

KNOWLEDGE MANAGEMENT TOWARDS A HOLISTIC APPROACH: INDICATION OF ASPECTS TO BE CONTEMPLATED IN MODELS OF KNOWLEDGE MANAGEMENT

A GESTÃO DO CONHECIMENTO RUMO A UMA ABORDAGEM HOLÍSTICA: INDICAÇÃO DE
ASPECTOS A SEREM CONTEMPLADOS EM MODELOS DE
GERENCIAMENTO DO CONHECIMENTO

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ABSTRACT

There is an expressive number of Knowledge Management models; however there is no widely accepted model. This can be derived from the inherent complexity of Knowledge Management and the organizational environment. However, there is a need for a model that is unifying and that addresses Knowledge Management in a holistic way, but the characteristics that should be considered for this approach have not yet been consolidated. Thus, this study proposes to investigate which aspects should be contemplated in new KM (Knowledge Management) models towards a holistic approach. Through a qualitative methodological course of exploratory nature and with a bibliographic research technique, this research presents, by results, the synthesis of these aspects, based on three perspectives: limitations of existing models, its gaps, and support theories to Knowledge Management. For limitation, one understands that these aspects have not been validated by specialists, which is a suggestion of future research, as well as the development of a Knowledge Management model that comprehends all these aspects. This study contributes by outlining aspects to be contemplated in holistic Knowledge Management models in order to allow this theme to consider all the inherent complexity of the organizational environment.

KEYWORDS

Knowledge management. Holistic approach. Knowledge management models.

RESUMO

Há um expressivo número de modelos de Gestão do Conhecimento; no entanto não há um modelo amplamente aceito. Isso pode ser derivado da complexidade inerente a Gestão do Conhecimento e ao ambiente organizacional. Todavia, é salientada a necessidade de um modelo que seja unificador e que aborde a Gestão do Conhecimento de forma holística, mas as características que devem ser consideradas para essa abordagem ainda não foram consolidadas. Assim, esse estudo se propõe a investigar quais aspectos deveriam ser contemplados em novos modelos de GC rumo a uma abordagem holística. Por um percurso metodológico qualitativo de natureza exploratória e com técnica de pesquisa bibliográfica, essa pesquisa apresenta por resultados a síntese desses aspectos, alicerçados em três perspectivas: limitações dos modelos existentes, lacunas e teorias de suporte à Gestão do Conhecimento. Por limitação se tem que esses aspectos não foram validados junto a especialistas, sendo essa uma sugestão de pesquisa futura, bem como o desenvolvimento de um modelo de Gestão do Conhecimento que apreenda todos esses aspectos. Esse estudo contribui por delinear aspectos a serem contemplados em modelos de Gestão do Conhecimento holísticos de forma a permitir que essa temática considere toda a complexidade inerente ao ambiente organizacional.

PALAVRAS-CHAVE

Gestão do conhecimento. Abordagem holística. Modelos de gestão do conhecimento.

1 Introduction

In previous decades the economic paradigm was oriented towards the production of tangible goods, either by men action in agriculture or factory production. The different aspects that have propelled this paradigm, oscillate between organizational, financial and productive characteristics, among others (CRAWFORD, 1994; PEREIRA, 1995; TOFFLER, 1998; SVEIBY, 1998; HOBBSAWM, 2015; CORRÊA; RIBEIRO; PINHEIRO, 2017) and, later, the economic paradigm changes for intangible goods.

The information explosion, the changes in society, the importance of the individual as a generator of revenues and no more of costs (SVEIBY, 1998; DRUCKER, 1998; MACEDO *et al.*, 2017), among other events, led to the recognition of people as knowledgeable beings and effective collaborators of organizational success. This was not only the contribution arising from muscular work, but for the learning and employment potential of the individual cognition in favor of business success.

Consequently, information and knowledge oriented approaches are started and, instead of the theoretical discussions, technological and scientific developments in various fields, Knowledge Management (KM) manifests itself as a human knowledge focused thematic in the organizational context, based on the inviolability of the knowledge, and therefore in the enclosure in which this asset is established: the knowing individual.

Since then, several approaches directed to the subject have proliferated in academia. The evolution of these discussions, fostered by areas such as administration (SILVA, 2015), Computer Science (PAIVA, 2011) and Information Science (SILVA SEGUNDO; ARAÚJO; DUARTE, 2017), among others, raised the KM to a high level interest, due to the new intangible economy and the recognition of man as an essential member of the business success.

The KM assaults in the organizational context, the learning and the theoretical reflections regarding the inherent complexity of the companies, stimulated the maturation of this theme that, in its first institutional interventions was based strictly on technology (SNOWDEN, 2002; BELLEFROID, 2012; APO, 2013). Recognizing organizations as complex environments, imbued with human, technological and cultural factors, has shattered the technological perspective employed by KM and dissolved it into an intricate mix of components that interact with and affect each other.

Thus, the hosting of new components along the KM journey, such as people, structure, infrastructure, organizational culture, leadership types and the relationship with

other approaches, such as lead and competitive intelligence, innovation and organizational learning, guided the Academy for the need to orchestrate such elements, their interactions and mutual interference, and to subsidize an application of KM in the organizational sphere, giving rise to what is called a KM model.

These models, also characterized as structures or frameworks, consist of a schematic representation that elucidates the main elements of KM and its interfaces (WEBER, 2002; HEISIG, 2009), each with one or more elements that add complexity and extend the scope of this field.

Since the beginning of KM, such models have been identified; however, like KM itself, the structural propositions began to admit greater complexity. An example of a KM model is that of Nonaka and Takeuchi (1997), who propose to express how knowledge conversion occurs in Japanese companies. Dated from what is understood as the second generation of KM (CARRILLO, 2006, APO, 2013), the model is based on the interaction between the types of tacit and explicit knowledge and focuses on the relationship between them for innovation.

In Brazil, Teixeira Filho (2000), from a broad perspective, related the dimensions of technology, knowledge and organization, while Angeloni (2002) represented KM from the point of view of infrastructure, people and technologies. Terra (2001, 2005) proposed a model emphasizing organizational levels and other elements such as human resources policies, culture, organizational structure and technology. Several other models of different nationalities are identified, such as Probst, Raub and Romhardt (2002), Choo (2003), Lin (2007) and Mehta (2008).

A holistic approach results in contemplating the whole as a counterpoint to the reductionist approach, which considers only the parts (PEREIRA, 2002). According to the results of the studies by Holsapple and Joshi (1999), Rubenstein-Montano et al. (2001) and Heisig (2009), there is a need for a model that holistically grasps the KM, ie, does not undertake isolated efforts in a single dimension (HEISIG, 2009). However, the characteristics that the new structural propositions (models) should address in order to cover the complexity of KM with a view to a totalitarian approach were not highlighted. Thus, it becomes relevant to investigate which aspects should be considered in KM models towards a holistic approach.

Considering that a model is proposed to manage knowledge and there are a representative number of structures proposed for the same purpose, the following question emerges: which aspects should be covered in new KM models towards a holistic approach? In search of answers to this question, this research is structured in five parts, besides this

introduction, namely: methodological procedures (section 2), which outlines the methods adopted to conduct this research; section 3, which deals with aspects from the analysis of KM models; results (section 4) that consolidate answers to the research problem; final considerations (section 5), which ends this study and presents the limitations and suggestions of future research; and the references (last section) used in this research.

2 Methodological Proceedings

This research is characterized by its exploratory nature, bibliographic research technique and qualitative approach. Faced with the establishment of the research question, Cervo, Bervian and Silva (2002) recommend the exploratory nature when there is little knowledge about the problem. In the case of this research, which aims to identify which aspects should be contemplated in new KM models towards a holistic approach, the exploratory nature is adequate to seek a response to this nuanced questioning.

The bibliographical research technique makes use of scientific articles, books, among other means and media, which guides the resolution of the problem to be investigated (BARROS; LEHFELD, 2007). Thus, this technique considers what other studies have said about a particular subject (MASCARENHAS, 2012). As a consequence of the established problematic, the exploratory nature and the research technique used, the qualitative approach is used to allow the capture of meanings and to provide depth in the analyzes (GIL, 2002).

To determine the literature sample that will be the research corpus for analysis, SCOPUS based research was done to identify recently proposed KM models. This database was selected as "the largest database [...] including scientific journals, books and conference proceedings, covering research topics in all technical and scientific disciplines" (SCOPUS, 2018). This search was conducted by a research applied in the title or keyword, considering the descriptors "knowledge management proposal" or "knowledge management model" or "knowledge management framework" and its variations for the English language. The articles resulting from the research were analyzed in order to evaluate if they have the descriptors and if, in fact, they present KM models. In addition to these articles were added books that present KM models, selected for being owned by the researchers of this study, as well as other texts of previous knowledge of the authors of this manuscript and also coming from the literary references of the analyzed models.

The establishment of the bibliographic source was followed for the analysis of the works, considering the following categories of analysis: i) justification for proposing the model: aims to capture the arguments of the author of the KM model that subsidize its

proposal; and ii) support theories for the construction of the model: aiming at identifying the theoretical baggage that conform the proposed model, being this delimitation guided by the fact that the KM is approached by several research fields. Both tend to underpin the identification of aspects that tend to drive KM models to a holistic approach.

The analyzes, as well as the texts that compose them, are explained in the following sections by the following perspectives: limitations, classifications and theories supporting the KM models. The outlook are a consolidated analyzes of the works and represent the issues to be addressed in new approaches aimed at contemplating KM in its entirety.

3 Development

This section aims to expose the development of three perspectives that tend to respond to the problematic of this research, these coming from analyzes on KM models and studies. The limitations of KM models (section 3.1) show weaknesses of existing models from the perspective of researchers who propose new frameworks to manage knowledge. The classification of KM models (section 3.2) expresses gaps in the frameworks that adhere to the identified classification scheme. KM support theories (section 3.3) demonstrate the complexity of KM and the theoretical input of other areas of study in this field.

3.1 Limitations of Knowledge Management Models

The expressive quantitative KM models fostered the academic interest in analyzing such structures in order to identify limitations present in these propositions. Some of these limitations are discussed in this section, through Terra (2001, 2005), Grotto (2002), Wong (2005), Karente *et al.* (2009), Magalhães, Dalmau and Souza (2014), Castillo and Cazarini (2014), Pons *et al.* (2014), Fivaz and Pretorius (2015), García-Fernández (2015) and Moscoso-Zea *et al.* (2016).

The literature review presented by Wong (2005) analyzes several models and signals fragilities present in twelve structures, leading to the conclusion that such proposals are not suitable for small and medium enterprises and are commonly developed for large organizations. Absence of knowledge-oriented phases, neglect of aspects such as culture, incentive systems and rewards, assumption of abundance of organizational resources and technological focus are some identified limitations.

In mentioning the work of Nonaka and Takeuchi (1997), the types of tacit and implicit knowledge are treated as synonyms, and this event is repeated by Magalhães, Dalmau (2001) and Grotto (2002) and Souza (2014) when discussing the work of Choo (2003). From another perspective, Moscoso-Zea et al. (2016) point out that previous models were not clear about the implementation of KM, considering all their dimensions and, therefore, propose a model of their own; however, equates tacit to implicit knowledge.

Pons *et al.* (2014) present KM framework for Information Technology project teams and, in order to subsidize the proposal, elucidate weaknesses in three models, such as the lack of detail of activities and tools inherent in the processes elucidated and the absence of type distinction of knowledge.

The proposal of the García-Fernández process model (2015) is based on phases obtained through the examination of several frameworks. The observance of such structures promoted the exposition of limitations present in four models, which refer to the absence of a description of how to store, transfer, promote and implement knowledge in organizations.

Fivaz and Pretorius (2015) propose a procedural KM framework within the manufacturing sector. Throughout the study the authors elucidate limitations of five models, which indicate the treatment of some types of knowledge as equivalent, focus too much on specific step of KM and absence of the feedback phase. The abovementioned limitations are presented in Chart 1.

Chart 1. Limitations of Knowledge Management Models

Author	Model	Limitation
Corrêa <i>et al.</i> (2017)	Terra (2001, 2005), Grotto (2002), Magalhães, Dalmau, Souza (2014) and Moscoso-Zea <i>et al.</i> (2016)	Types of tacit and implicit knowledge treated as synonyms.
Wong (2005)	Lee and Yang (2000)	Incomplete for not presenting the stages of application and use of knowledge, as well as the elements of culture and strategy. Limited scope and does not specify "how" to implement KM.
	Gore and Gore (1999)	It presents few considerations about organizational needs, transfer of knowledge and measurement of results. Limited scope.
	Wiig (1997)	Precisely oriented to large companies as it assumes plenty of human, financial, time, knowledge and experience.
	Holsapple and Joshi (2002)	Insufficiency in describing "how" to implement KM.

	Wiig, De Hoog and Van Der Spek (1997)	Lack of sound guidelines leading to the initiation or implementation of KM.
	Jarrar (2002)	Precisely oriented to large companies, as it enumerates several specific positions for KM.
	Apostolou <i>et al.</i> (2000), Mentzas (2001) and Mentzas <i>et al.</i> (2001)	Precisely oriented to large companies, because it assumes the implementation of the KM in its completeness throughout the organization.
	McCampbell, Clare and Gitters (1999)	It presents technological focus, neglecting aspects such as culture, motivational factors, rewards and incentive systems.
	Rubenstein-Montano <i>et al.</i> (2001)	Complex structure with extensive documentation. In addition, it presents the system of motivation and reward early in the strategy phase.
	Apostolou and Mentzas (1998)	Absence of the phases of application and use of knowledge.
	Lai and Chu (2002)	Precisely geared towards large companies.
	APQC (1999)	It does not determine the types of knowledge to be managed by the model.
Pons <i>et al.</i> (2014)	Nonaka and Takeuchi (1995)	It does not detail the activities, inputs, outputs, techniques and tools to be used in each process.
	Wiig (1994)	It does not distinguish cognitive and real knowledge.
	Bridge (1999)	It does not distinguish cognitive and real knowledge.
Fivaz and Pretorius (2015)	Nonaka, Toyama and Konno (2000)	Focus on knowledge creation, neglecting the rest of the KM cycle.
	Alavi, Wahab and Muhamad (2010)	Although comprehensive, it does not detail the types of knowledge and mechanisms to be used in the process, as well as does not present KM activities.
	Holsapple and Jones (2005)	KM activities are perceived as sequential and without <i>feedback</i> and treats types of knowledge as similar.
	Kamhawi (2010)	Focus on the activity of knowledge sharing and does not present the mechanisms for the KM.
	Diakoulakis <i>et al.</i> (2004)	Different types of knowledge treated as analogues.
García-Fernández (2015)	Kim (1993)	Focus on knowledge creation only by individuals. It does not show how knowledge can be stored and transferred.
	Nonaka and Takeuchi (1995)	The creation of knowledge, from where

		knowledge originates and how it can be applied within the organization, is not concentrated on encouraging conditions.
	Crossan, Lane and White (1999)	It does not describe how to promote the exploration and implementation of knowledge.
	Senge (1990)	It does not address how disciplines can be achieved.

Source: The authors, from Wong (2005), Pons *et al.* (2014), Fivaz and Pretorius (2015), García-Fernández (2015) and Corrêa *et al.* (2017)

In analyzing Table 1, studies that present such limitations point to models dating to the twenty-six-year range, ranging from Senge (1990) to Moscoso-Zea et al. (2016). Although some findings, such as García-Fernández (2015) regarding the study of Nonaka and Takeuchi (1995), may be challenging, such evidence is useful to highlight that KM still needs a more vigilant approach to these aspects.

In time, some other studies explore weaknesses in the KM model and, although they do not mention which proposals present such limitations, these references are still relevant for reflection.

For Karente *et al.* (2009) one of the imperative points of management is planning, which considers the establishment of objectives for its subsequent attainment. In this regard, planning must be carried out before conducting KM activities, and although several model proposals have cited this activity, it has not been treated as a central aspect (KAREMENTE *et al.*, 2009).

Castillo and Cazarini (2014) indicate that the focus on technology, failure to follow the cultural and human factors, lack of alignment organizational strategies, fragmented modeling between implementation and development, lack of detail, as well as design models without methodological basis, emphasize limitations inherent in academic propositions.

In the view of Moscoso-Zea *et al.* (2016), although several proposals have been based on solid theories, they have not been detailed in order to specify how to implement them in practice, and they do not cover all dimensions of KM. These records highlight limitations in the existing models and point out points to be considered by researchers who propose to develop new KM models.

In continuity, the perspective of classification of KM models, exposed in the next subsection, tends to subsidize the composition of a more effective response to the aspects to be contemplated in new propositions of knowledge-oriented frameworks, considering a holistic approach.

3.2 Classifications of Knowledge Management models

Some researchers were devoted in an attempt to classify the significant amount of dispersed models in the literature, to identify segments in which the proposals are based. Research by Holsapple and Joshi (1999), Rubenstein-Montano et al. (2001), Heisig (2009) and Fteimi (2015) are some examples of scholars who have committed themselves in such a feat.

Holsapple and Joshi (1999) analyzed 10 KM models and classified them into two categories, namely: a) descriptive: they characterize, or describe, the constituent elements of KM, being broad, contemplating several elements, or specific, addressing one or some elements; b) prescriptive: prescribe procedures (tasks) to promote KM without specific details of how they can, or should be performed.

Some descriptive models categorized by the authors include: i) broad: the model of the Wiig (1994) KM and knowledge organizations of Choo (1996); and (ii) specific: the Nonaka knowledge conversion model (1994) - later expanded in Nonaka and Takeuchi (1997) - and the intangible assets of Sveiby (1998). By prescriptive model we have the eight phases of KM of Beckman (1997).

The understanding of Holsapple and Joshi (1999) in relation to "model" considers frameworks that somehow treat knowledge, either by its process of creation (NONAKA; TAKEUCHI, 1997), use (CHOO, 1996) or valuation (SVEIBY, 1998). As a result, each model has different elements; however, no proposal overrides the other, leading to the need to develop a comprehensive and unifying model (HOLSAPPLE; JOSHI, 1999).

Subsequently, Rubenstein-Montano et al. (2001) studied 26 models, aiming to present suggestions of elements that a framework should encompass. One of the analyzes carried out considers the descriptive and prescriptive framework proposed by Holsapple and Joshi (1999). Rubenstein-Montano et al. (2001) indicate that many prescriptive structures neglect aspects of KM due to the focus on tasks, and the descriptive ones do not commune to a consensus on the elements to be considered in a comprehensive framework.

The authors expose a new category called hybrid, which represents a combination of the previous classifications. The model of Holsapple and Joshi (1998) is an example of this category which, according to Rubenstein-Montano et al. (2001) is a path to a holistic structural approach. The study pointed out the strengths and weaknesses of the models analyzed and pointed out the need for a hybrid unifying model.

After eight years of study by Rubenstein-Montano et al. (2001), Heisig (2009) examined 160 KM models from different countries - records the absence of Brazilian models - considering the descriptive and prescriptive framework proposed by Holsapple and Joshi (1999), and the hybrid type, exposed by Rubenstein-Montano et al. (2001). Heisig (2009) extended the characterization of hybrid models as being a combination of the previous types, which should guide, according to Weber (2002, p.4, authors' translation) "how things should be done".

As a result, the study corroborates the lack of consensus regarding the epistemology of knowledge in the models analyzed, emphasizes the need for a holistic approach and considers the efforts in approaches that include isolated elements insufficient. They also point out a certain homogeneity in dimensions and processes of knowledge manipulation and point out the importance of the models for systematizing the KM efforts.

Recently, Fteimi (2015) analyzed 74 KM studies and classified them to represent the domain of this subject. The author justifies that this effort tends to provide scholars with the focus of the studies in KM and to point out relevant topics to the new researches. As a result, a classification scheme is proposed that comprises seven categories and summarizes the foundations explored by the academy about KM.

Among the seven categories, one specific is oriented to the frameworks, being called Knowledge Management Frameworks and Models. Fteimi (2015) used the categories presented by Lloria (2008) regarding orientation, amplitude and origin, and expanded the latter adding the business type, which encompasses concrete organizations that implement and evolve KM models.

Within the category "breadth" of Lloria (2008) are situated descriptive ratings and prescriptive models presented by Holsapple and Joshi (1999), and the hybrid type Rubenstein-Montano et al. (2001). The latter type is fragmented into specific and broad, as well as into the descriptive models that, according to Fteimi (2015), are justified to the detriment of the large number of prescriptive models available.

In summary, the descriptive model describes the features and elements of KM, while the prescriptive establishes tasks without specific detail of how these are or should be performed; both can be broad or specific. The hybrid type incorporates the two previous classifications and points out "how things should be done" (WEBER, 2002, page 4, translation by the authors); nevertheless assumes the weaknesses of both.

The models analyzed by the previous studies are framed in three classifications that, in essence, indicate the incompleteness of the frameworks they cover. To clarify this

statement, Chart 2 presents the classifications and signals these gaps.

Chart 2. Classifications of Knowledge Management models

Category	Orientation	Action	Gaps	Author
Descriptive	Characterize or describe.	Describe the main elements, broadly or specifically.	It can be specific and limit the essential description of relationships, without emphasizing how to do them.	Holsapple and Joshi (1999)
Prescriptive	Establish procedures.	To contemplate the procedures for the promotion of KM without detail .	It does not inform (details) how such procedures can or should be performed.	Holsapple and Joshi (1999)
		They can be specific or broad.		Fteimi (2015)
Hybrid	Describe and establish procedures for "how things should be done".	The sum of the descriptive and prescriptive categories.	It takes on the shortcomings of previous categories, which may be specific or broad and, although it raises "how tasks should be done", does not necessarily detail such procedures.	Rubenstein-Montano <i>et al.</i> (2001), Weber (2002) and Heisig (2009)

Source: The authors, adapted from Holsapple and Joshi (1999), Rubenstein-Montano *et al.* (2001), Weber (2002), Heisig (2009) and Fteimi (2015)

While the descriptive type characterizes the main elements of KM, in the whole (largely) or in part (strictly), it leaves a gap on how to implement such actions. The descriptive type gap is filled by the prescriptive category, which elucidates procedures (tasks) for KM promotion; however, without specific details of how procedures should or can be performed, even if such prescriptions are extensive or restricted.

The specific non-detailing of the procedures assumed by the prescriptive type elucidates a shortcoming of this categorization, which is not necessarily fulfilled by the hybrid category, since it somatises the previous two - descriptive and prescriptive - , maintaining the essential properties that constitute them. Therefore, the models analyzed in the studies of Holsapple and Joshi (1999), Rubenstein-Montano *et al.* (2001), Heisig (2009) and Fteimi (2015) tend to present gaps regarding categorizations, even if they are of the hybrid type.

Although the classifications of the models allow a visualization that segments them in a perspective on the KM approach, the categorizations highlight the deficiencies of the

structures and assume, in essence, gaps that distance them beyond the taxonomic characteristics that distinguish them. Therefore, another perspective shows that the KM could absorb some theories for a better and consistent approach to other currents studied, which are contemplated in the following subsection.

3.3 Support theories to Knowledge Management Models

The intricate relationship between science, technology, and society overflows on business by generating a two-way relational flow between these elements. Companies are individuals, technological articles and scientific advances. Society is influenced by technology and science. Therefore, science evolves by means of studies related to society, business and technological advances.

In this relational complex scientific advances, in emphasis those arising from the last decades, are driven by a body of knowledge that aims to explain order to the facts of the world. These advances are contemplated in this section, from the perspective of theories, which constitute a set of principles of science that seek to search and explain facts of reality (MARCONI, LAKATOS, 2003).

Theories aiming then to approach reality through scientific principles, are proposals from various points of view. This is because, to study a certain phenomenon, science must delimit aspects to which a theory is oriented, focusing on what it is intended to deal with (MARCONI, LAKATOS, 2003). Thus, the theory of Chaos, Fractais, Fuzzy Logic and Complexity (TORRES; GÓIS, 2011) are some examples of the advances arising from the recent science.

Due to the immersion of KM in the organizational context, some theories are proposed as alternatives to be considered in the models of this theme. Among these, the General Theory of Systems, Complex Adaptive Systems and the approaches related to inter and transdisciplinarity are some of the ones recorded in the studies of Holsapple and Joshi (1999), Rubenstein-Montano et al. (2001), Snowden (2002), Scholl et al. (2004), Heisig (2009) and Bem, Coelho and Dandolini (2016), which are presented in this subsection.

Sommerman (2005) reflects that, as a consequence of a reductionist process, in which science seeks to understand the whole by understanding its parts, the sciences were segmented as provinces of a continent that constitutes its amplitude, segmenting knowledge into areas of knowledge , or disciplines, in search of analysis and understanding of such provinces for synthesis and consolidation of the continent.

However, studies that contemplate KM in a disciplinary way tend to disregard other relevant aspects. Empirical example of this assertion is found in the first generation approaches of KM, in which the treatments were strictly oriented by the technological aspect, disregarding human and behavioral aspects (EARL, 2001; CARRILLO, 2006; APO, 2013). Strictly technological approaches are still frequent and can be seen in the frameworks of Cob et al. (2015) and Xiaobo, Jinglong and Xiao (2015).

Under the disciplinary foundation is established multidisciplinary, interdisciplinarity and transdisciplinarity. The multidisciplinary comprises the teaching of the sciences in a compartmentalized way, in which the disciplines are treated separately in relation to the others and without cooperation (COIMBRA, 2000 ; SOMMERMAN, 2005; BERNEISTEIN, 2014), this being a characteristic of KM signed off by Francini (2002), Silva and Rozenfeld (2007) and Castillo and Cazarini (2014), who highlight.

KM is characterized by its multidisciplinary approach, covering areas such as organizational science, cognitive science, information technology, communication science, sociology, anthropology, psychology, among other disciplines. (CASTILLO, CAZARINI, 2014, p.145, translated by the authors)

Although disciplinary, scientific advances in each area contribute to KM. The frameworks of Cob et al. (2005) and Xiaobo, Jinglong and Xiao (2015), mentioned above, although strictly technological, collaborate with the current knowledge management centered on Information Technology and led by American companies (LLORIA, 2008). Such contributions are adherent to KM because it considers technology a means for its promotion.

On the other hand, interdisciplinarity assumes the relation and interaction between the disciplines that implies effective co-ordinated cooperation, involving a common object, resulting in new knowledge through the fusion of disciplinary knowledge specific to the parties, which differentiates it from the multidisciplinary approach, that does not assume such relation, since the disciplines are contemplated separately. (COIMBRA, 2000; SOMMERMAN, 2005; ALVARENGA; SOMMERMAN; ALVAREZ, 2005).

One of the contributions to KM can be absorbed by Bernstein's (2014) perception of the epistemology of knowledge. Bernstein (2014) points out that by promoting interdisciplinarity on knowledge-based studies, a new unit is expected to be able to contemplate knowledge in its entirety, reducing the gaps and disciplinary fragmentations that lead to heterogeneous proliferations, often confusing, on the epistemology of knowledge.

Thus, once the relationships and interactions between KM dimensions in the organizational context are recognized, the interdisciplinarity perspective emerges as a possible approach for cooperation between the parties (disciplines), and this perception is pointed out

in the results of the study on the future of KM, developed by Scholl et al. (2004), along with 45 experts in the area of KM, and by Heisig (2009), noting that KM research and practice is also driven by cross-disciplinary cooperation.

The specialists present in the study by Scholl et al. (2004) also suggest that transdisciplinary approaches would benefit KM. Corroborating with Scholl et al. (2004), Lloria (2008) states that each research field provides important information on one aspect of KM, but no single field translates an integrative structure (model) and transdisciplinary studies are needed.

While interdisciplinarity is established as a proposal for coordinated and cooperative interaction between disciplines, transdisciplinarity evokes such integration with expressive intensity that it is no longer possible to distinguish between the boundaries between the disciplines (ALVARENGA; SOMMERMAN; ALVAREZ, 2005).

In other words, it consists in the fusion of the knowledge of different areas of knowledge and the sharing of its methods towards what can not be achieved through isolated disciplinary negotiations (DOMINGUES, 2005). Therefore, it transcends interdisciplinarity through the intense interweaving between disciplines and the rescue of the past, before the reductionist process (SOMMERMAN, 2005).

It is imperative to emphasize, as pointed out by Coimbra (2000), that whatever prefix is adopted for disciplinarity (multi, inter or trans), none of these preach the termination of disciplines. It is proposed, in a way, a link between the knowledge contained in their specific scientific fields. Each discipline acts with determined focus on a body of study; however, we hope these will do the same collaboratively in order to understand the totality of knowledge; which for the KM, would tend to the evolution of its modeling approaches (frameworks) towards its integrality.

Another aspect that supports KM support theories is the inherent interfaces to the orbital elements of the surrounding disciplines. The dimensions people, culture, technology, organizational learning, tools such as formal and informal meetings, mentoring and coaching, as well as the processes of creation, dissemination, storage, transfer of knowledge, constitute the elements of disciplines that interact with the KM and generates a complex environment that demands orchestration.

While Alvarenga, Sommerman and Alvarez (2005) reflect, from the perspective of interdisciplinarity, that complex problems require a holistic view, Holsapple and Joshi (1999) and Rubenstein-Montano et al. (2001) have already pointed out that a suitable approach to provide a holistic view of KM is the need for a hybrid unifying model, based on systemic

thinking.

The systemic thinking is based on the General Theory of Systems (TGS), proposed by the German biologist Bertalanffy (1972), which assumes three properties: 1) the behavior of each member of the set affects the behavior of the whole set; 2) properties and behavior of each member influences the whole and is influenced by properties and behavior of, at least, one member; and 3) all subgroups inserted in the set have the above properties.

For example, the organs of the human body influence the functioning of the human system as a whole (1), and the behavior of the heart is influenced by the behavior of the lung and influences the other organs (2) and the nervous and respiratory subsystems interact and affect the totality understood by the human system (3).

Therefore, to guide KM models in Bertalanffy's (1972) systemic thinking is to assume that dimensions (people, technology, culture, organizational learning and others) interact and influence each other and affect organizational wholeness, which tends to guide proposed frameworks for a holistic view of the organization.

Another theory of support includes the Complex Adaptive Systems (SAC), which can be perceived by the TGS abstraction. A system can be understood as "a group of interrelated elements in order to compose a unit or totality. (PICKERING, 2012, p. 518), being adherent to TGS. However, the SACs admit the terms adaptive and complex.

Adaptive is the system's ability to adapt to changes from the environment (PICKERING, 2012), and by complex, we rescue Morin (2005), by mention that the whole is greater than the sum of its parts. In this perspective, to approach the whole by the section of its parts (reductionism) infers in the loss of characteristics of the system and implies in recognizing the diversity and the numerous interactions between the parts (SILVA; REBELO, 2007), conferring complexity by the treatment of the complete.

In SAC theory, adaptive capacity to environmental changes is carried out through the adaptive agents existing in the system, which follow a set of rules (STACEY, 1996) for their behavioral and system improvement as a whole. Thus, to consider an agent, as adaptive, "its actions must add value to the system over time" (SILVA; REBELO, 2007).

In the organizational context, it would be to recognize people as agents who organize themselves and adapt to the changes in the environment (MCELROY, 2002). Therefore, the complex is to consider the interactions between the various agents (the whole) and the characteristics of such interactions, in which the agents affect each other and the environment (system) itself.

In this context, two proposed KM models are presented as being related to the SACs. Snowden (2002) proposed a sense-building model, called Cynefin (Welsh term, pronounced kun-ev'in) in which the author recognizes complex thinking.

Snowden (2002) states the human systems as constituted of individuals that interact and promote changes, it is not possible to analyze cause and effect, as these are inseparable by being interwoven in these systems. For example, rumors of organizational restructuring affect the cognitive field of the individual that tends to promote changes in other individuals through interaction and, consequently, affect the environment (system).

Thus, the individuals of an organization are the agents that interact with each other and constitute a supra system (STACEY, 1996) , called organization, and such interactions influence both agents and subsystems and therefore the organization as a whole. The cause of a certain change in the behavioral field of the agents and their effects can not be dissociated, since they are connected by the complexity of the interactions (SNOWDEN, 2002).

Another association is presented by Bem, Coelho and Dandolini (2016), who express a KM model for university libraries, based on the SACs. The proposal is driven by the attempt to recognize the complexity in this context, implying in assuming its existence and coexistence instead of ignoring or discarding it. The authors' proposal is to understand university libraries from the perspective of SACs , assuming that, in this context, the KM needs a broad approach that can contemplate libraries in their totality, considering the individuals, purpose and resources inherent to this context.

In both of the above approaches there is recognition of the complexity and acceptance of the need to live with it without reducing it in parts. Thus, in questions related to the behavior of agents (individuals), such behavior emerges from the interaction between people and cannot be analyzed by the attempt to understand only one individual (reductionism), and it is necessary to approach the whole.

Theories or approaches, described earlier, are highlighted in KM studies of Scholl et al. (2004), Heisig (2009), Holsapple and Joshi (1999) and Rubenstein-Montano et al. (2001) and used in the Snowden (2002), Bem, Coelho and Dandolini (2016) and Silveira (2012) models. These are shown in Chart 3.

Chart 3. Support theories to Knowledge Management Models

Theory or approach	Studies that contemplate it
Inter and trans-disciplinarity.	Scholl <i>et al.</i> (2004) Heisig (2009) Silveira (2012)

General System Theory (TGS).	Holsapple and Joshi (1999) Rubenstein-Montano <i>et al.</i> (2001)
Complex Adaptative Systems (SACs).	Snowden (2002) Bem, Coelho and Dandolini (2016)

Source: The authors.

All theories related in Chart 3, among others, are covered, according to Torres and Góis (2011), by the theory of complexity and are distinguished by the amplification of the characteristics that constitute them. While TGS (BERTALANFFY, 1972) assumes the relationship of interdependence between the elements of the system, the SACs (Stacey 1996) raise this perception by showing that such systems adapte to the context, by means of its agents and other components.

Inter and transdisciplinarity, discussed by thinkers such as Coimbra (2000), Morin (2005), Alvarenga, Sommerman and Alvarez (2005), Domingues (2005) and Bernstein (2014) assume interdependence between systems and contribute to the understanding that the world is so complex that there is an inability to understand the whole (broader system) by the reductionist paradigm, it is necessary to accept the complex, to recognize the existence of inherent knowledge of its completeness, and therefore to study the whole in its entirety, aiming at the ransom of the holistic.

4 Results

The significant number of KM models identified in the literature over the years - in evidence the 160 models analyzed by Heisig (2009) - , and the need to reflect the KM in totalitarian form in organizations, guided the question: which aspects should be included in new KM models towards a holistic approach? As an alternative to the search for answers, three perspectives were identified in KM studies and, for each one of them, the mentioned aspects will be highlighted.

The perspective of limitations of KM models presented reports of several studies that point out fragilities present in structures over twenty six years. In this regard, a possible inference for the emergence of new frameworks is the researchers' attempt to override such limitations by means of new propositions, guided by more vigilant approaches to such frailties. Therefore, in view of such limitations it is possible to infer that there is a need for structures that

- i. distinguish between types of knowledge in order to avoid inconsistent analogies or the non-identification of the type to be managed (WONG, 2005;

- PONS *et al.*, 2014; FIVAZ; PRETORIUS, 2015; CORRÊA *et al.*, 2017);
- ii. present the planning activity and the KM cycle, allowing visualization of the phases in order to elucidate how knowledge is created, stored, transferred or shared, applied or used, as well as the mechanisms that can be used in each process (KAREMENTE *et al.*, 2009; WONG, 2005; FIVAZ; PRETORIUS, 2015; GARCÍA-FERNÁNDEZ, 2015);
 - iii. contemplate issues related to motivation and reward, as well as the various dimensions of KM (culture, strategy, technology, people, etc.), expanding the scope of the proposal (WONG, 2005; CASTILLO; CAZARINI, 2014; MOSCOSO-ZEA *et al.*, 2016);
 - iv. present guidelines that discuss "how to" initiate and implement KM (WONG, 2005; CASTILLO; CAZARINI, 2014; MOSCOSO-ZEA *et al.*, 2016);
 - v. can be implemented in institutions of different sizes, considering aspects such as financial investments, time, team for KM, among others (WONG, 2005);
 - vi. contemplate a simple structure, based on a methodological basis and to consider the measuring results (WONG, 2005; CASTILLO; CAZARINI, 2014).

Although there is a quantitative representation of KM models, they have limitations, and from this perspective the proposition of new structures can be justified by the attempt to override such limitations. Therefore, it is possible to consider that new models are developed with attention to these fragilities in order to allow the KM to move toward a holistic approach.

The perspective of classification of KM models exposes a schematization of the types of models and, among the studies analyzed by this research, the descriptive, prescriptive and hybrid classifications indicate gaps in the frameworks that can not be cured within these types. This is because the classifications assume, in essence, the limitations of the models.

Descriptive models characterize the main elements of KM but do not say how to operationalize them, while the prescriptive ones do; however without detailing. The hybrid type presents as a junction of the previous ones, adding up its fragilities. Although, in the first instance, it may seem more complete, the hybrid type is still deficient because it inherits not enough detail for the KM prescription and because it can be specific, not considering the several areas that surround knowledge management.

Thus, like the perspective of limitations of the models, the classifications elucidate gaps inherent in the categories themselves. Therefore, it is possible to infer that new propositions of KM structures can be justified by seeking to heal existing gaps in such categories, and may lead to a new category that, in fact, contemplates the gaps of the previous

ones. These aspects allow the KM to be elevated to a level of comprehension and prescription sufficiently detailed and with greater amplitude, regarding the dimensions to be contemplated and, consequently, to lead the KM to a holistic approach.

Therefore, given the proposed classifications and the gaps that such segmentations represent, it is possible to infer that a KM framework must assume the potentialities of these categories and exhaust their deficiencies. Thus, new propositions should:

- i. be widely descriptive (HOLSAPPLE; JOSHI 1999), in order to show the relations between the elements that constitute the KG in its completeness, or as close as possible to its completeness;
- ii. be extensively prescriptive (FTEIMI, 2015) in order to highlight "what" could or should be carried out, with specific details of such procedures;
- iii. to assume the characteristics set forth in items i and ii, above, and to elucidate "how" (WEBER, 2002; HEISIG, 2009) such procedures could, or should, be carried out.

Although such potential can be perceived as complex to be achieved, the challenge for new frameworks is mister, since it would result in raising the KM to a new level in their holistic descriptions and prescriptions.

The perspective of theories supporting the KM models elucidates the various challenges posed for a new science, which aims to address the complex as a counterpoint to reductionism. Thus, it is possible to consider the need to contemplate KM in its entirety, in order to consider the complexity, present in TGS, SACs, inter and transdisciplinarity. This, in order to promote holistic KM, awareness and coexistence of what is complex, allowing to approach it rather than fragment or disregard it.

On the records of studies that indicate the need to address KM through the eyes of other theories, one may infer that new proposals models could consider:

- i. to address KM in its completeness (Scholl et al., 2004; Heisig, 2009), considering the dimensions that surround it and the interactions inherent to them;
- ii. to recognize the interdisciplinarity (LLORIA, 2008; SILVEIRA, 2012) and to consider the sum of knowledge among the disciplines, aiming to contemplate reality in its integrality;
- iii. (SNOWDEN, 2002; BEM, COELHO; DANDOLINI, 2016) present among the KM elements (dimensions, tools and processes).

Completeness (i) aims to consider the whole that is known, since new elements can be inserted into the KM and new interactions can arise. Thus, recognizing and considering

interdisciplinarity (ii) raises the issues of several disciplines and researchers, and new knowledge can emerge and recognize new elements and their interactions, aiming at the whole (i) which, at first, may not be perceived and, therefore, not contemplated. Thus, the maturity obtained by previous discussions (i and ii) tends to clarify the complexity that must therefore be recognized and dealt with in its breadth (iii).

5 Final Thoughts

This study aimed to identify aspects to be considered in new KM models to lead this theme towards a holistic approach in organizations. These aspects were inferred through three perspectives: 1) analysis of KM models, which consider limitations in existing frameworks; 2) analysis of classification structures of models, which reveal gaps present in the classificatory structures themselves; and 3) support theories, which show currents to be adopted in the KM for a holistic approach.

It is believed that the related aspects can be useful to guide the development of new models. This is because a KM model intends to manage knowledge and must consider various organizational aspects (people, technologies, organizational culture, top management support, among others) and attention to the aspects identified in this search tends to elevate the KM to a holistic approach and, consequently, to promote new research aimed at how to promote this holism.

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Although aspects have been identified through the analysis of articles and books, which makes relevance to the sources and traceability of the inferences made, this research has the limitation of not validating these aspects with the experts in KM. Thus, as a suggestion of future studies, it is considered the validation of these aspects as constraints to KM models towards a holistic approach in organizations. It is also suggested the analysis of existing models, in order to identify how, or to what degree, these are oriented to a totalitarian approach.

Reflections on KM models and some features, exposed in each perspective, may encourage the proposition of new models that converge to a structure that may in the future

be widely accepted or at least minimize the variations proposed towards a KM more cohesive and practicable in organizations, considering its full scope. Thus, another suggestion of future studies is to promote the development of a structure that demonstrates how to approach this totality, contemplating the aspects pointed out in this research and prescriptive characteristics (tasks) that can be put into practices in the organizations.

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