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The Development of Information Science in Ibero-America

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ABSTRACT

The purpose of this article is to problematize the existence of a possible Ibero-American informational thinking. It was initially observed that a relative absence of Ibero-America in the international presentations and mappings of information science exists. Below, the reality of the 22 countries that compose Ibero-America is discussed, a region that can be understood from a sociocultural and geopolitical perspective. Then, a mapping of the information science research in these countries is made. The main research topics found are: epistemological studies, relationships with library science, information literacy, representation and organization, bibliometric studies, information management, user studies, technological dimensions, and relationships with archival science and museum studies. Finally, a general epistemological configuration of information science is presented at a global level, highlighting the great trends of study of information that marked the decades of the 1960s and 1970s (physical model), 1980s and 1990s (cognitive model), and the 21st century (sociocultural model), and which manifested themselves in the different subareas that make up the field. The most recent research in information science, in addition to addressing information transfer (physical dimension) and its relationship with data and knowledge (cognitive dimension), has also incorporated aspects related to the social effects of information, its role in the constitution of identities and culture, and the importance of its material conformations. Such expansion reflects attempts to address the complexity of informational phenomena. Therefore, it is concluded that it is important to place the specific contributions of Ibero-America in this context.

Keywords: information science, Ibero-American information science, information science epistemology

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1. INTRODUCTION

In this text we aim to question the possibility of identifying the existence of an Ibero-American information science. A consultation of the manuals and treaties of information science with greater international visibility would not allow answering of this questioning. Such manuals often present the field from the facts, concepts, theories, and institutions of the United States or Union Kingdom and, eventually, other countries (Rubin, 1998; Davis & Shaw, 2011; Bawden & Robinson, 2012; Stock & Stock, 2013). In other manuals there are cases of presentation of specific study traditions, such as Soviet Union *informatika* (Ivanovich Chernyi, Mijailov, Chernii, Ivanovich, & Guiliarevskii, 1973), the *sciences de l'information et de la communication* of France (Dacheux, 2009), the information studies of Canada (Salaün & Arsenault, 2009), the *informationswissenschaft* of Germany (Wersig, 1980), and the library and information science of the Nordic countries (Åström, 2008). The research produced and published by the Spanish and Portuguese-speaking countries (Ibero-America) is not usually presented in these manuals and has little visibility in the international scenario (Gorbea Portal, 2000; Moya-Anegón & Herrero-Solana, 2002).

This happens for several reasons: the difference of resources and infrastructure in science and technology of the different countries of the world; the overvaluation of certain languages to the detriment of others in terms of circulation, reading, and citation; the coverage of international databases; among others. There is, however, a significant production in information science in the countries that compose Ibero-America, both quantitatively and qualitatively. This production is based, in part, on the theories and concepts of the Anglo-Saxon hegemonic tradition, but also shows itself at certain moments as creative and innovative, constructed from specific problems and the theoretical models built to solve them (Liberatore, 2006; Hernández Quintana, 2007).

There is an infrastructure in information science in Ibero-America (undergraduate, master's and doctorate courses, journals, events, and scientific associations), as well as initiatives to institutionalize dialogue and cooperation between the countries. A challenge that still remains is the search for common points between the different research, in order to identify a possible "Ibero-American thinking of information." In addition, another important challenge is, once such a thought is delimited, to confront it with the general epistemological reality of information science in the world, in order to identify the specific contributions of Ibero-American research. The purpose of this text is to begin the discussion on these two challenges, knowing that much still needs to be done in order to consolidate the answers.

2. IBERO-AMERICA AND THE INFORMATION FIELD

Ibero-America is an expression used to designate the 22 countries of Europe and America that have Spanish or Portuguese as their predominant languages: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Portugal, Puerto Rico, Spain, Uruguay, and Venezuela. More than that, however, the term also has a social, cultural, and geopolitical dimension. At the social and cultural level, the expression refers to certain historical ties, that is, to a common past and to the various processes and phenomena that have been common throughout the centuries. This has also led to the intertwining of the identity and culture of these countries, forming a territory with a shared history and culture (García Canclini, 2003; Blas Zabaleta, de la Puente Brunke, Serviá Reymundo, Roca Cobo, & Alberto Rivas, 2000; Loprete, 2000). At the same time, there is a geopolitical dimension, as the countries that make up this region have a range of strategic political and economic interests, as well as a series of demands related to how these issues are discussed and decided at a global level (Ramos & Winter, 2006; Ferrer, 1971). In this sense, note should be taken of initiatives such as the Ibero-American Conference of Heads of State and Government, which has held annual meetings since 1991 with the aim of developing cooperation between the 22 member countries, and the Organization of Ibero-American States for Education, Science and Culture, founded in 1991, which aims to promote cooperation in education, science, and culture.

Besides the historical, cultural, political, and economic dimensions, there is also a scientific dimension. There are debates today on the ways of producing, disseminating, and evaluating scientific activity, and one of the issues that stands out is how different parts of the planet act, benefit, and/or suffer from current practices and protocols. Thus, also in the scientific field, it is possible to identify a core of interests and demands related to Ibero-America.

In information science, an institutional interest in the subject has already existed for some years (Barber, 2004). The first initiative was the "Encuentro de Educadores Latinoamericanos de Bibliotecología y Ciencia de la Información," held in 1993 in Puerto Rico, with representatives from fifteen countries. The purpose of the meeting was to think of teaching strategies in library science and information science, with emphasis on distance education actions.

In 1995 in Mexico there was the "II Reunión de Investigadores y Educadores de Iberoamérica y del Caribe en el área de Bibliotecología y Ciencia de la Información." Here the

expression "Ibero-America" was incorporated into the name of the meeting, and interests also turned to cooperative activities and agreements in the field of postgraduate research. And so, in the following year the "III Encuentro de Educadores e Investigadores de Bibliotecología, Archivología y Ciencia de la Información de Iberoamérica y el Caribe" was held in Puerto Rico. In this meeting, the institution of EDIBCIC—Asociación de Educación e Investigación en Bibliotecología, Archivología, Ciencia de la Información y Documentación de Iberoamérica y el Caribe was formalized. The constitutive minutes of the association were drafted and its first executive council was elected. Since then, the association has held meetings in 1998, 2000, 2002, 2003, 2004, 2006, and 2008. At the 2008 meeting in Mexico a structural change was made in the association's statute and a change of name was promoted for EDICIC—Asociación de Educación e Investigación en Ciencia de la Información de Iberoamérica y el Caribe, the current name. Following meetings were held in 2011, 2016, and 2018, and the next one has already been confirmed for November 2020 in San José, Costa Rica. At the same time, Iberian meetings have begun to be held since 2005, organized by the Iberian chapter of EDICIC. The meetings were held in 2005, 2006, 2008, 2009, 2011, 2013, 2015, and 2017, including the 2019 meeting in Barcelona, Spain.

Among the main activities of the association are the meetings (general and Iberian), which provided the consolidation of an international scientific space, Hispanic and Lusophone (speakers of Portuguese), for the presentation and discussion of scientific research results; the increase of Ibero-American research visibility for the countries of the region; and the establishment of several partnerships between universities in the countries that comprise it—enabling common research projects such as advising and co-advising activities of doctoral and postdoctoral research. Above all, there is also an interest in looking for common points that allow the identification of a possible "Ibero-American informational thinking," respecting the diversity that composes the region.

Other more punctual initiatives could be mentioned, such as the research days promoted in a regional or binational scope, the Infobila database, and the meetings of directors and teachers of library science schools of Mercosur. All of them have in common the perspective of integration, the formation of a partnership, cooperation, and sharing, in the scope of conducting research or the formation of teaching plans.

In relation to the identification of the content and general trends of research in Ibero-America, there are some studies on the research in information science carried out in the countries of the region. However, they are usually bibliometric approaches that map more productive authors, most cited authors, or most studied subjects (Sánchez-Perdomo, Rosario-Sierra, Herrera-Vallejera, Rodríguez-Sánchez, & Carrillo-Calvet, 2017; Menéndez Echavarría et al., 2015; Herrero Solana & Liberatore, 2008; Licea de Arenas, Valles, Arévalo, & Cervantes, 2000); or, they are studies that make diagnoses on the institutional situations of the countries of the region (Hernández Salazar, 2006) or even biographical studies on authors of reference (Morales Campos, 2006).

There is a lack of studies that effectively analyze the content of the research produced, analyzing the theories that underlie the studies, the empirical subject matters, the methods, and the results found. And although there is great diversity among the countries of the region, and even in the research conducted within each country (Rendón Rojas, 2013), it is believed that it is possible to identify some trends in the composition of the universe of information science in Ibero-America. In this sense, a first effort was made to trace this research, that is, what is produced in information science in Ibero-America. Such tracking sought to contemplate the diversity of countries and is presented in the following topic, in a rather simplified and generic way.

To identify and collect the scientific papers mentioned in this article, searches were carried out in scientific journals published in Ibero-American countries, in proceedings of congresses held in the countries of the region, and in databases such as Infobila (Base de datos sobre la información bibliotecológica latinoamericana), Scielo (Scientific Electronic Library Online), and LISA (Library Information Science Abstracts). There is a list of institutions that teach Information science in Ibero-America in the Appendix.

3. IBERO-AMERICAN INFORMATION SCIENCE: SOME FEATURES

Ibero-American scientific production in the area, as pointed out above, is very rich and diversified, marked by a dialogue with the other traditions of study (American, Anglo-Saxon, French, Nordic, and German) as well as by moments of the creation of individual and innovative theories, concepts, and methods.

There is a strong tradition of studies in the epistemology of information science in several countries. In Mexico, there are dense studies of the area from a philosophical perspective, with the problematization of the concepts of the field and the definition of information as the secondary quality of certain entities (Rendón Rojas, 2005) or from the notion/overcoming

the notion of "library" and the epistemological rupture with the field of professional performance (Alfaro López, 2010). In Cuba, there are foundation initiatives based on the history of knowledge registries from antiquity, highlighting the origin of the discipline with the notions of culture and communication, in a fecund dialogue with the Soviet *informatika* (Zoia Rivera, 2016). In Spain, there are also very original movements. One of them is part of the notion of the information society to situate the area between a mathematical perspective, originating in the field of telecommunications, and another one that arises from the social sciences (Moreiro González, 2005). In the next line, from a discussion about what would be the adequate basis for the area (physical, positivist, cognitive, domain analysis, hermeneutics, etc.) the three most significant perspectives are defined: positivist, cognitive, and sociological (Moya Anegón & Fernández Molina, 2002). From Colombia, we can mention an original contribution relating information science to the "emergent" paradigm that is put forward as an alternative to the models of objectivity and causal and linear explanation (Mancipe Flechas & Lukomski, 2009). From Portugal a discussion has grown that defines information science as a post-custodial perspective that developed in relation to another, custodial and patrimonialist (Silva & Ribeiro, 2002). From Brazil, the foundation of the field from its insertion in the human and social sciences has advanced (González de Gómez, 2000; Araújo, 2018).

Ibero-America is also fertile in relation to library science. There are those dealing with all topics and processes, such as the history of libraries, concepts and types, techniques (acquisition, selection, storage, conservation, cataloging, classification, user services, and reference), management, and digital technologies, among others, which has originated in countries such as Spain (Amat i Noguera, 1982; Magán Wals, 2004; Pérez Pulido & Herrera Morillas, 2006) and Brazil (Vieira, 2014; Fonseca, 2007). There are also those who turn to specific aspects of the library science activity, such as the development of collections (Orera Orera & Hernández Pacheco, 2017), planning, and marketing in libraries (Téllez Tolosa & Vallejo Sierra, 2012). Other research is related to a wider discussion about the library and its social role, whether it is a concern that the library is actually used, that it becomes an effective social practice, an environment of interaction and reflection, with a true transforming action (Céspedes, 2006), emphasizing the link between the librarian and the community, the need for their political participation, and their role in societies marked by contradictions and structural inequalities (Almeida Jr., 1997). In this line, there are works that argue about the role of libraries within the values defended by UNESCO—education, culture, peace promotion, inclusion, social redistribution of information and knowledge, and deepening democracy (Calixto, 2007). Another discussion is that of the perspective of the decolonization of knowledge to be promoted by libraries, transforming the hegemonic model of privilege of Western knowledge to the valorization and incorporation of other forms of knowledge, including traditional ones (Gordillo Sánchez, 2017). In this theme are also works on infodiversity, diversity, and multiculturalism (Hernández Pérez, 2017, Morales Campos, 2008). In a very specific line, there is a set of studies on heritage and, more specifically, bibliographic patrimony (Cabral, 2009).

There is a great deal of research on specific types of libraries. The school library is the most studied. There are many studies about it and its context of contradictions, poverty, and exclusions, as well as the need for actions to promote reading, user training, librarian extension, and mediation (Álvarez, Gazpio & Lescano, 2001), denunciation of their conditions (Silva, 1999), and professional programs (Campello, 2012). But there are also many studies on public libraries and their social and cultural functions (Moncada Patiño, 2008), and on university libraries (Magán Wals, 2001).

Directly related to this subject is the question of the formation of the professional librarian and/or information professional. In Cuba, for example, there is a concern with the information professional in the context of the information society and the need for critical and comprehensive thinking (Frías Guzmán, Haro Águilla & Artiles Oliveira, 2017). In Venezuela, there is a concern with the necessary skills with the advent of digital technologies (Pirela Morillo & Peña Vera, 2005). In Portugal, the concern is the professional profile before the epistemological changes of the area (Ribeiro, 2002).

A particularly strong theme in the Ibero-American context is information literacy. There is research on cooperation between Brazil and Spain in three dimensions—digital inclusion, information inclusion, and social inclusion (Cuevas-Cerveró & Simeão, 2011), or initiatives in Colombia seeking to overcome an instrumentalist perspective of search processes and acquisition of skills in the use of technologies for competence in concrete learning situations, with emphasis on the intersubjective relationships that occur in the mediation processes (Cabra-Torres et al, 2017). Some perspectives are given in the direct dialogue between information literacy and the skills of librarians, for example in Chile (Castillo Sáez, 2010) or in Spain (Pinto & Uribe-Tirado, 2017). And there are still the more applied perspectives, which present ways of conducting user training, including with their own models, such as the Colombian MOFUS (Naranjo Vélez, Rendón Giraldo & Giraldo Arredondo, 2006; Rendón Giraldo & Naranjo Vélez, 2008).

Also worth mentioning are discussions that place the theme as a complexification of issues related to reader training and reading promotion (Calixto, 2010) or that articulate semiotics in the study of adherents, beliefs, and worldviews of the subjects (Barbosa-Chacón & Castañeda Peña, 2017).

The area of information representation and organization also has significant production in Ibero-America, and this production is reinforced institutionally by the existence of two chapters of the *International Society for Knowledge Organization* in the region: one from Brazil and another from Spain and Portugal (Guimarães, 2008; Moneda Corrochano, López Huertas, & Jiménez Contreras, 2012). There is a strong connection between production in the region and international production, with the scientific production of the subject being the study and critical analysis of internationally recognized instruments and systems of cataloging, such as the Functional Requirements for Bibliographic Records, International Standard Bibliographic Description, and Resource Description and Access, authority control, indexing, and controlled vocabularies (documentary languages, thesauri, subject headings lists, and classification systems (Library of Congress Classification, Dewey Decimal Classification, Bliss Classification, Cutter Classification, and Universal Decimal Classification), as well as taxonomies and ontologies (Rodríguez Bravo, 2011; Souza, 2007) and even the system of Library-Bibliographic Classification (BBK, the acronym in Russian) of the extinct Soviet Union (Herrera Acosta, 2016). And there is also study of the different theoretical currents, like the cataloging of the subject, of the North American matrix; the indexation, of the English matrix; and documentary analysis, of the French matrix (Guimarães, Ferreira, & Freitas, 2012). These studies are subject to discussion, critical analysis, and reformulation, composing aspects of Ibero-American theories about documentary languages, thesauri, subject analysis (Barité, 2001; Campos, 2001; Vizcaya Alonso, 1997; Dias & Naves, 2013), and innovative aspects such as gender (López-Huertas & Ramírez, 2005), domain analysis (López-Huertas, 2006), and declassification (García Gutiérrez, 2007).

In the field of bibliometric studies, there is significant scientific production. It manifests in different fronts, such as the visualization of domains (Díaz Pérez, Moya Anegón, & Carrilo-Calvet, 2017; Padilla-Patricio et al., 2017) and the analysis co-related to historical and temporal dimensions (Gorbea Portal, 2016; Arencibia Jorge & Moya Anegón, 2008), as well as to the field's own rationale (Spinak, 1998). Next to this theme are the studies in scientific communication. There is, in the Ibero-American context, a great concern with contemporary issues related to digital technologies, such as e-science (Borges, 2008), as well as open access to scientific information (Kuramoto, 2007) and the study of scientific communication (Mueller, 2007).

Information management is an important topic in Ibero-American research, with different manifestations in countries such as Brazil (Valentim, 2008; Paim, 2003; Tarapanoff, 2006), Costa Rica (Rodríguez Salas, 2002), and Cuba (Ponjuán Dante & León Santos, 2016), in themes related to organizational culture and competitive intelligence.

The studies of information users represent a significant part of the research carried out in the region. There is an extensive mapping of existing theories and models in the world (González Teruel, 2005; Cunha, Amaral, & Dantas, 2015) and development of specific models for the study of different communities (Calva González, 2004). In Uruguay, there is a line of research related to the study of people living in unfavorable and vulnerable conditions, articulating user studies on human rights, information policies, improving living conditions, and the library as a cultural institution (Sabelli, 2008a; Szafran, 2016; Pérez Giffoni & Sabelli, 2010). In Argentina there is another line of work, with discussions about users and exclusion caused by the advent of the information society (Monfasani & Curzel, 2006). In Brazil, studies have been developed in the perspective of informational practices (Rocha, Gandra, & Rocha, 2017).

There is a broad set of research efforts on the technological dimension of information, covering very varied topics, such as information architecture, usability, and accessibility (Ramírez-Céspedes, 2016; Jiménez-Iglesias, Pérez-Montoro & Sánchez-Gómez, 2017), databases and modeling (Sokol, 2014), ontologies (Currás, 2010; Sánchez & Martínez, 2002), digital libraries (Ramalho & Lopes Fujita, 2011), and data mining (Jaramillo Valbuena, Cardona, & Fernández, 2015).

It is also worth mentioning the strong incidence of archival research in Ibero-America, from innovative manuals such as Tanodi (1961), which brings to bear the concept of *archivalia*, the work of dynamizing archives (Alberch i Fugueras, Boix Llonch, Navarro Sastre, & Vela Palomares, 2001), the discussion of archives as social constructions (Delgado Gómez & Cruz Mundet, 2010), and the link between archives and the national information and transparency policies of the state (Jardim, 1995).

Also in the field of museum studies, there is a rich tradition of studies, many in the form of manuals (Fernández, 1995; Hernández Hernández, 2006) and others with innovative proposals in the cultural heritage field (Fernández de Paz & Agudo Torrico, 1999), of identity (Magalhães, 2005), the links between expographic speech and culture (Semedo & Lopes, 2006), and critical museums studies (Santacana Mestre & Hernández Cardona, 2006).

This brief overview of Ibero-American research makes it possible to highlight above all the fact that it presents the same themes and sub-areas that make up the field of information science internationally. There is, of course, a greater density and depth in some areas than in the rest of the world, while in others there is less research. In general, it is possible to perceive a greater connection with the social and human sciences than in the rest of the world, as well as a greater critique of the hegemonic positivist model of the 1960s.

The mapping presented does not intend to identify the themes quantitatively. However, it is possible to think that the major contributions that Ibero-American research can make to world information science are related to themes less present in Anglo-Saxon information science, such as epistemology, librarianship, and cultural and social dimensions of information.

Besides the identification of general traces of the research in the region, it is necessary to mention works that seek to present the main traces of research and training in each country. Thus, there is the case of Spain in which there is a greater recognition of documentation (López Yepes & Osuna Alarcón, 2011; Sanz Casado & Lascurain Sánchez, 2010; Frías Montoya, 2008), and Portugal, that has seen a transition from the librarian-archivist course for documentary sciences and, more recently, information science (Ribeiro, 2010; Pinto, 2008). In Mexico, there is a stronger tradition of library science (Ríos Ortega & Ramírez Velásquez, 2015) while in Cuba there is the unique case of research that has developed largely from the Soviet experience (Linares Columbié, Romero Quesada, & Fernández Hernández, 2016). In Colombia, there is a predominance of library science with issues related to archival science and the integration of both in information science (Jaramillo, Salazar Álvarez, & Mercado, 2017), a situation partially similar to that of Argentina (Liberatore, 2011), and Uruguay, where there is also an approximation with the area of communication (Sabelli, 2008b). In Brazil, information science is predominant in post-graduate studies, but is in direct dialogue with library science and archival science, and partially with museum studies and other areas (Souza & Stumpf, 2009). Other Ibero-American countries such as Costa Rica (Córdoba González, 2010) and Venezuela (Pirela Morillo, 2010) also have a significant research volume.

The overview presented above is extremely summarized and aimed to provide a minimum overview of the diversity that makes up Ibero-American information research. As presented, a challenge that still remains is to look for the existence of common traits, concepts, theories, and perspectives that may allow the identification of a specific trend in the region within the diversity that composes this set.

4. THE GENERAL FRAMEWORK OF INFORMATION SCIENCE

Another fundamental challenge is the dialogue between Ibero-American reality and the general epistemological perspective of the field of information science. For that, it is necessary to identify and map the world reality of information science. A framework of reasonably consensual understanding, built on the contribution of different authors, makes it possible to show that information science evolved from a certain model, consolidated in the 1960s, to a set of contemporary perspectives that see/analyze several other dimensions of phenomena information. This framework is presented below.

The authors dedicated to the historiography of the area (Shera & Cleveland, 1977; Rayward, 1983; Buckland & Liu, 1998) point out that information science arose from the confluence of several factors, among which four stand out. The first of these factors is the post-custodial perspective, which emerged from bibliography in the fifteenth century, and continued with the design of Otlet's documentation in the early twentieth century, leading to the consolidation of an area less concerned with possession of documents and more concerned with its circulation and use. The second factor has to do with the emergence of specialized library science as a dismemberment within the field of library science, of which the United States' case, with the Special Libraries Association, established in 1909, is exemplary—specialized library science was the embryo of information science. The third factor was the performance of the first "information scientists" in England, the USSR, and the United States in the 1930s to 1950s, which demonstrated the strategic nature of scientific information, especially in the post-war context. The last factor was the increase in information technologies, from microfilm in the 1920s, and then digital technologies, from which a reflection was developed that would lead to the concept of information as the intended objective content of the documents and subject to technical processing.

These same narratives about the foundational period of information science usually identify the phenomenon of its consolidation in the 1960s, based on the Mathematical Theory of Communication by Shannon and Weaver, and the Systemic Theory, around a certain understanding of the informational phenomenon in a transmissive logic (transport problem, the transfer), mathematics (as probability, giving centrality to the notion of "information retrieval"), and systemic - identifying the elements of the information process and their interrelationship of n input mechanisms (documents), processing (processing/retrieval), and output (search by users). In the 1970s, this model met an extension from a "cognitive turn," based on the

theory of objective knowledge of Popper and expressed in the "fundamental equation" of Brookes. This proposal brought a new conceptual framework for the field (around the articulation of concepts of data, information, and knowledge), although it is possible to identify a continuity of basic aspects such as the transmissive, unidirectional, systemic, and instrumental logic of the studies (Vickery & Vickery, 1987).

However, what would become information science in the following years far exceeded that imagined in the early years. According to Bawden and Robinson (2012), in the following decades information science developed through subareas related to several "research programs": information organization, information technologies (creation, dissemination, and retrieval), informetrics, information behavior, communicating information, information society, information management, and policy and digital literacy.

According to several authors (Saracevic, 1999; Ørom, 2000; Capurro, 2007; Salaün & Arsenault, 2009; Vega-Almeida, Fernández Molina, & Linares, 2009; Bawden & Robinson, 2012), the different theories and sub-areas have consolidated into three broad models of information phenomena: the physical (which privileges the idea of information as a "thing" to be transferred from one point to another or processed within a system), the cognitive (inspired by Popper's philosophy and emphasizing information as an altering element of users' mental models), and social (which seeks to understand what information is from user communities, rescuing the idea of intersubjective construction).

In this period, research in the field of information science was being carried out and several research findings and theoretical elaborations eventually led to a series of changes in the understanding of information phenomena. The first of these has to do with the concept of "knowledge" used in studies, and the increasingly clear perception in research that knowledge is not just cumulative, a sum of data, as presented in the Brookes equation. Several authors have demonstrated that the process of knowing is dialectical, involving a tension between the subject and the real, relating the processes of accommodation and assimilation, coding/decoding, appropriation, and imagination. A second change concerns the understanding of the subjects, who ceased to be understood only as "mentalist" beings, living in a noumenal world, as if they were just data-processing "brains." In contemporary research in information science, subjects are understood as beings who act in the world, interfere, and develop different lines of action, as configured by the notion of "praxis."

A third change concerns the verification that the informational phenomenon is not only individual, it is not just between the individual and the data. It is collective, it is of an intersubjective nature, of the order of interactions, as well as the other actions and "existences" of the subjects. A fourth change relates to the actions of the subjects. More recent perspectives have emphasized that individuals not only seek information (as emphasized in the centrality of the idea of information retrieval, in the 1960s model of the "counter paradigm"), but they also perform other actions: They create content, share, and reject information.

There is a fifth change, related to the realization that information is not only a process of data transport but a process through which culture and collective memory are constructed, as well as the identities and lines of action of the subjects. Finally, we can observe a last observation of the informational research, the idea that information is not something that happens only inside a system (of its mechanisms of entry and exit), it is imbricated to a context; it is the contingency order. Information, therefore, is not something that transports itself but something that builds reality; it is not the delivery of something from an emitter to a receiver, it produces "effects"; it is a form of action in the world - it must therefore necessarily be understood in its links with social, cultural, political, and economic dimensions.

These aspects related to the understanding of informational phenomena have been developed in the area, especially since the 1990s (Capurro & Hjørland, 2003; Cronin, 2008) and although they have not led to a new general model of information studies, replacing that of the 1960s, increasingly evidence of the complex nature of informational phenomena is pointing to a certain exhaustion of both the hegemonic physicist explanatory model of the 1960s and its continuity via the cognitive model. Hjørland (2018) points out the importance of a culture and social-oriented view for the study of informational phenomena in recent years, and Floridi (2019) enumerates several characteristics of contemporary societies that pose new challenges for thinking about information. Between the recent perspectives of study in information science there can be cited digital curation, the open access movement, ontologies, folksonomies, domain analysis, Internet of things, information practices, critical information literacy, information culture, information orientation, intercultural ethics of information, information regimes, altmetrics, neodocumentation, and digital humanities (Araújo, 2018).

Among the factors that led information science from a physicist/cognitive perspective of the 1960s and 1970s to the current trends, of a sociocultural, pragmatic, and constructional nature, at least three are usually pointed out in the literature. The first of these is the development, within the scope of information science, of distinct sub-areas or specific fields of study, such as information management, information organization, user

studies, the political economy of information, and studies in scientific communication. Each turned to particular aspects of information in different contexts and generated diverse results, such as the discovery of "invisible schools," the tension between "tacit knowledge" and "explicit knowledge," the imbrication between "social classifications," and "bibliographical classifications," among others. The second factor concerns the various attempts to characterize information science - as a postmodern science, as an interdisciplinary field, and as a social science. All three perspectives are anti-positivist and, therefore, were fundamental to lead the science of information in the search for models more attentive to the complexity of the studied phenomena.

There is a third factor commonly identified in the history of information science. These are manifestations in several countries other than the United States, which also led to the formulation of different theories, concepts, and methods. Among the best-known and studied cases we have, as already mentioned in the introduction, are the Soviet, French, Canadian, German, and Nordic countries. Among the places of manifestation of information science, there is, also, Ibero-America. However, there are fewer studies that identify their specificity and their contribution. It is in this sense that it is fundamental to advance in the identification and characterization of the research carried out in Ibero-America, rather than merely mapping it, to seek its foundations and locate it in this conceptual framework of the world informational thinking.

5. FINAL CONSIDERATIONS

The teaching of information science, in practically all countries, at undergraduate and postgraduate levels, usually has a programmatic content, a discussion of some relevant topics (such as "information society," "technologies information quality," and "ethics") and the presentation of theoretical concepts and/or trends. It is common to present all these topics from a perspective focused on the information science of the United States, with some contributions from theoreticians from other countries. It is not common to have a teaching unit related to the different manifestations of information science in the world—even less the presentation of some kind of specific perspective of Ibero-America, as well as Asian or African research traditions. With this, a logic of invisibility and exclusion is reproduced that results in the loss of opportunity to increase the training of future researchers and professionals.

This fact is reinforced by the way in which research is carried out, as literature reviews are usually done almost exclusively from U.S. and Anglo-Saxon information science materials—which further diminishes the contribution of Ibero-America for the advancement of information science worldwide.

Thus, addressing the two challenges presented in this text is fundamental, both to increase education and training in information science, with a more complete picture of the manifestations of information science across the world and the various epistemological possibilities that exist, as well as for the improvement of research, for a more comprehensive offer of concepts and theories to be chosen and adopted by researchers. It is also important to enrich the very design of history, concepts, and theories of information science, including the Ibero-American contribution. The task of identifying, characterizing, analyzing, and situating Ibero-American informational thinking worldwide is just beginning.

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APPENDIX. List of Institutions That Teach Information Science in Ibero-America

Argentina (Universidad de Buenos Aires – UBA, Universidad del Museo Social Argentino – UMSA, Universidad Nacional de Córdoba – UNC, Universidad Nacional de Mar Del Plata – UNMdP, Universidad Nacional de Misiones – UNAM, Universidad Nacional del Nordeste – UNNE, Universidad Nacional de La Plata – UNLP); Bolivia (Universidad Mayor e San Andres – UMSA); Brazil (Faculdades Integradas Coração de Jesus – FAINC, Faculdades Integradas Teresa D'Ávila – FATEA/Lorena, Centro Universitário de Formiga – UNIFOR, Fundação Escola de Sociologia e Política de São Paulo – FESP, Fundação Universidade Federal do Rio Grande – FURG, Instituto de Ensino Superior da Funlec – IESF, Pontifícia Universidade Católica de Campinas – PUC-CAMPINAS, UNIRONDON Centro Universitário, Universidade de Brasília – UnB, Universidade de São Paulo – USP, Universidade de São Paulo – USP - Campus Ribeirão Preto, Universidade do Estado de Santa Catarina – UDESC, Universidade do Rio de Janeiro – UNIRIO, Universidade Estadual de Londrina – UEL, Universidade Estadual Paulista – Unesp, Universidade Federal da Bahia – UFBA, Universidade Federal da Paraíba – UFPb, Universidade Federal de Alagoas – UFAL, Universidade Federal de Goiás – UFG, Universidade Federal de Minas Gerais – UFMG, Universidade Federal de Pernambuco – UFPE, Universidade Federal de Santa Catarina – UFSC, Universidade Federal de Santa Maria – UFSM, Universidade Federal de São Carlos – UFSCar, Universidade Federal do Amazonas – UFAM, Universidade Federal do Cariri – UFCa, Universidade Federal do Ceará – UFC, Universidade Federal do Espírito Santo – UFES, Universidade Federal do Maranhão – UFMA, Universidade Federal do Pará – UFPA, Universidade Federal do Paraná – UFPR, Universidade Federal do Rio Grande do Norte – UFRN, Universidade Federal do Rio Grande do Sul – UFRGS, Universidade Federal Fluminense – UFF, Universidade Vale do Rio Verde de Três Corações – UNINCOR); Chile (Universidad de Playa Ancha de Ciencias de la Educación – UPA, Universidad Tecnológica Metropolitana del Estado de Chile – UTEM); Colombia (Pontificia Universidad Javeriana, Universidad de Antioquía – UDEA, Universidad del Quindío – UNIQUINDIO, Universidad de La Salle); Costa Rica (Universidad de Costa Rica – UCR, Universidad Nacional – UMA); Cuba (Universidad de La Habana – UH); Ecuador (Universidad de Guayaquil – UG, Universidad Tecnológica Equinoccial – UTE); El Salvador (Universidad Panamericana del El Salvador – UPAN); Spain (Universidad Alcalá de Henares – UAH, Universidad Carlos III de Madrid - UC3M, Universidad Complutense de Madrid – UCM, Universidade da Coruña – UDC, Universidad de Extremadura – UNEX, Universidad de Granada – UGR, Universidad de León – UNILEON, Universidad de Murcia – UM, Universidad Pablo de Olavide – UPO, Universidad de Salamanca – USAL, Universidad de Zaragoza- UNIZAR, Universitat Autònoma de Barcelona – UAB, Universitat de Barcelona – UB, Universitat Oberta de Catalunya – UOC, Universitat de València- UV, Universitat de Vic- UVIC); Guatemala (Universidade de San Carlos de Guatemala – USAC); Jamaica (The University of the West Indies – UWIMONA); México (Escuela Nacional de Biblioteconomía y Archivonomía – ENBA, Universidad Autónoma de Chiapas – UNACH, Universidad Autónoma del Estado de México – UAEM, Universidad Autónoma de Nuevo León – UANL, Universidad Autónoma de San Luis Potosí – UASLP, Universidad Nacional Autónoma de México – UNAM); Panama (Universidad de Panamá – UP); Paraguay (Universidad Nacional de Asunción – UMA); Peru (Pontificia Universidad Católica del Perú – PUCP, Universidad Nacional Mayor de San Marcos – UNMSM); Portugal (Instituto Politécnico do Porto – IPP, Universidade de Coimbra, Universidade Nova de Lisboa – UNL, Universidade do Porto – UP); Puerto Rico (Universidad de Puerto Rico – UPR); Uruguay (Universidad de La República – UDELAR); Venezuela (Universidad Central de Venezuela – UCV, Universidad del Zulia – LUZ).

Source: Information present in the directory of the EDICIC (Information Science Education and Research Association of Ibero-America and Caribbean). Retrieved from http://edicic.org.