshima Aluminum (supplier of engines and brake parts). The author presents an observation made by the project leader at Hiroshima Aluminum in which he says:

There's a big gap between planning and manufacturing, and because this method covers that gap, I think it was very good. We can't understand things like the origins of the shapes we work with just from the drawings. Oh, the shapes come out clearly, but the reasons behind them are not communicated just from the prints [8].

With the concept of information redundancy, one realizes the concern with semantics and the understanding that the obvious is not always so obvious or, what is obvious to you may not be obvious to me. The higher the quality of shared information, the more sense in that context it will have for those who receive it and an environment of trust is created. Thus, [8] states that information redundancy is a facilitator for converting tacit knowledge into "articulate" knowledge.

In February 1994 the article "Dynamic Theory of Organizational Knowledge Creation" by Nonaka [9] was published in the journal "Organization Science". This is one of the if not the most important article of the author since it is in this document that he brings together the conceptual bases of his previous articles (Table 1) and presents the theory of the creation of organizational knowledge.

Table 1 – Epistemological and Ontological Dimensions for Dynamic Theory of Organizational Knowledge Creation

EPISTEMOLOGICAL DIMENSION	Information "A stream of messages or meanings that can add, restructure or change knowledge" Information is a medium or material necessary to initiate and formalize knowledge and can be seen from "syntactic" and "semantic" perspectives.		Syntactic Structure of information.
			Semantics Information, viewed from the semantic point of view, literally means that it contains a new meaning.
	Knowledge "A dynamic human process of justifying personal beliefs as part of the aspiration for" truth "		Tacit "Tacit knowledge is deeply rooted in action, commitment, and involvement in a specific context." Explicit "Or codified refers to the knowledge that is transmissible in a systematic way"
	References: Machlup (1983); Dretske (1981); Shannon e Weaver, 1949 Michael Polanyi (1966)		
ONTOLOGICAL DIMENSION	Social interaction On a fundamental level, knowledge is created by individuals. An organization cannot create knowledge without individuals. The organization supports creative individuals or provides a context for those individuals to create knowledge. The creation of organizational knowledge, therefore, must be understood in terms of a process that "organizationally" amplifies the knowledge created by individuals and crystallizes it as part of the organization's knowledge network.		
	COMMITMENT		
	Intention The intent is concerned with how individuals form their approach to the world and try to understand their environment.	Autonomy The principle of autonomy can be applied at the individual, group and organizational levels - separately or together.	Fluctuation Chaos or discontinuity may generate new patterns of interaction between individuals and their environment.
References: Searle (1969); Searle (1983); Gleick (1987); Winograd e Flores (1986)			

Source: Authors (2019).

With these initial concepts, [9] described the idea of knowledge conversion to present the Knowledge Spiral. According to the author, the term knowledge conversion comes from Anderson (1983) in his study "The Architecture of Cognition" based on cognitive psychology and where he worked with the transformation

of declarative knowledge into procedural knowledge.

Nonaka [9] states that, for purposes of comparison, declarative knowledge approaches explicit knowledge, whereas procedural approaches are closer to tacit knowledge. One limitation pointed to Anderson's model lies in the fact that he considers only the one-way transformation of declarative to procedural knowledge. The Knowledge Spiral admits four modes of knowledge conversion, namely: “(1) from tacit knowledge to tacit knowledge, (2) from explicit knowledge to explicit knowledge, (3) from tacit knowledge to explicit knowledge, and (4) from explicit knowledge to tacit knowledge” [9].

It is assumed that through the interaction between individuals it is possible to perform the conversion of tacit knowledge and that this transference and acquisition can occur verbally and nonverbal. For the conversion of tacit knowledge into tacit, it was called Socialization.

The key to acquiring tacit knowledge is an experience. Without some form of shared experience, it is extremely difficult for people to share each other’s thinking processes. The mere transfer of information will often make little sense if it is abstracted from embedded emotions and nuanced contexts that are associated with shared experiences. This process of creating tacit knowledge through shared experience will be called "socialization" [9].

For the second mode of conversion, which includes the conversion of explicit knowledge into explicit, it is necessary to emphasize the need for social processes, that is, the involvement of individuals in diverse situations in which there is the exchange of knowledge, such as meetings, tele-phone conversations, etc.

The reconfiguring of existing information through the sorting, adding, recategorizing, and recontextualizing of explicit knowledge can lead to new knowledge. Modern computer systems provide a graphic example. This process of creating explicit knowledge from explicit knowledge is referred to as "combination" [9].

The third mode of conversion deals with the conversion of tacit knowledge into explicit and is called Externalization. Finally, the fourth mode of conversion is called Internalization and deals with the conversion of explicit knowledge into tacit knowledge. [9] emphasizes that "These conversion modes capture the idea that tacit and explicit knowledge are complementary and can expand over time through a process of mutual interaction”. Figure 1 shows how the author illustrated the four modes of knowledge conversion:

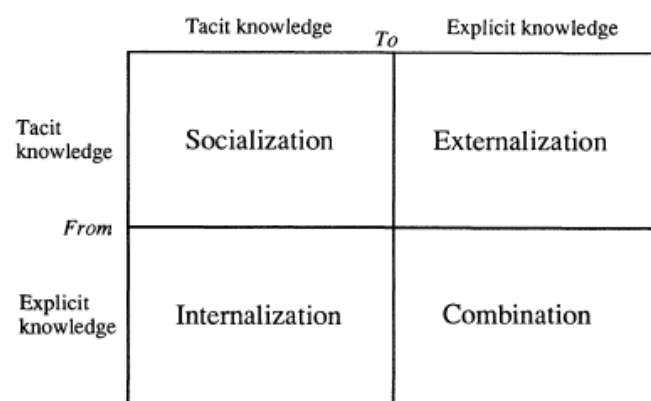


Figure 1 – Modes of the Knowledge Creation

Source: Nonaka (1994, p.19)

Although they are independent of the process of knowledge creation, [9] draws attention to the fact that:

While each of the four modes of knowledge conversion can create new knowledge independently, the central theme of the model of organizational knowledge creation proposed here hinges on a dynamic interaction between the different modes of knowledge conversion. That is to say, knowledge creation centers on the building of both tacit and explicit knowledge and, more importantly, on the interchange between these two aspects of knowledge through internalization and externalization. [9].

For the author, the creation of organizational knowledge will occur when triggers are used to interweave each of the modes of knowledge conversion. As an example, he mentions that, initially, Socialization can favor the formation of groups, in which individuals will outsource their knowledge in dialogues. The next step is the Combination of this externalized knowledge and Internalization that occurs through experimentation.

Still on the creation of organizational knowledge and the triggers for the mode of knowledge conversion, [9] says that three processes are necessary, namely: enlargement of individual knowledge, sharing of knowledge and crystallization of knowledge.

The enlargement is related to tacit knowledge and to the fact that the individual is a key factor in the knowledge creation process. However, it is not enough that he has tacit knowledge, it is necessary that this knowledge has "high quality". This high quality of tacit knowledge is related to the number of experiences that the individual has and the incorporation of them, that is, it is not enough that the individual has several experiences that build his tacit knowledge, it is necessary that they have a meaning. " If the individual finds various experiences to be completely unrelated, there will be little chance that they can be integrated to create a new perspective" [9].

About the sharing of knowledge, it is necessary to establish within the organization a team and a field where social interactions can happen. Within this team, it is necessary to identify who the key individuals are, as they will be responsible for the redundancy of information. This term was presented by Nonaka (1990) and retaken in (1994) within the process of creation of organizational knowledge.

For these teams to advance in the process of knowledge creation, a degree of trust must be established among its members. The establishment of trust can be stimulated by the sharing of personal experiences of its members (tacit knowledge sharing).

When an individual share with others their experiences, that is, something they have experienced, they will be able to attract the empathy of those who have similar experiences and this fact creates a bond between them. At this point, according to [9], there is evidence of the mode of conversion Socialization, "communication is like a wave that passes through people's bodies and culminates when everyone synchronizes himself with the wave. Thus, the sharing of mental and physical rhythm among participants of a field may serve as the driving force of socialization" [9].

Still in the process of knowledge sharing, but now at the stage of the Externalization conversion mode, the importance of dialogue as "face to face" communication is described. In this mode of conversion, tacit

knowledge is converted into explicit knowledge, direct interaction between individuals enables the sharing of tacit knowledge with the possibility of explanation and a greater understanding of the receiving individual, so that concordances and disagreements occur.

Finally, the third process, that of crystallization, says that crystallization occurs when a new product is created by the team, or when processes are reviewed, improved and/or created based on the knowledge built through the process of sharing. Here, the mode of active conversion is internalization, facilitated by experimentation.

At the end of the paper, [9] points out that although the studies that founded the theory of organizational knowledge creation have taken place in the Japanese organizations scenario, "it should be stressed that the principles described have a more general application to any organization, either economic or social, private or public, manufacturing or service, in the coming age despite their field of activities as well as geographical and cultural location".

In 1995 Nonaka, together with Hirotaka Takeuchi, launched the book "The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation".

In this book, the authors define the creation of organizational knowledge as "the ability of a company to create knowledge, to disseminate it in the organization as a whole and to incorporate it into products, services, and systems" [10].

While in the 1994 Nonaka article more was devoted to describing the conceptual bases of the Knowledge Spiral model, the authors present in more detail the conceptual basis and describe each of the modes of conversion by citing examples.

In 1996, a new article entitled "The theory of organizational knowledge creation" was published this time by the journal "International Journal of Technology Management" and co-authored by Hirotaka Takeuchi and Katsuhiko Umemoto. This article presents a summary of the evolutions and concepts presented in the book released the previous year, dealing with a clipping of the contents of the book [11].

Also, in 1996, in the article entitled "From Information Processing to Knowledge Creation: Paradigm Shift in Business Management" by Nonaka, co-authored by Umemoto and Dai Senoo, there remains the discussion about the differences between Western industries and Japanese companies. In this article, however, the authors, in addition to presenting the Theory of Creation of Organizational Knowledge once again, insert the discussion of the use of information technologies in the process.

The authors present as a concept of knowledge "a meaningful set of information that constitutes a justified true belief and/or an embodied technical skill" [12]. This concept considers the fact that beyond knowledge is a true and justified belief, as already said in previous concepts and accepted by the authors, are considered as knowledge the technical and/or corporal abilities of the individual.

Accompanying the concept of presented knowledge, the actors conceptualize the process of knowledge creation as "a dynamic human process of justifying a personal belief toward the truth and/or embodying a technical skill through practice" [12].

The first relationship they make is between the conditions for knowledge creation and information technology tools that can act as facilitators. In addition, the authors relate the use of information technology to the five phases of the knowledge creation process.

In 1997, Nonaka co-authored the article "Develop Knowledge Activists!" which with authors Georg Von Krogh and Kazuo Ichijo bring the concept of "knowledge activist" by stating that individuals, groups and/or organizations can act by encouraging the creation of knowledge organizational, and to this end, they should act as catalysts for the creation of knowledge and encourage initiatives to create knowledge [13].

In 1998, were published the articles "The Concept of "Ba" Building the Foundation for Knowledge Creation", by Nonaka and Noboru Konno, and the article entitled "Management Focus The 'ART' of Knowledge: Systems to Capitalize on Market Knowledge" by Nonaka, Patrick Reinmoeller and Dai Senoo. In the first one, the authors highlight the Knowledge Management as a subject quite worked in literature at that moment and present the concept Ba equivalent to the English term place.

For those unfamiliar with the concept, ba can be thought of as a shared space for emerging relationships. This space can be physical (e.g., office, dispersed business space), virtual (e.g., e-mail, teleconference), mental (e.g., shared experiences, ideas, ideals), or any combination of them. What differentiates ba from ordinary human interaction is the concept of knowledge creation. Ba provides a platform for advancing individual and/or collective knowledge. It is from such a platform that a transcendental perspective integrates all in-formation needed. Ba may also be thought of as the recognition of the self in all. According to the theory of existentialism, ba is a context which harbors meaning. Thus, we consider ba to be a shared space that serves as a foundation for knowledge creation [14].

According to the authors [14], this concept (Ba) originated from studies of Kitaro Nishida, having been developed by studies of Shimizu and adapted by the authors for the model of Creation of Organizational Knowledge.

In this article, the authors call the SECI Model knowledge conversion model, and the SECI comes from the initials of the conversion modes described in Nonaka (1994) - Socialization, Externalization, Combination, and Internalization.

The authors highlight the possibility of four types of Ba, each related to a mode of knowledge conversion predicted in the SECI Model and can act as an accelerator in the process of knowledge creation: Originating Ba, Interacting Ba, Cyber Ba, and Exercising Ba.

Finally, the authors emphasize that "knowledge activists" can act as support for the creation and maintenance of Ba spaces in the organization [14].

In the second article, the authors introduce the concept of Action - reflection - trigger (ART) systems, to support the modes and knowledge conversion of the SECI Model [15].

For the authors, until now, Knowledge Management was concerned only with explicit knowledge, leaving aside the tacit knowledge and all its value to the organization. Thus, the ART Systems aims to contemplate all modes of knowledge conversion articulating action between the modes of Socialization and Internalization and reflection between the modes of Externalization and Combination.

The authors state that for ART systems to work, leadership is required to be aware of the need for and maintenance of Ba space, and to be alert and apt to conduct Chaos and Order (Fluctuation) in the organization [15].

The following year, 1999, authors Fabio Corno, Patrick Reinmoller and Nonaka in the article "Knowledge

Creation within Industrial Systems" work with the concept of District Ba, which is a dynamic context in which different companies are interacting and creating a space Ba in which they can create knowledge [16]. In the 2000s, two published articles reinforce the need for attention to the Ba environment, the influence of leadership and the SECI Model in the Theory of Knowledge Creation. They are "A firm of knowledge-creating entity: a new perspective on the theory of the firm", by Nonaka, Ryo-ko Toyama and Akiya Nagata [17], and "SECI, Ba, and Leadership: A Unified Model of Dynamic Knowledge Creation", Nonaka, Ryoko Toyama, and Noboru Konno [18].

In the article [17], in addition to revising concepts such as the SECI Model and Ba environment, a highlight in Knowledge Creation Theory the Knowledge Conversion Rate and the Cost of Knowledge Creation.

For the authors, the factors that determine the Knowledge Conversion Rate are knowledge vision, organizational form, incentive system, corporate culture, and organizational routines and leadership. The costs of knowledge creation are measured considering the cost of knowledge entry, opportunity cost, and time cost.

In the paper [18], the authors review concepts such as the SECI Model, the Ba environment and aim to propose a knowledge creation model composed of three elements: (1) SECI Model, (2) Ba environment and (3) knowledge assets.

Knowledge assets is a new concept brought by the authors and are "firm-specific resources that are indispensable to create values for the firm." Knowledge assets are the inputs, outputs and moderating factors of the knowledge-creating process" [18].

Four categories of knowledge assets are presented in order to facilitate the understanding of how they are created, acquired and exploited: Experiential knowledge assets, Conceptual knowledge assets, Systemic knowledge assets, and Routine knowledge assets.

For [18], it is suggested that the organization has its mapped knowledge assets, however, they point out that depending on the dynamic characteristic of knowledge assets, having them mapped may not be an easy task.

Leadership then appears as a fundamental figure to stimulate and coordinate the process of creation of knowledge proposed by the authors, being the leader responsible for articulating and promoting knowledge of the knowledge vision for the whole organization, and that knowledge assets appear as moderators for the conversion of knowledge that Ba's ideal environment is.

Nonaka and Toyama, in 2002, in the article entitled "A firm as a dialectical being: towards a dynamic theory of a firm"[19] , discuss the contradictions faced by companies in relation to aspects such as being efficient and fast, and argue that when the organization manages to develop the ability to synthesize these dualities, it can be more efficient in producing knowledge.

The ability to synthesize dualities involves constructing the vision of knowledge, the Ba space, creative routines, incentive systems, and distributed leadership.

The authors reinforce the idea that the Ba environment is not limited to a single organization and can transcend the organization's barriers and connect with its customers, suppliers, and others involved.

In the paper "The Theory of Knowledge-Creating Firm: Subjectivity, Objectivity and Synthesis", published in 2005, the authors bring together the conceptualization of leadership need with the organization's ability

to consider the context in which it is embedded [20].

They emphasize the concept of driving objectives that add to the vision of knowledge goals/objectives that act as drivers. [20] argue that if the company is not clear what is expected of the established view of knowledge, it will be no more than "loose words". It is this goal-driver that will link the vision of knowledge with dialogue and practice.

In 2007, also the authors Nonaka and Toyama, with the article "Strategic management as the distributed practical wisdom (phronesis)", advance and discourse on the strategic management and the possibility of transforming the knowledge in wisdom [21].

[21] bring the concept of Phronesis, one of the types of knowledge de-scribed by Aristotle related to wisdom. This type of knowledge is related to what they call "high-quality tacit knowledge" and comes from practical experience, allowing decisions to be made considering the context in each situation. "Phronesis is a concept that synthesizes" knowing why "in scientific theory, with" knowing how "in practical skill, and" knowing what "as a goal to be realized." [21].

The authors, Zeynep Erden, Georg Von Krogh, and Ikujiro Nonaka, published, in 2008, the article titled "The quality of group knowledge tacit knowledge", in which they bring the concept of quality of tacit knowledge group, which they identified as an existing gap [22].

Based on Dreyfus and Dreyfus' (1986) 'skill development' model, [22] present a model with four levels of quality of tacit group knowledge: Group as assemblages, Collective action, Phronesis, and Collective improvisation.

Already in 2014, the authors Ikujiro Nonaka, Mitsuru Kodama, Ayano Hirose, and Florian Kohlbacher have the challenge of answering the question: "What form should I have an organization that aims to become innovative in a sustainable way?" [23].

The authors begin by criticizing the separation of exploration and exploitation from the knowledge in organizations held by the Carnegie School. They argue that this separation of actions is not possible since an organization is always carrying out its actions simultaneously, as is the dynamics between tacit knowledge and explicit knowledge.

To that end, they propose what they called the "triad of knowledge and the multilayered networks of Ba", involving tacit, explicit, and practical wisdom (Phronesis). Referring to the knowledge spiral presented by Organizational Knowledge Creation Theory, the authors state that it "transcends all organizational levels and at the same time synthesizes them", for the conversion of knowledge can occur at all levels - individual, group, organizational and inter-organizational.



Figure 2 - Phronesis drives the conversion of tacit and explicit knowing.

Source: Nonaka, Kodama, Hirose, and Kohlbacher (2014, p. 139).

Figure 2 shows the way in which the authors illustrated the relationship between the three forms of knowledge. Phronesis is the promoter of knowledge conversion.

Tacit knowledge is closely related to ontology, explicit knowledge to epistemology, and phronesis can add axiology, i.e. value that comes from peoples beliefs, commitment, passion, and judgments. Phronesis is a leadership capability that needs to be distributed at every level of organization. But at the same time, all of them have to be synthesized into a whole [23].

Phronesis will be established with a set of multi-faceted layers of Ba, that is, the continuous conversion of tacit knowledge and explicit knowledge and into a continuum of exploration and capitalization of knowledge that can extrapolate the organizational environment or not.

Another concept presented by the authors is that of "dynamic fractal organization" (Figure 3) which describes how: "Fractal organization refers to an organization in which multiple knowledge triad relationships emerges from multi-layered and networked bas" [23].

In this type of organization, self-innovation is driven by the creative routine, and it is premised that the relationship of the knowledge triad is spread throughout the organization. This movement allows the organization to carry out the synthesis established in the relationship between dialogue and practice [20].

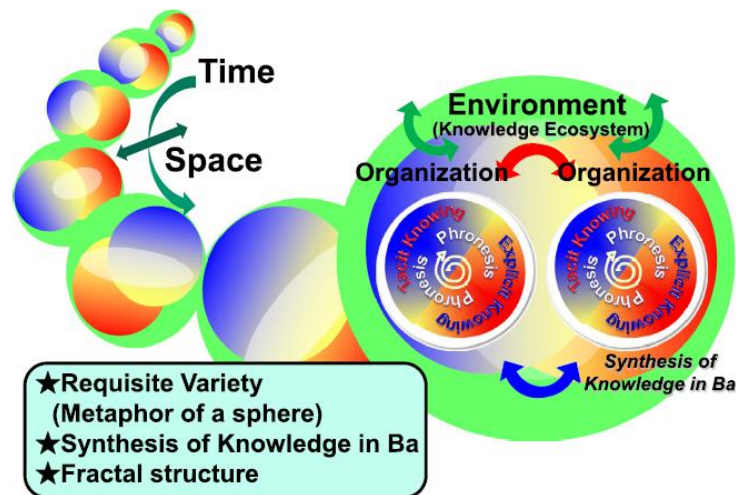


Figure 3 - Dynamic fractal organizations

Source: Nonaka, Kodama, Hirose, and Kohlbacher (2014, p. 141).

For the authors [23], dynamic fractal organizations (Figure 3) act by transforming knowledge both vertically and horizontally in the organization, and between organizations, emphasizing the importance of connectivity between structures.

In a fractal organization, there is a symbiosis between the parts and the whole in self-organization that allows the creation of new knowledge. The parts can compose a whole, parts can relate to a whole, and a whole can become a part to compose another whole. This dynamic only ends when there is a difference between the points of view - depending on the vision of the leader.

In 2018, the book "Knowledge Creation in Community Development" relates the ways of con-verting knowledge with practices of innovation and social development. In the chapter "Unleash-ing the Knowledge Potential of the Community for Co-creation of Values in Society", Nonaka, Yokomichi and Nishihara highlight the moment of Socialization in the cases presented, noting that "It is important to note that Socialization is not just about sharing time and space together, but emphasizing, synchronizing, and resonating with each other physically and psychologically" [24].

5. Discussion

In summary, following the evolution of research to the Theory of Knowledge Creation and after its creation, it is possible to understand that the previous moment had as its premise to seek concepts and bases that constituted the matrix of the modes of knowledge conversion (Model SECI) and the processes necessary for the creation of organizational knowledge.

Table 2 – concepts before and after Theory of Knowledge Creation

<p>Before</p> <ul style="list-style-type: none"> • The attention of Human Resources to the process of creativity 	<p>Theory of Knowledge</p>	<p>After</p> <ul style="list-style-type: none"> • Action - reflection - trigger (ART) systems
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<ul style="list-style-type: none"> • Alignment between individual, group and organizational levels • Autonomy • Order and Chaos • Semantic information • Create information and Process information • Information Redundancy 	<h2 style="margin: 0;">Creation</h2>	<ul style="list-style-type: none"> • Ba and Ba Ba • Knowledge Conversion Rate • Cost of creating knowledge • Knowledge activist and knowledge assets • Leadership in the process of knowledge creation • Target Drivers • Phronesis • Quality of tacit group knowledge • Knowledge triad and Ba multilayer networks • Organization as an organic figure • Dynamic fractal organization
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Source: Authors (2019).

There is concern about the quality and quantity of information available (semantic information, create versus information processing, information redundancy) and the possibility of interaction and creation between people (autonomy, HR with attention to creation, environment with fluctuation between order and chaos in the organization).

At the moment of the launch of the book and that the Theory of Organizational Knowledge Creation becomes known and studied, it is noticed the concern to evolve in the concepts and to advance to the look of the organization and all the environment in which it is inserted. The analysis and construction that began at the individual level have expanded to the level of organizational networks.

5. Conclusion

Although the Theory of Organizational Knowledge Creation is recognized and diffused in the academy and in the organizations that study or implant the Knowledge Management, it is noticed that few authors deepen the knowledge to understand the fundamentals of the theory or, of fundamental reasoning.

It is evident the concern of Nonaka and his co-authors to seek facilitators for the modes of knowledge conversion, to facilitate the practical application of the modes of knowledge conversion.

In the literature, there are several articles with practical applications of the ways of converting knowledge, ranging from industrial areas to public management, and although the possibility of real application is verified, it is fact that the implementation of the conversion modes of knowledge remains a complex subject requiring attention.

For future research, it is possible to realize the survey of facilitators proposed to the modes of knowledge conversion that extrapolate the authorship of Nonaka and his co-authors.

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Appendix

Appendix 1.

Table 3 – Documents selected for reading

Title	Year	Author(s)
<i>Self-renewal of the Japanese Firm and the Human Resource Strategy</i>	1988	Nonaka
<i>Toward Middle-Up-Down Management: Accelerating Information Creation</i>	1988	Nonaka
<i>Creating Organizational Order Out of Chaos: Self-Renewal in Japanese Firms</i>	1988	Nonaka
<i>Managing innovation as a self-renewing process</i>	1989	Nonaka and Yamanouchi
<i>Redundant, Overlapping Organization: A Japanese Approach to Managing the Innovation Process</i>	1990	Nonaka
<i>Dynamic Theory of Organizational Knowledge Creation</i>	1994	Nonaka
<i>The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation</i>	1995	Nonaka and Takeuchi
<i>A theory of organizational knowledge creation</i>	1996	Nonaka, Takeuchi, and Umemoto.
<i>From Information Processing to Knowledge Creation: A Paradigm Shift in Business Management</i>	1996	Nonaka, Umemoto, and Senoo
<i>Develop Knowledge Activists!</i>	1997	Von Krogh, Nonaka and Ichijo
<i>The Concept of "Ba": Building a Foundation for Knowledge Creation</i>	1998	Nonaka and Konno
<i>Management Focus The 'ART' of Knowledge: Systems to Capitalize on Market Knowledge</i>	1998	Nonaka, Reinmoeller, and Senoo.
<i>Knowledge Creation within Industrial Systems</i>	1999	Corno, Reinmoller, and Nonaka
<i>A firm as a knowledge-creating entity: a new perspective on the theory of the firm</i>	2000	Nonaka, Toyama, and Nagata
<i>SECI, Ba, and Leadership: A Unified Model of Dynamic</i>	2000	Nonaka, Toyama, and

<i>Knowledge Creation</i>		Konno
<i>A firm as a dialectical being: towards a dynamic theory of a firm</i>	2002	Nonaka and Toyama
<i>The theory of the knowledge-creating firm: subjectivity, objectivity, and synthesis</i>	2005	Nonaka and Toyama
<i>The theory of the knowledge-creating firm: subjectivity, objectivity, and synthesis</i>	2007	Nonaka and Toyama
<i>The quality of group tacit knowledge</i>	2008	Erden, Von Krogh, and Nonaka
<i>Dynamic fractal organizations for promoting knowledge-based transformation – A new paradigm for organizational theory</i>	2014	Nonaka, Kodama, Hirose, and Kohlbacher
<i>Unleashing the Knowledge Potential of the Community for Co-creation of Values in Society</i>	2018	Nonaka, Yokomichi, and Nishihara

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