

# Theoretical overlaps between communication, information management and knowledge management in Information Science<sup>1</sup>

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## Abstract

Conceptual relationships amongst information communication, information management and knowledge management are discussed, with the aim of presenting a theoretical framework of these topics within the scope of information science. The discussion resulted from both the analysis of the literature and authors' reflexions upon readings and previous research works. Therefore, the article discusses epistemological aspects of information science as regard these issues. In this context, the interdisciplinary focus of the discussion allows approaching seminal authors from both information science and communication science, as well as authors from information and knowledge management. Throughout the discussion, models that illustrate approaches from the most relevant authors and researchers' theoretical constructions that show crucial conceptual relationships amongst the topics covered are presented. It is concluded that an approach which takes into account these relationships should be privileged in information science. It requires, in turn, the adoption of an associated approach of communication and management in different contexts. That is, communication and management studies in information science should take into account their conceptual overlaps, in the extent to which these are concepts whose approaches tend to be strongly associated in the area.

**Keywords:** Information Communication. Information Management. Knowledge Management. Knowledge Creation. Knowledge Sharing and Use. Epistemological Approach of Information Science.

## Resumo

As relações conceituais entre comunicação da informação, gestão da informação e gestão do conhecimento são discutidas, com o objetivo de propor modelo conceitual que ilustra imbricações teóricas entre comunicação, gestão da informação e gestão do conhecimento na Ciência da Informação. À luz da literatura e com base em reflexões dos autores, o artigo discorre sobre aspectos epistemológicos da Ciência da Informação no que concerne a essas questões. O foco interdisciplinar da discussão permite abordar tanto autores seminais da Ciência da Informação quanto autores da comunicação e da gestão da informação e do conhecimento. Ao longo da discussão são apresentados modelos que ilustram tanto as abordagens dos autores mais relevantes quanto as construções teóricas que mostram as relações conceituais crucias entre os temas abordados. Conclui-se que uma abordagem que leva em conta essas relações deve ser privilegiada na Ciência da Informação, o que, por sua vez, requer adoção de abordagem associada da comunicação e da gestão, em diferentes contextos. Isto é, estudos de comunicação e de gestão, na Ciência da Informação, devem

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<sup>1</sup> Translation in english of the article published in the journal *Investigación Bibliotecológica: archivonomía, bibliotecología e información*, Vol. 32, No. 74, Enero-Marzo 2018, available in <http://dx.doi.org/10.22201/iibi.24488321xe.2018.74.57923>.

levar em conta suas imbricações conceituas, na medida em que são conceitos cujas abordagens tendem a estar fortemente associadas na área.

**Palavras-chave:** Comunicação da Informação. Gestão da Informação. Gestão do Conhecimento. Criação do Conhecimento. Compartilhamento e Uso do Conhecimento. Abordagem Epistemológica da Ciência da Informação.

### Resumen

En este artículo son discutidas las relaciones conceptuales entre comunicación de la información, gestión de la información y gestión del conocimiento con el objetivo de proponer modelo conceptual que ilustra imbricaciones teóricas de la comunicación, la gestión de la información y gestión del conocimiento en la Ciencia de la Información. Con base en la literatura y la reflexión de los autores, el artículo discute aspectos epistemológicos de la ciencia de la información en relación con estos temas. El enfoque interdisciplinario permite abordar tantos autores representativos de la Ciencia de la Información, de comunicación, de gestión de la información y gestión del conocimiento. A lo largo de la discusión son presentados modelos que ilustran los abordajes de autores pioneros, así como las construcciones teóricas que muestran las relaciones conceptuales más importantes entre los temas presentados. Se concluye que un abordaje que considera las relaciones antes descritas deben ser privilegiadas en la Ciencia de la Información, lo que a su vez requiere una adopción de los abordajes asociados a comunicación y gestión en los diversos contextos, lo que implica que estudios de comunicación y de gestión en las Ciencia de la Información, deben tener en cuenta sus abordajes conceptuales, teóricos inherentes, en la medida que son conceptos cuyos abordajes tienden a estar formalmente asociados en el área.

**Palabras claves:** Comunicación de la información. Gestión de la Información. Gestión del Conocimiento. Creación de Conocimiento. Compartir el Uso del Conocimiento. Abordaje Epistemológico de la Ciencia de la Información.

## 1. INTRODUCTION

Since its beginning, Information Science has been studying matters concerning scientific communication as the core phenomenon of interest. It may have been because this discipline arose from the concern with the flows of information in science and technology by scientists, technologists, and documentalists, in the mid-20<sup>th</sup> century. However, throughout the past few decades, there has been a considerable expansion in the phenomena of interest in this area. In addition to the diversification of phenomena of interest, the contexts in which communication has been studied are also broadening. The widening of the focus in the studies of Information Science stem, hence, from the identification of these phenomena and contexts, which, in turn, requires new approaches.

Such a scenery does not seem to be clearly exploited in the studies of this area due to the lack of acknowledgment of this widening focus by certain theoreticians. Therefore, this paper aims to contribute to the enrichment of such discussions. These contributions concern the conceptual relationships observed between communication and management as phenomena of Information Science from its genesis. Hence, this paper aims to present a conceptual model illustrating theoretical overlaps between information communication, information management and knowledge management in Information Science. This research resulted in the identification and analysis of relevant and seminal authors in the area. As a result, a discussion dwells from the start on Information Science epistemological questions, which comprehend the nature of the area and information as the study object. A discussion follows on two central questions of the paper. The first concerns the dimension of communication under the view from the approach by Belkin<sup>2</sup> and other authors, not only in Information Science but also other areas. The second regards the understanding of knowledge and information management as phenomena of Information Science, from works by Brookes<sup>3</sup> associated with other authors. The conclusion presents, graphically, a

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<sup>2</sup> BELKIN [1978] N. Information concepts for information science. *Journal of Documentation*, v. 34, p. 55-85.

<sup>3</sup> BROOKES, B.C. [1980] The foundations of information science. Part I. Philosophical aspect. *Journal of Information Science*, n. 2, p. 125-133.

proposed theoretical model and the textual explanation of the conceptual relationships therein found.

## 2. EPISTEMOLOGICAL ASPECTS OF INFORMATION SCIENCE

The theoretical contribution adopted in this paper shows the input from scholars of Information Science for research grounds in the area, beginning with Borko<sup>4</sup> and the definition of Information Science. This author presented his definition from the analysis he made of Taylor's<sup>5</sup> work, which, in turn, reported on definitions and approaches resulting from discussions during congresses at Georgia Institute of Technology. However, despite the undeniable contribution from both the discussions at the congress, registered in its annals, as well as Taylor's work, in his article for the first volume of the Annual Review of Information Science and Technology (ARIST), Borko has been acknowledged as the other seminal – and still current – definition for Information Science. That is because, in spite of the variety of definitions found in literature, Borko's remains, to this day, appropriate for the area, as Pinheiro<sup>6</sup> observes when analyzing Information Science epistemological questions. According to Borko, Information Science is the discipline that investigates the features and behavior of information, the strengths ruling the information flows, and the means to process information, aiming to achieve optimum use and access.<sup>7</sup>

Also according to the author that Information Science concerns the body of knowledge regarding information origin, collection, organization, storage, retrieval, interpretation, transmission, transformation, and use. This includes the investigation of three types of phenomena. The first one is approached as the forms information representation in natural and artificial systems. The second regards the use of codes for an efficient transmission of the message. The third concerns the study of the means and techniques of information processing.

Two fundamental questions for Information Science studies are remarkable at this point. The first regards the interdisciplinarity needed for the definition, the scope, the comprehensiveness and the theoretical framework of research. The second refers to the concept of information defining research object, in a variety of contents, focuses and approaches, amongst other aspects. It is this interdisciplinarity in the study of information that reinforces the appropriateness of the links between communication and management in Information Science, as further discussed in this article.

In the domain of Information Science, different concepts, approaches, contexts and focuses toward information are identified. The analysis of the literature allowed the identification of four different – albeit complementary – approaches. The first, uncertainty reduction versus decision making, was identified in works such as those by Pignatari<sup>8</sup>, Yovits<sup>9</sup>, and Kochen<sup>10</sup>. The second regards *sense making*, whose work considered relevant is Dervin's<sup>11</sup>. The third concerns registered knowledge versus physical substitute for knowledge, whose representative authors in this paper are Le Coadic<sup>12</sup> and Farradane<sup>13</sup>. It is important to observe that Farradane's work introduces the

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<sup>4</sup> BORKO, H. [1968] Information Science: what is it? American Documentation, p. 3-5.

<sup>5</sup> TAYLOR, R. S. [1966] Professional aspects of information science and technology. Annual Review of Information Science and Technology, v. 1, p. 15-40.

<sup>6</sup> PINHEIRO, L. V. R. [2005] Processo evolutivo e tendências contemporâneas da Ciência da Informação. Informação & Sociedade: Estudos, v. 15, n. 1, p. 1-21.

<sup>7</sup> BORKO, H. [1968] Information Science: what is it? American Documentation, p. 3-5.

<sup>8</sup> PIGNATARI, D. [1968] Informação, linguagem, comunicação. 2. ed. São Paulo: Perspectiva.

<sup>9</sup> YOVITS, M. C. [1969] Information science: towards development of a true scientific discipline. American Documentation, v. 20, n. 4, p. 369-376.

<sup>10</sup> KOCHEN, M. [1983] Information and society. Annual Review of Information Science and Technology, v. 18, p. 277-304.

<sup>11</sup> DERVIN, B. [1977] Useful theory for librarianship: communication, not information. Drexel Library Quarterly, v. 13, n. 3, p. 16-32.

<sup>12</sup> LE COADIC, Y. [1996] A ciência da informação. Brasília: Briquet de Lemos.

notion of information meaning versus the need of individual's presence and their mental states, which, in turn, draws the cognitive point of view of these studies focuses. Finally, the fourth identified approach regards knowledge structures, acknowledged in works by Belkin<sup>14</sup>, Brookes<sup>15</sup>, and Ingwersen<sup>16</sup>, reinforcing and broadening the cognitive point of view for the studies of information in Information Science. These authors' definitions are briefly presented here.

Pignatari<sup>7</sup> considers that information is related to selection and choice (of what solves a doubt or fills a gap). In his focus, the author conceives information as selective instructions. That is, information is there only when there are doubts, which assumes a set of alternatives (able to solve them).

Kochen<sup>17</sup> presents a definition similar to Yovits', in whose works information constitutes "data of value for decision making." In Kochen's words, information is, in fact, relevant data for decision making (on what solves a gap, doubt, or need).

Dervin<sup>18</sup>, apparently paraphrasing Karl Popper, remains in the context of decision making, suggesting three distinct types of information, based on the individual's interaction versus the environment:

- Information 1: describes reality, its original structure or pattern, and is external to man;
- Information 2: consists in a subjective repertoire: ideas, structures or images people inserted in the external environment;
- Information 3: how each individual deals with Information 1 and 2 so as to consolidate their decision process.

Therefore, according to Dervin, there are three types of information. The first is objective information, external to man and independent of him. The second is subjective, internal, inherent to man and independent of objective reality. The third is information resulting from the interaction of the first two, i.e. out of the decision that results from the interpretation individuals have of these two alternatives (Information 1 and 2). In her approach, the issue of meaning attributed to what information is becomes relevant and requires an interpretation process by an individual.

In an approach similar to Dervin's<sup>17</sup>, in the sense of requiring the presence of the individual and his/her interpretation of what information is, Farradane<sup>19</sup> considers information "sterile" until it is linked to an individual who produces it or whom it affects. The author analyzes information as a mental phenomenon, emphasizing the communication meaning differences in the perception of different receptors, according to the initial state of knowledge they have and their abilities to understand information. In the article analyzed here, the author gives continuity to the previous discussion<sup>20</sup>, complementing what was defined as information: a substitute or physical representative of knowledge. More than that, cognitive aspects are included in his analyses.

Le Coadic<sup>21</sup>, using a definition analogous to Farradane's, albeit with a different focus, regards information as knowledge registered in written, oral or audiovisual form. Similarly, to Le

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<sup>13</sup> FARRADANE, J. [1979] The nature of information. *Journal of Information Science*, v. 1, n. 3, p. 13-17.

<sup>14</sup> BELKIN, N. [1978] Information concepts for information science. *Journal of Documentation*, v. 34, p. 55-85.

<sup>15</sup> BROOKES, B.C. [1980] The foundations of information science. Part I. Philosophical aspect. *Journal of Information Science*, n. 2, p. 125-133.

<sup>16</sup> INGWERSEN, P. [1992] *Information retrieval interaction*. London: Taylor Graham.

<sup>17</sup> KOCHEN, M. [1983] Information and society. *Annual Review of Information Science and Technology*, v. 18, p. 277-304.

<sup>18</sup> DERVIN, B. [1977] Useful theory for librarianship: communication, not information. *Drexel Library Quarterly*, v. 13, n. 3, p. 16-32.

<sup>19</sup> FARRADANE, J. [1979] The nature of information. *Journal of Information Science*, v. 1, n. 3, p. 13-17.

<sup>20</sup> FARRADANE, J. [1976] Towards a true information science. *Information Scientist*, v. 10, n. 3, p. 91-101.

<sup>21</sup> LE COADIC, Y. [1996] *A ciência da informação*. Brasília: Briquet de Lemos.

Coadic, several authors of the area of Information Science consider information as the research object, as long as it is produced as registered knowledge.

Belkin<sup>22</sup> defines information as the structure of any text (communicable structure) able to modify a receptor's cognitive structure. The text, in this case, consists of message purposely structured by a generator who decides to communicate a given aspect of his/her knowledge. For that it is isolated, modified and transformed into a communicable structure: the text.

Still similarly to Belkin, in the sense of adopting an approach related to individual's cognitive aspects, Brookes<sup>23</sup> states that knowledge is a group of concepts connected by their relations, and information is a small part of this structure. In his fundamental equation, illustrated in Figure 1, Brookes conveys the concept of information as a phenomenon which produces effects on the individual, altering his/her structures of knowledge. According to the author, a current state of knowledge, plus a new piece of knowledge (obtained by means of a new piece of information) is equal to a new state of knowledge, resulting from the effect of the new information.

In a similar and complementary mode, Ingwersen points out that the concept of information must satisfy two requirements. On one hand, information resulting from the transformation of the generator's knowledge structures (by intentionality, the receptor's knowledge state models, and in the form of signals). On the other hand, as something that, once perceived, affects and transforms the receptor's state of knowledge.<sup>24</sup>

It is possible, therefore, to observe that, according to the authors so far analyzed, information in Information Science constitutes a phenomenon to be studied both from the physical, objective point of view, (knowledge registered in some sort of support and external to man), and from the cognitive, subjective point of view, (processes performed in individuals' mental structures).

It is relevant, at this point, to highlight the importance of communication within the focus of information studies in Information Science. In this context, the following section discusses the focus on communication in Information Science from Belkin's perspective.

### **3. FOCUS ON COMMUNICATION FROM BELKIN'S PERSPECTIVE**

Belkin<sup>25</sup>, after an exhaustive research on information concepts defined in the sphere of Information Science, presented a concept that echoes structural (cognitive) aspects, in which eight requirements must be fulfilled. These requirements, in turn, are grouped based on three approaches, namely, methodological (M – utility of the concept), behavioral (C – phenomenon for which the concept “counts”), and definitional (D – concerning the context of the concept). According to the author's approach, a concept of information is appropriate for Information Science when it:

- refers to information that occurs within a communication with purpose and meaning; (D)
- considers information as a social communication process amongst human beings; (D)
- considers information as something required or desired; (D)
- considers information as something that affects its receptor; (D; C)
- considers information as something related to a generator's and a receptor's “state of knowledge”; (D; C)

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<sup>22</sup> BELKIN, N. [1978] Information concepts for information science. *Journal of Documentation*, v. 34, p. 55-85.

<sup>23</sup> BROOKES, B.C. [1980] The foundations of information science. Part I. Philosophical aspect. *Journal of Information Science*, n. 2, p. 125-133.

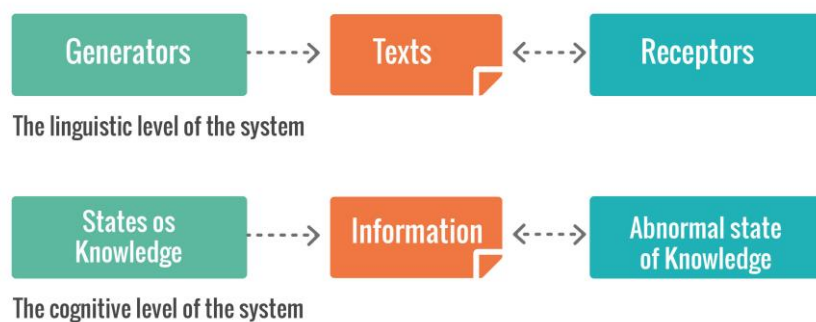
<sup>24</sup> INGWERSEN, P. [1992] *Information retrieval interaction*. London: Taylor Graham.

<sup>25</sup> BELKIN, N. [1978] Information concepts for information science. *Journal of Documentation*, v. 34, p. 55-85.

- considers information as something that has various effects when the message is presented by different means;
- is generalizable beyond individual cases; (M)
- offers a means to predict information effects. (M)

Belkin’s concept of information meets the eight requirements proposed in his doctoral work. It is relevant to highlight that the author uses the idea of structure inserted within the analysis of what he calls the “system of communication that interests Information Science<sup>26</sup>.” Such a system is, according to him, controlled by a receptor who, instigated by an abnormal state of knowledge regarding a topic, can be studied at both, cognitive and linguistic levels (Figure 1):

Figure 1 – Elements of a communication system of Information Science interest



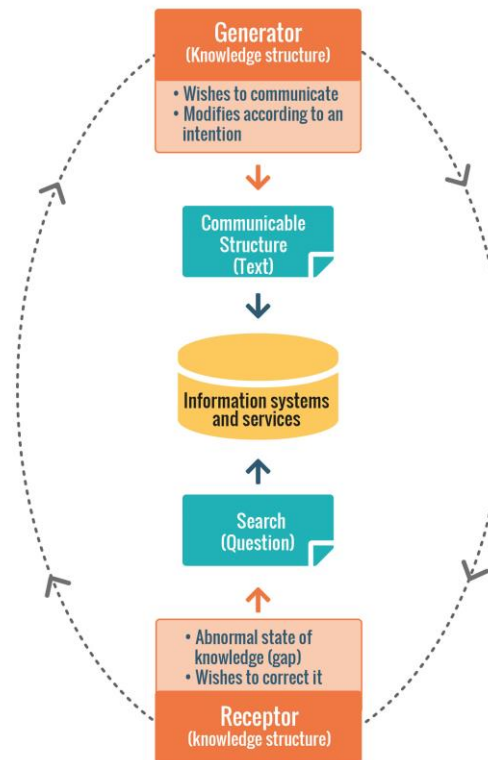
Source: Adapted from Belkin<sup>27</sup>

At the linguistic level, the author inserts the information in a communication process among human beings. In this sense, the concept conforms a communication system in which information is associated with a text (a collection of signs purposely structured by a generator intending to modify a receptor’s “structure-image”). Information associated with a text is therefore a generator’s conceptual structure, who modifies it in conformity with a purpose, an intention, and the knowledge of the receptor’s state of knowledge, subjacent to the surface structure (i.e. language) of the text. Figure 2 illustrates the author’s approach at linguistic level, i.e. concerning an information communication process.

<sup>26</sup> BELKIN, N. [1978] Information concepts for information science. *Journal of Documentation*, v. 34, p. 55-85.

<sup>27</sup> *Ibidem*.

Figure 2 – Communication process of information studied at linguistic level.



Source: Adapted from Belkin.

It is interesting to note that human communication scholars define it with the attributes Belkin used in his construction of the information concept for Information Science at linguistic level. For instance, in Tubbs'<sup>28</sup> model, there are seven elements comprising the communication process, namely, communicators 1 and 2 (respectively: sender and receiver, in the works of other authors), input (stimuli in both to communicate), filters (used by both communicators), message, interferences, channel and feedback. From the authors discussed hitherto, it is interesting to highlight the relevance of the sender's intentions in terms of causing effects on the receptor when sending him/her a communication. These aspects of communication studies, in fact, are present in the approach a variety of other theoreticians, since the pioneer Lasswell<sup>29</sup> and his formula (who ⇒ says what ⇒ on what channel ⇒ to whom ⇒ with what effect) to more current ones, such as McQuail and Windahl<sup>30</sup>, Barker and Gaut<sup>31</sup>, Curral *et al.*<sup>32</sup> among other countless authors.

At the cognitive level, Belkin's<sup>33</sup> approach is centered on transformations taking place in the individual's states of knowledge, when s/he receives the information able to fulfill a need or gap in his/her cognitive structure. In fact, what the author calls the "abnormal state of knowledge"

<sup>28</sup> TUBBS, S.; MOSS, S. [2003] Human communication: principles and contexts. 9. ed. Boston: McGraw-Hill.

<sup>29</sup> LASSWELL, H. [1948] The structure and function of communication in society. In: BRYSON, L. (Ed). The communication of ideas. New York: Institute for Religious and Social Studies. p. 32-51.

<sup>30</sup> MCQUAIL, D.; WINDAHL, S. [1993] Communication models for the study of mass communication. London: Longman.

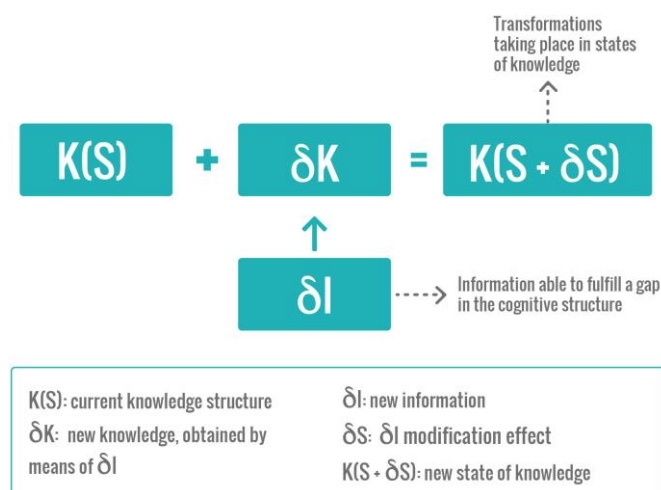
<sup>31</sup> BARKER, L. L.; GAUT, D. [2001] Communication. 8th ed. Boston: Allyn & Bacon.

<sup>32</sup> Curral, L. et al. [2001]. A comunicação nas organizações. In: FERREIRA, J. M. et al. *Manual de psicossociologia das organizações*. Alfragide: McGraw-Hill de Portugal. p.357-376.

<sup>33</sup> BELKIN, N. [1978] Information concepts for information science. *Journal of Documentation*, v. 34, p. 55-85.

can be understood as a need for information, a doubt, a failure or a gap in the cognitive structure. This approach, in turn, finds echo in Brookes'<sup>34</sup> fundamental equation for Information Science (Figure 3), as it focuses on changes brought about by a new piece of information in the individual's knowledge structure:

Figure 3 – Transformations in the individual's knowledge structure, brought about by new information, studied at cognitive level, as proposed by Belkin and according to Brookes.



Source: Adapted from Brookes.

The study of information needs, information search behavior, information use, and knowledge structures embeds the concepts comprising the study of informational behavior, establishing – but not limited to – the focus of knowledge and information management in Information Science, discussed further ahead.

A greater effort allows to see, at both levels at which Belkin's<sup>35</sup> concept of information is expressed, communication as part of management (and vice-versa). At the first level – the linguistic one – the author approaches the communication process between a generator and a receptor, with all its particularities (intention, purpose, conceptual structure etc.). At the second level – the cognitive one – the author provides the elements needed for the focus of knowledge management (which embeds information management) in Information Science. This is because Belkin relates information to something that changes the individual's state of knowledge. It is important to emphasize that it requires professionals, products, services and systems to be in fine-tuning between users' states of knowledge and information collections (available and accessible).

The treatment given to these collections and the availability of the resulting services and products concern information management. On the other hand, the effects or benefits from the obtained results, i.e. the creation of knowledge from the information obtained and assimilated, its application in the best courses of action (intelligence) and its sharing in specific communities and

<sup>34</sup> BROOKES, B.C. [1980] The foundations of information science. Part I. Philosophical aspect. Journal of Information Science, n. 2, p. 125-133.

<sup>35</sup> BELKIN, N. [1978] Information concepts for information science. Journal of Documentation, v. 34, p. 55-85.



environments are the focus of knowledge management. This, in turn, requires information communication processes. In short, Belkin's approach allows to both ground information communication studies and identify groundwork for studies on information management and knowledge management in the domain of Information Science.

Regarding the issue of management, Teixeira Filho<sup>36</sup>, for instance, mentions communication as one of its crucial components. Some studies corroborate this, especially in what concerns the domain of organizations, i.e. regarding organizational communication and organizational knowledge management. Leite & Costa<sup>37</sup> go further in this discussion as they also study this relationship in the academic context, involving scholarly communication and scholarly knowledge management.

This sort of discussion certainly contributes to theoretical constructions in which communication has been studied, mainly with two focuses. The first regards communication processes taking place in different contexts (science & technology, organizations, communities and business, with greater emphasis on the first two). The second concerns knowledge management. Brookes<sup>38</sup> explores better the guiding issue of studies on information and knowledge management in Information Science. His ideas are briefly discussed in the next section.

#### **4. FOCUS ON INFORMATION AND KNOWLEDGE MANAGEMENT, FROM BROOKES' PERSPECTIVE**

It is important to start this discussion highlighting the understanding of different authors about the relationship between knowledge management and information management. As summarized by Leite, after a broad analysis of the literature and reflexions on the themes:

knowledge management includes information management practices and methodologies, especially in what concerns the processes regarding collecting, storing and retrieving part of the tacit knowledge, which is reduced to information structures. However, knowledge management cannot be reduced to, nor confused with, information management. This is because when the type of knowledge sharing requires it to be served by means of formal systems allowing its storage and retrieval, knowledge is, in fact, reduced to information structures. Nevertheless, this may bring about the creation of knowledge in the individual<sup>39</sup>.

In this perspective, most Information Science scholars consider that the discipline should handle what Le Coadic<sup>40</sup>, among other authors, calls registered knowledge. Knowledge management opponents, in fact, consider that knowledge, once registered or registrable, is information. Bouthillier & Shearer<sup>41</sup>, however, consider the argument that registered (or explicit) knowledge is information as an inadequate assessment of the qualitative dimensions of various types of information and knowledge created, used, and transferred.

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<sup>36</sup> TEIXEIRA FILHO, J. [2001] Gestão do conhecimento e comunicação organizacional. *Insight Informal*, n. 44.

<sup>37</sup> LEITE, F. C. L.; COSTA, S. M. S. [2006] Gestão do conhecimento científico: proposta de um modelo conceitual com base em processos de comunicação científica. *Ciência da Informação*, v. 36, n. 1, p. 92-107.

<sup>38</sup> BROOKES, B.C. [1980] The foundations of information science. Part I. Philosophical aspect. *Journal of Information Science*, n. 2, p. 125-133.

<sup>39</sup> LEITE, F. C. L. [2006] Gestão do conhecimento científico no contexto acadêmico: proposta de um modelo conceitual. 2006. xiii, 240 f. Dissertação (Mestrado em Ciência da Informação) - Universidade de Brasília, Brasília.

<sup>40</sup> LE COADIC, Y. [1996] A ciência da informação. Brasília: Brique de Lemos.

<sup>41</sup> BOUTHILLIER, F.; SHEARER, K. [2002] Understanding knowledge management and information management: the need for an empirical perspective. *Information Research*, v. 8, n. 1.

Among the interesting approaches discussing the relationship between information and knowledge there is Popper's<sup>42</sup> Objective Knowledge Theory. Brookes<sup>43</sup> appropriates this perspective and applies it to the field of Information Science, giving rise to a fertile theoretical environment for the discussion on relations between information and knowledge management in this discipline.

Based on Karl Popper's Three Worlds approach, Brookes proposes a relationship between information and knowledge in Information Science studies based, mainly, on the notion of "unique mental spaces." The author draws attention to the fact that World 2 events – mental individualities – take place in private individual spaces, being, therefore, subjective. In order to objectify these mental individualities, one needs to express them and deposit the registers in World 3, where they are accessible to others and can, hence, be critically considered.

Brookes explores Popper's World 3 as that of Library Science and Information Science, pointing out, nevertheless, that the practical work of professionals in the area is to collect and organize for use registers of World 3. Its theoretical tasks are the study of the interactions between World 2 and World 3, so as to describe them and -if they can - explain them. Additionally, they help organize knowledge, rather than documents, for more effective use. An important contribution from Brookes for studies on knowledge management in Information Science, within Popper's three worlds approach, is that it allows to escape the subjectivities of the old approach from 2000 years ago for theories on knowledge and subjective psychology, as well as traditional philosophy. Moreover, while adopting the interaction between Worlds 2 and 3 as our field of studies, we are claiming the property of a discipline that no other discipline has claimed.

The author's argument, as one can find explicit in his text, is that information Science should not be a combination of approaches from various disciplines, such as linguistics and computer science, among others, as the area actually has, according to the author, its own territory, its own problems, and its own view of human issues. One of the possible readings of Brookes' argument concerns what is studied as knowledge management. In this perspective, the conclusion of the reflexions presented by Batista et al., after a thorough study of Brookes' perspective in which these questions are discussed, is that

the analysis of Nonaka & Takeuchi's model [...] indicates that it is Knowledge Management which, since dealing with the description and analysis of the conversion process of the two forms of knowledge (tacit or subjective and explicit or objective), performs the second proposal made by Brookes to information scientists, i.e. studying interactions between Popper's Worlds 2 and 3.<sup>44</sup>

With no further detailing of Brookes' approach, it is interesting to resume at once his proposal of a "fundamental equation for Information Science", illustrated in Figure 3. As one can notice, the individual's knowledge structure (or state) changes towards a new structure, modified by a piece of information. Note that the same information ( $\partial I$ ) may cause different effects on different structures of knowledge. In this sense, Brookes considers that, as the information is a small portion of knowledge, it would be correct to replace notation  $\partial I$  with  $\partial K$  in the equation.

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<sup>42</sup> POPPER, K. R. [1975] Conhecimento objetivo: uma abordagem evolucionária. Belo Horizonte: Itatiaia. (Espírito de Nosso Tempo, v. 13).

<sup>43</sup> BROOKES, B.C. [1980] The foundations of information science. Part I. Philosophical aspect. Journal of Information Science, n. 2, p. 125-133.

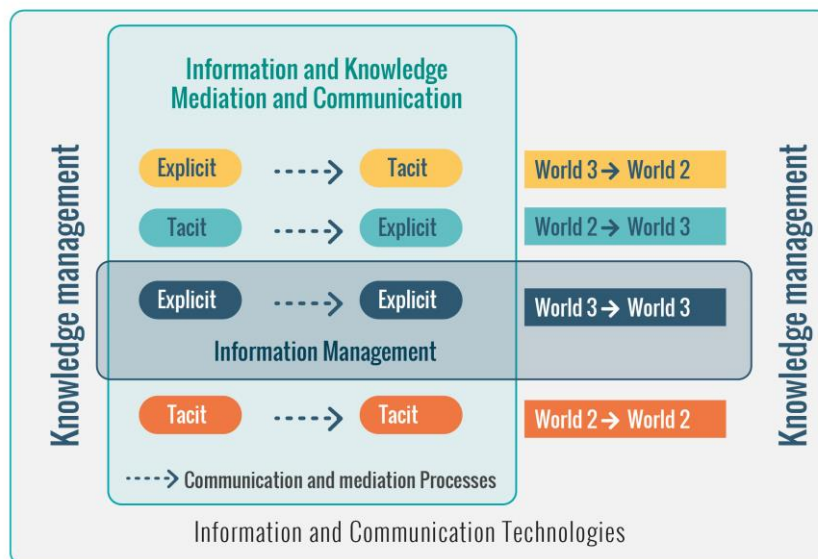
<sup>44</sup> BATISTA, F. F. et al. Gestão do conhecimento: a realização da proposta de Brookes para a ciência da informação? In: ENCONTRO NACIONAL DE PESQUISA EM CIÊNCIA DA INFORMAÇÃO, 8., 2007, Salvador. Anais... Salvador: ENANCIB, 2007.

Note, still, that what Brookes calls “unique mental spaces” can perfectly be considered as what Nonaka & Takeuchi<sup>45</sup> call “tacit knowledge.” Thus, it seems that what Brookes calls “objectification” of individual spaces provides a basis for Nonaka & Takeuchi’s knowledge conversion processes, more specifically, the processes of socialization and externalization. It is also worth mentioning that Nonaka & Takeuchi based their approach Sveiby’s works<sup>46</sup>. Sveiby is seen as one of the “fathers” of knowledge management. Moreover, Sveiby’s works have been guiding knowledge management studies in Information Science such as, for example, in Choo<sup>47</sup>.

Add to these, Teixeira Filho’s (2001)<sup>48</sup> definition of communication as a crucial component of knowledge management, since it deals with making useful knowledge getting through to the right person, comprehensibly, and in due time. Teixeira Filho’s definition resembles Mason’s<sup>49</sup>, whose paper on information professionals focuses on these issues, which have been considered as being the bases for information and knowledge management in Information Science. The concern is, then, that knowledge is to be shared as effectively as possible. It is important to note that, once more, information management is a constituent part of knowledge management. Hence, one can clearly see the contribution from theoreticians admittedly of Information Science, such as Brookes and Belkin, among others, building grounds for studies carried out in Information Science on information and knowledge management.

Figure 4 illustrates the reflexions on Information Science and the approaches by Belkin, Brookes, Popper, and Nonaka & Takeuchi, in addition to authors of communication and of information and knowledge management. Nevertheless, it contributes to reflexions about dialogs between communication and management in Information Science, as in the following section.

Figure 4 – Relationships between information and knowledge management and communication for Information Science, under Brookes’ perspective.



<sup>45</sup> NONAKA, I.; TAKEUCHI, H. Criação do conhecimento na empresa: como as empresas geram a dinâmica da inovação. Rio de Janeiro: Campus, 1997.

<sup>46</sup> Sveiby, K. E. 1994. Towards a knowledge perspective on organisation. 1994. Dissertation (Doctoral Business Administration)- Department of Business Administration, University of Stockholm.

<sup>47</sup> Choo, C. W. 2003. *A organização do conhecimento: como as organizações usam a informação para criar significado, construir conhecimento e tomar decisões*. São Paulo: Editora Senac.

<sup>48</sup> Teixeira Filho, J. 2001. “Gestão do conhecimento e comunicação organizacional”. *Insight Informal*, n. 44.

<sup>49</sup> Mason, R. O. 1990. “What is an information professional?” *Journal of Education for Library and Information Science*, v. 31, n. 2, p. 122-138.

Source: the authors

## 5. DIALOGS BETWEEN COMMUNICATION AND MANAGEMENT IN INFORMATION SCIENCE

The arguments supporting the relationship between information and knowledge management as well as communication processes are presented in this section. At first, from Borko's<sup>50</sup> very definition of Information Science, associated with other authors' perspectives, the discussion is carried out based on phenomena understood as central and inseparable in the area, which comprises the relationships between information communication and information management. At a second moment, the relationship between knowledge management and communication processes is discussed. In both subsections, there is a flow of necessary dialogue between communication and management in the context of Information Science.

### 5.1. Information management and communication

The definition presented by Borko<sup>51</sup> is filled with signs revealing the most immediate interests of Information Science. More specifically as he states that the area concerns the body of knowledge regarding origin, collection, organization, storage, retrieval, interpretation, transmission, transformation, and use of information, Borko unveils two large guiding bases for both investigation and practice in the field. This is because the phenomena Borko considers include information communication issues in a broader perspective and information management ones, as an intermediate perspective. A brief discussion on both proposals follows.

Information communication issues are clearly and widely considered in Borko's (1968) definition. He highlights the origin and use of information, placed coherently as the first and the last phenomena in the definition, which addresses two important elements found in human communication, sometimes understood as actors, other times as processes. The first element is the origin (senders/producers) and the second one is the use (receptors/users).

In this line of thought, it is considered that information communication among human beings – as well as the whole dynamics found between the origin and the use of information – corresponds to the wider interest of Information Science and is found in Borko's definition<sup>52</sup>. Some authors claim it as, in fact, the central interest of the area, as briefly presented next.

Vickery<sup>53</sup> considered that the interest of the area, since its appearance, was the facilitation of information transmission among human beings. Later on, Vickery & Vickery<sup>54</sup> observed that Information Science investigates information communication in society, at that time centered in specific phenomena (information organization, information retrieval, and information dissemination).

In coherence with these authors, Ingwersen<sup>55</sup> suggests that the area concerns predominantly the study of phenomena connected to information generation, communication, and use. Note that Ingwersen includes the mentioned processes at the beginning and at the end of Borko's definition- origin and use -, wherein the communication he mentioned corresponds to the existing and feasible dynamics of those two highlighted processes. Returning to Belkin<sup>56</sup>, one

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<sup>50</sup> BORKO, H. [1968] Information Science: what is it? American Documentation, p. 3-5.

<sup>51</sup> *Ibidem*.

<sup>52</sup> BORKO, H. [1968] Information Science: what is it? American Documentation, p. 3-5.

<sup>53</sup> VICKERY, B. C. [1973] Information systems. London: Butterworth.

<sup>54</sup> VICKERY, B. C.; VICKERY, A. [1987] Information science in theory and practice. London: Bowker-Saur.

<sup>55</sup> INGWERSEN, P. [1992] Information retrieval interaction. London: Taylor Graham.

<sup>56</sup> BELKIN, N. [1978] Information concepts for information science. Journal of Documentation, v. 34, p. 55-85.

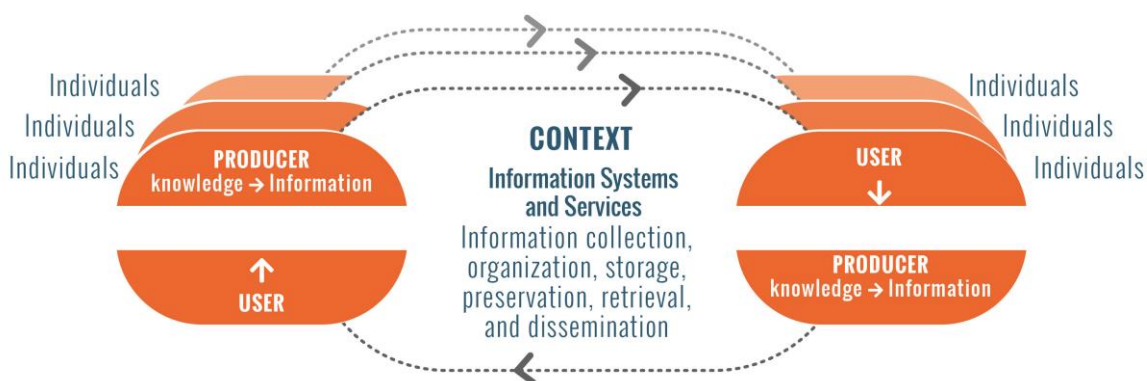
observes that his approach does not escape this notion, as he states the area aims to produce knowledge on the facilitation of effective communication of desired information. It includes, at this moment, a strong cognitive component between human users and generators. Note, still, that Belkin also emphasizes origin and use, two central elements of human communication.

Finally, Saracevic<sup>57</sup>, in the Encyclopedia of Library and Information Sciences, states that the area is dedicated to scientific issues and to the professional practice concerning effective information communication issues among human beings, in the individual, institutional, or social contexts of use, as well as information needs. These are, hence, the notions building grounds for the idea that, from the seminal definition of Information Science presented by Borko, which later finds support in other scholars, information communication among human beings constitutes the widest interest for Information Science.

While highlighting information communication among human beings as the broadest interest in the area, represented by interactions between information producers and users, which would, then, be the most specific phenomena? The answer to this question refers to processes the author juxtaposed between information origin and use. That is, the questions regarding the study of information management are entirely related with intermediate phenomena, placed between the origin and the use of information in the definition Borko presented. Intermediate phenomena are: collection, organization, storage, retrieval, interpretation, transmission, and transformation of information. In this perspective, it is suggested that the interaction between information producers and users, i.e. the creation of effective correspondence between information needs and information collections, constitutes a communication process viable. It is only because of the systematization of the information management processes, which in turn, are equivalent to intermediate phenomena found in Borko's definition.

Although Borko's<sup>58</sup> definition dates from the 1960s, the elements comprising it make it timeless, in so far as they draw attention to phenomena that remain, to this day, essential and are likely to remain henceforward. Such phenomena, albeit not unique, seems completely present in the essence of the investigation performed in Information Science until the present day. Thus, the theoretical construction here discussed can be represented in Figure 5, as follows.

Figure 5 – Conceptual relations between Information Management and Communication



Source: the authors

<sup>57</sup> SARACEVIC, T. [2010] Information Science. In: ENCYCLOPEDIA of Library and Information Sciences. 3rd. ed. [S.l.: s.n.]. p. 2570-2585.

<sup>58</sup> BORKO, H. [1968] Information Science: what is it? American Documentation, p. 3-5.

Both to investigate and to apply knowledge when solving real issues related with the improvement of information communication among human beings, Information Science uses the perspective of information management processes. This means the most basic processes of information management, namely collection, organization, storage, preservation, retrieval and dissemination, are essential for an effective communication between information producers (origin) and users (use).

In order to explain the theory included in the model represented in Figure 5, we draw attention to four aspects whose essence illustrates the understanding of the inseparable relation between information management and communication as well as the need for dialog between the two perspectives.

The first aspect is the presence of communication system elements that interest Information Science, proposed by Belkin and present in Brookes'<sup>59</sup> fundamental equation, previously discussed.

The second aspect concerns the communication system actors (producers and users). It is important to highlight that information production and use are activities performed by the same individuals at different moments and in different contexts. As illustrated in Figure 5, the producers' knowledge generation results from, among other factors, the needs for information fully satisfied, i.e. producers are necessarily information users. In short: as users satisfy their needs for information, they generate new knowledge, and the cycle of information communication is repeated.

The third aspect, in turn, draws attention to the link responsible for the connection and interaction of producers and users: information systems and services, constituted of information and communication technologies. Therefore, it makes possible to attain conditions for the full correspondence between the information produced (origin) and the needs for information (use). The operationalization of the producers and users' interaction is, hence, in the information management performed by information systems and services, generically comprehended by the group of processes related with information collection, organization, storage, preservation, retrieval, and dissemination.

Finally, the fourth aspect deals with the context in which both information management and communication operate. In this perspective, context is understood as the group of cognitive, social, cultural, political, technological, economical, and legal order factors which, to some extent, influences information management and communication. There are elements from both Information management and communication processes present, invariably, in any context. The group of particular forces in each context imprints specificities in the behavior of the one producing, communicating, and using information. This is why, despite the same elements, one assumes that the contexts influence communication and, as an outcome, require services and systems that consider specificities resulting from this influence.

In summary, Borko's<sup>60</sup> Information Science definition offers all necessary elements to understand the broadest interest in the area to investigate and propose improvements in information management in any context.

As previously said, the proposed perspective does not exhaust the group of interests of Information Science, but rather represents the essence of central phenomena under which the area has been producing knowledge, constituting, perhaps, its most solid grounds. Evidently, throughout nearly seven decades since its emergence, the area expanded considerably in both views and practices. Moreover, other phenomena, whether directly or indirectly related with

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<sup>59</sup> BROOKES, B.C. [1980] The foundations of information science. Part I. Philosophical aspect. *Journal of Information Science*, n. 2, p. 125-133.

<sup>60</sup> BORKO, H. [1968] Information Science: what is it? *American Documentation*, p. 3-5.

information management and communication emanated. Considering the questions connected to the study of knowledge management were of no concern to Information Science scholars – perhaps of no discipline at all – in the 1960s, it is understandable that they are not present in the phenomena Borko described. Nevertheless, the next section presents aspects signaling the possible convergence of knowledge management and communication in the field of Information Science, identified since Brookes'<sup>61</sup> approaches, as previously discussed.

## 5.2. Knowledge management and communication

The basic assumption of the argument supporting the relationship between communication and knowledge management is that communication, in its human interaction aspect, not reduced, but supported by technologies, is one of the essential processes toward the success of knowledge management. A brief analysis of the literature offered a series of arguments corroborating this assumption.

As Leite<sup>62</sup> pointed out, Jensen<sup>63</sup> considers that communication and knowledge management are interlinked. The difference between them, according to her, is that knowledge management is a bit more disciplined for capturing, organizing, and tracking what we need in order to make decisions, while communication is more focused on exchanges. In the same line of thought, Ash<sup>64</sup> states that an effective communication is essential for any knowledge management program. Martensson<sup>65</sup> and Sharp<sup>66</sup> enumerated critical elements for the success of knowledge management, including, amongst them, communication.

Such definitions lead to the consideration that there is a relation of complementarity and interdependency between the two practices. This is because, on the one hand, knowledge management disciplines, systematizes, and increases the effectiveness of communication processes. On the other hand, communication allows knowledge management to be rendered viable, as it makes possible, among other processes, the interaction among individuals, and consequently, knowledge creation, sharing, and use<sup>67</sup>.

Although the question of communication stands out as important in the sphere of knowledge management, initiatives of knowledge management that, in fact, consider communication processes, and not only the technologies, as an essential layer of a knowledge management project seem scarce. In fact, little is said regarding communication, from the point of view of its processes, as a management knowledge element. Considering communication under

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<sup>61</sup> BROOKES, B.C. [1980] The foundations of information science. Part I. Philosophical aspect. *Journal of Information Science*, n. 2, p. 125-133.

<sup>62</sup> LEITE, Fernando César Lima. Comunicação científica e gestão do conhecimento: enlaces conceituais para a fundamentação da gestão do conhecimento científico no contexto de universidades. *Transinformação*, Campinas, v. 19, n. 2, p. 139-151, Aug. 2007. <[http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0103-37862007000200005&lng=en&nrm=iso](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-37862007000200005&lng=en&nrm=iso)>. Access: 10 Aug. 2016. <http://dx.doi.org/10.1590/S0103-37862007000200005>.

<sup>63</sup> JENSEN, B. [1998] Communication or knowledge management? It's time to wake up and smell the koffee. *Communication World*.

<sup>64</sup> ASH, J. Communication missing from KM's core strategies. 2000. <[http://www.knowledgepoint.com.au/knowledge\\_management/Articles/KM\\_JA001.htm](http://www.knowledgepoint.com.au/knowledge_management/Articles/KM_JA001.htm)>. Access: 10 mar. 2005.

<sup>65</sup> MARTENSSON, M. [2000] A critical review of knowledge management as a management tool. *Journal of Knowledge Management*, v. 4, n. 3, p. 204-216.

<sup>66</sup> SHARP, D. [2003] Knowledge management today: challenges and opportunities. *Information Processing and Management*, v. 20, n. 2, p. 32-37.

<sup>67</sup> LEITE, Fernando César Lima. Comunicação científica e gestão do conhecimento: enlaces conceituais para a fundamentação da gestão do conhecimento científico no contexto de universidades. *Transinformação*, Campinas, v. 19, n. 2, p. 139-151, Aug. 2007. Disponível em <[http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0103-37862007000200005&lng=en&nrm=iso](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-37862007000200005&lng=en&nrm=iso)>. Acesso em 10 Aug. 2016. <http://dx.doi.org/10.1590/S0103-37862007000200005>.

the aspect of technologies, knowledge management discourse appears reductionist. On the other hand, communication must be seen as an element of strong influence on the performance of organizational activities, especially in knowledge management, as it is responsible for knowledge sharing, for learning and for the dissemination of culture in the organization<sup>68</sup>.

Ives *et al.* (1998)<sup>69</sup> state that Plato perceived that oral learning tradition was based on dialog, while in the written tradition the learner has little ability to converse with the creator of knowledge. This is because, according to these authors, the creation of knowledge results from the interaction between two points of view. The authors add that the reintroduction of the dialog – now at global levels, thanks to the development of communication technologies – may possibly start one of the greatest cognitive contributions for the current management knowledge stage. In a similar argument, Theunissen<sup>70</sup> states that she believes the failure of knowledge management projects centered in technologies is directly related to the Ives *et al.*'s argument that knowledge is created by means of dialog. That is, according to Theunissen, the communication between two points of view.

Kuhlen's<sup>71</sup> theoretical construction supports the reflexion and relationships built so far between communication processes and knowledge management. In this sense, the author discusses two approaches for knowledge management: *Knowledge Warehouse Paradigm* and *Communicative Paradigm*.

*Knowledge Warehouse Paradigm* considers knowledge management without taking into account communication processes. Kuhlen considers the models by Nonaka & Takeuchi<sup>72</sup>, Wiig<sup>73</sup>, and Probst *et al.*<sup>74</sup> Knowledge Warehouse Paradigm representatives. He states that, with the advent of communication technologies in a large scale, it is possible to observe a change of paradigm, from a more static view of knowledge and information production dissemination, and use to a dynamic and collaborative view of these processes, specially in what concerns knowledge generation and exchange. Kuhlen names this new view the *Communicative Paradigm* for knowledge management.<sup>75</sup>

In the *Communicative Paradigm* approach, in addition to considering the use of existing information sources, there is an emphasis on the effects of combining individuals with different backgrounds and different levels of expertise, as well as context maintenance or re-contextualization of shared knowledge. Social interaction among individuals, shared expertise, and exchanges of knowledge are as important as the very knowledge warehouses<sup>76</sup>.

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<sup>68</sup> *Ibidem*.

<sup>69</sup> IVES, W. et al. [1998] Knowledge management: an emerging discipline with a long history. *Journal of Knowledge Management*, v. 1, n. 4, p. 269-274.

<sup>70</sup> THEUNISSEN, P. [2004] Communication: the cornerstone of knowledge management. Making a difference: Australian and New Zealand Communication Association Conference.

<sup>71</sup> KUHLEN, R. [2004] Change of paradigm in knowledge management: framework for the collaborative production and exchange of knowledge. In HOBOM, H. (Ed.). *Knowledge management: libraries and librarians taking up the challenge*. München: K. G. Saur. p. 21-38. IFLA Publications.

<sup>72</sup> NONAKA, I.; TAKEUCHI, H. [1997] *Criação do conhecimento na empresa: como as empresas geram a dinâmica da inovação*. Rio de Janeiro: Campus.

<sup>73</sup> WIIG, K. M. [2002] *Knowledge management has many facets*. [S.l.: s.n.].

<sup>74</sup> PROBST, G.; RAUB, S.; ROMHART, K. [2002] *Gestão do conhecimento: os elementos construtivos do sucesso*. Porto Alegre: Bookman.

<sup>75</sup> LEITE, Fernando César Lima. *Comunicação científica e gestão do conhecimento: enlaces conceituais para a fundamentação da gestão do conhecimento científico no contexto de universidades*. *Transinformação*, Campinas, v. 19, n. 2, p. 139-151, Aug. 2007. Disponível em <[http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0103-37862007000200005&lng=en&nrm=iso](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-37862007000200005&lng=en&nrm=iso)>. Acesso em 10 Aug. 2016. <http://dx.doi.org/10.1590/S0103-37862007000200005>.

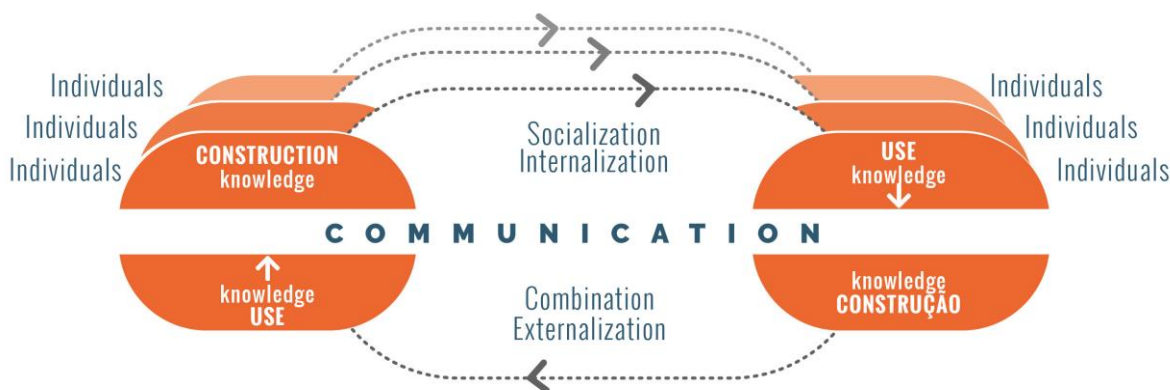
<sup>76</sup> *Ibidem*.



According to the argumentative line of this article, knowledge management can be understood as the creation of fertile conditions for knowledge to be built, shared, and used. Cyclic macroprocesses, namely construction, sharing and use of knowledge represented in Figure 6, have in the individuals their protagonists and in communication their enabling element, in reason of three arguments that justify knowledge management. The first regards the fact that the generation of new knowledge starts from the use of existing knowledge, in its subjective or objective dimension, previously communicated. The second concerns the dynamic of interaction, either informal or formal, necessary to knowledge share, which concerns the very action of communicating. The third aspect results from the two previous ones and refers to the understanding that, among the requirements for using knowledge, there are the availability and accessibility to those who need it.

Thus, the common and integrating dimension of macroprocesses comprising knowledge management is communication, which includes and brings about the cycle of construction, sharing, and use of knowledge. This cycle is based on Nonaka & Takeuchi's<sup>77</sup> modes of knowledge conversion, which constitute the theory of knowledge creation in the organizations they propose. Their proposal is expanded here in order to illustrate - besides the creation - the sharing and the use of knowledge. This line of reasoning meets and reinforces Kuhlen's<sup>78</sup> *Communicative Paradigm* of knowledge management.

Figure 6 – Relations between communication and knowledge management



Source: The authors

## 6. FINAL CONSIDERATIONS

The epistemological argumentation briefly presented in this paper aimed to contribute to an understanding of conceptual relationships between information communication, information

<sup>77</sup> NONAKA, I.; TAKEUCHI, H. Criação do conhecimento na empresa: como as empresas geram a dinâmica da inovação. Rio de Janeiro: Campus, 1997.

<sup>78</sup> KUHLEN, R. Change of paradigm in knowledge management: framework for the collaborative production and exchange of knowledge. In HOBBOHM, H. (Ed.). Knowledge management: libraries and librarians taking up the challenge. München: K. G. Saur, 2004. p. 21-38. IFLA Publications.

management, and knowledge management, in the context of information Science, as generically illustrated in Figure 7. As it is possible to perceive, communication processes in different contexts are crucial for both information management and knowledge management. They constitute, in fact, one of the central focuses of Information Science studies.

*Figure 7 – Relations between communication and knowledge management.*



*Source: The authors*

Based on arguments supported in grounds provided by the literature and in theoretical constructions, it is therefore suggested that it is pertinent to carry out studies both on communication and on knowledge and information management, in the field of Information Science, taking into account at least three questions.

The first question is related to the different contexts in which communication and management take place. The contexts can be understood as a group of cognitive, social, cultural, political, technological, economical, and legal factors which, to some extent, influence the genesis and flows of information and knowledge. Consequently, they also influence their management and communication processes. Examples: the contexts of scientific information, technological information, business information, organizational information, civil and community information, among others.

The second question regards the conceptual relations between communication and information and knowledge management. Among the possibilities of reading such relations, the theoretical proposal started from the assumption that, under the view of Information Science, as discussed throughout this paper, appropriate knowledge and information management processes lead to effective communication, i.e. information and knowledge management are boosting conditions for communication among human beings. Conversely, knowledge management itself, as proposed, depends on communication processes. This is because, considering knowledge conversion processes, the core of Nonaka & Takeuchi's<sup>79</sup> knowledge creation theory, in fact concerns communication processes. In this sense, it is here considered that communication is crucial for management.

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<sup>79</sup> NONAKA, I.; TAKEUCHI, H. Criação do conhecimento na empresa: como as empresas geram a dinâmica da inovação. Rio de Janeiro: Campus, 1997.

Finally, it is important to consider that the conceptual proposals constitute possible theoretic frameworks of reference, though not unique, for studies on communication and information and knowledge management under the perspective of Information Science. Furthermore, it is important to mention the occurrence possibility of only one or another of these topics (communication or management) in Information Science studies, if one considers the information concepts for the area presented by the authors whose seminal approaches support it.

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