

Foundations of the information science. History and contemporary theories

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ABSTRACT

It presents the result of theoretical research on the history of information science from its theories and concepts. From the systematization of the collected data, a framework has been built in which information science is divided into three major moments: the founding period, in which information science was born as a result of five distinct phenomena (the 1960s); the period of expansion of the problems, with the constitution of six sub-areas (1970s to 1990s); and contemporary perspectives, presented here from the identification of twelve distinct approaches developed in the last twenty years. Next, the six dimensions of the information concept are presented in which the most significant conceptual advances have been made over these decades. Its findings show that the diversity of theories is an enriching factor for the field, but also produces the need for systematization and mapping works.

KEYWORDS

Information science; Information science theories; History of information science; Foundations of information science.

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Introduction

The term “information science” appeared in the 1950s, but was effectively consolidated in the 1960s, and since then it has been strengthened through institutional actions (the establishment of associations, research groups, undergraduate and graduate courses, scientific journals) and also intellectual ones (the creation of theories, research implementation, epistemological formulations). The immense diversity of these actions made it difficult to reach a consensual understanding of what information science itself is, with great disagreement about its identity and its limits – which is expressed in the diversity of teaching programs in the area, in debates about what is or is not part of it, the criteria for acceptance of papers for publication in journals and scientific events, and so on (Le Coadic 1994; Davis and Shaw 2001; Bawden and Robinson 2012; Stock and Stock 2013).

As a way of attempting to find some cohesion around the idea of what information science is, research was developed with the specific purpose of building, from a historical perspective, an intellectual mapping of the sector. At the same time, there was a concern to consider the most recent study trends in the area. As a result, we arrived at a framework in which information science is presented in three major moments, marked by distinct characteristics, which allow us to visualize a certain overview of the sector’s evolution over the decades.

The purpose of this text is to present this framework with its three moments, to provide systematization for the information science field enabling to unify different ongoing perspectives in the work of different researchers.

The emergence of information science

The establishment of information science has involved several historical and scientific facts that have occurred at different times and places. Although these facts are multiple, they can be grouped into five dimensions: the emergence of bibliography and documentation; the institutional relationship with library science; the performance of the first “information scientists” in providing services in science and technology; technological accrual; and the grounding in mathematical theory (Shera and Cleveland 1977; Buckland and Liu 1998; Hjørland 2018).

The first fact was the emergence of the bibliography in the fifteenth century. Seeking to elaborate lists of existing books, instead of having as an objective the assembly of collections, this activity marks the appearance of a “post-custodial” orientation. At the end of the 19th century, Otlet and La Fontaine reinvigorated bibliography by proposing the First International Conference on Bibliography in 1895 and then creating the International Institute of Bibliography (IIB). Right after Otlet proposed the creation of a new scientific discipline, the documentation. In this sense, a fundamental contribution was Otlet’s elaboration of the concept of “document” as meaning the totality of human artifacts, registered in the most diverse ways, in the most diverse media: books, manuscripts, photographs, paintings, sculptures, moving images, phonographic records, stamps, prints, etc. A first element emerged here that would be fundamental, decades later, for the elaboration of the concept of “information”.

The second dimension refers to the relationship between documentation and a part of library science (that related to the technical treatment aspects of documents), which involved yet another aspect: the

institutional. The case of the United States is exemplary, with the rupture that occurred in the American Library Association (ALA) in 1908. With the growing incompatibility between those librarians focused on public libraries, servicing the general public and the educational role of the library, on one hand, and those more concerned with serving scientists in specific areas of knowledge, aimed at increasing the procedures and technical treatment services of documents, on the other hand, in 1908, the establishment of the Special Libraries Association (SLA), by the second group. A few years later, in 1937, SLA changed its name to the American Documentation Institute (ADI), following an international trend towards recognizing documentation as a new field of work. A few years later, in 1968, ADI changed its name to the American Society for Information Science (ASIS), the world's first information science association.

The third major phenomenon was the role that several scientists began to play from the 1920s to the 1940s, first in England, then in the United States, and other countries, in providing their colleagues with information about their respective fields – the so-called science services. Some chemists, physicists, engineers, and other scientists began to engage in the work of preparing indexes, abstracts, promoting dissemination channels, to facilitate and speed up the work of their peers, and, after a time, began referring themselves as *information scientists*. Although it started as an eminently practical activity, over the years this initiative moved towards an important institutionalization. The most important milestone was the Institute of Information Scientist, created in London in 1958.

The fourth phenomenon occurred at the confluence of technological developments and the consequent efforts to theorize about these developments. The use of microfilm as a form of storage and consultation of documents began in the 1920s and 1930s. Reflections along these lines led to the consideration of the possible dissociation between information's physical medium and its content, to the extent that the content of a book or newspaper could be microfilmed and therefore preserved (and also used, disseminated, etc.) independently from the original document. With the development of computers in the following years, this thought sharpened. This vision was consolidated in the Vannevar Bush's reflections, who in 1945 published an article, "As we may think", in which he identified a real problem (the informational "explosion", that is, the growth in the number of documents, and the resulting difficulty of information retrieval) and a possible solution: the automation of retrieval processes. In the following years, the proposal of automated information retrieval was embraced within the information science project, and it was even understood by different authors as the "core" of the area, including Tefko Saracevic, in his 1970 book "Introduction to Information Science".

The four facts highlighted above led to the formation of an emerging scientific discipline that needed, however, a theoretical basis. This basis was sought in the mathematical theory of communication, published in 1949, by Claude Shannon and Warren Weaver - a theory which developed, for the first time, a scientific concept of information, preparing the ground for the emergence of a discipline dedicated to this matter. The authors were concerned with the communication process effectiveness and, thus, they elected the notion of information as the core concept of their work.

In their definition of "communication" as a process in which a sender sends a message to a receiver (in which information is a measure of the probability of that message), the authors considered only the technical problems related to messaging transmission. When information science appropriated this theory, it led to a "reduction" of its research object, considering only the physically observable

and measurable aspects of “information”, clearly inserting itself in the prevailing perspective during the Cold War era research contexts tuned with military strategic objectives. Researchers working along these lines have brought to information science, along with them, their mode of scientific rationale – the positivist mode, which consists of applying to human phenomena and processes the same observation and research techniques of the natural sciences, in search of universally valid laws and principles.

Shannon and Weaver, by “cleaning” the concept of information from its dimensions of meaning and social relationship, discard subjectivity as a comprising element of information, making it possible to approach information as an objective phenomenon, independent of the subjects that relate to it and, therefore, able to be studied “scientifically”.

Together, these facts led to the consolidation of the first information science, which manifested itself in the Anglo-Saxon and Soviet context between the 1940s and 1960s, and from there spread to several other regions of the planet. A major event in this consolidation was the publication, in 1968, of Harold Boroko’s now-classic article entitled “Information Science: what is it?”, presenting an exhaustively repeated definition of what would become the new field.

The expansion of research

In the following decades, this first model of a science of information was considerably enlarged, as research subareas with relative autonomy were developed in the 1970s, 1980s, and 1990s. In each of them, distinct theoretical currents appeared, and they addressed other empirical realities beyond the realm of science and technology and automated information retrieval systems.

The first sub-area to be highlighted, however, is the very study of scientific information flows, which has been associated with two real problems: the need, by scientists, to access information, research results, and documents, efficiently and quickly; and the phenomenon of the informational explosion, notably the explosion of information in science and technology, making it increasingly difficult for scientists to keep up with the evolution of knowledge in their field. The information science subarea that developed in this context is mainly concerned with knowing and characterizing information sources, services, and systems, both those that scientists may need as input for their research activity and those into which the products of scientific activity are converted. Studies have proliferated seeking to characterize, therefore, the various sources of information, both formal and informal, defining each type, with its characteristics, advantages, and disadvantages in terms of speed, accessibility, enduring, cost (Meadows 1974).

The second sub-area is the representation of information, which was built with the challenge of searching for the best way to represent information (both in terms of form and content) while thinking about the optimization of its retrieval. The studies at that time led to the emergence of several controlled language tools and classification systems, all aiming to maximize cost savings, noise reduction, redundancy suppression, and application of logical principles. The systems and languages created then competed to see which one was the best, this being precisely the issue – the search for the best language, the best representation – the initial goal of this information science subfield (Lancaster 1968). In the late 1970s, the growing influence of cognitivist theories in information science

was felt in the field of representation, as efforts were made to build representation languages and information systems focused on users, or users' cognitive strategies (Vakkari 1999).

A third sub-area is the field related to the study of information users. In the 1940s and 1950s, users' studies were carried out within the scope of scientific communication research on scientists' information flows and information habits. In the following decades, extensive quantitative research was conducted attempting to correlate determined users' sociodemographic profiles with informational behavior patterns.

In the late 1970s, studies with effective user-centered approaches emerged. These studies were based on theories such as Belkin's anomalous state of knowledge, Dervin's sense-making theory, Taylor's value-added theory, and Kuhlthau's process-based constructivist approach. In common, they all present a cognitivist perspective: they seek to understand what information is from point of view of users' mental structures relating to information (need, seek, and use). Users are studied as beings endowed with a certain "universe" of information in their minds, using this information to set and guide their daily activities (González Teruel 2005).

A fourth sub-area is information and knowledge management, which had as its starting point the perception of the importance of information as a resource within organizations. Since the end of the Second World War, information has been increasingly understood as an important resource for corporations (Drucker 1993). However, its excess was a problem, both in terms of use (difficulty in finding wanted information in a very broad universe) and in terms of obstacles to its circulation (ensuring that it reaches all the sectors needing it, instead of being stored in a single point) and even concerning its physical volume (the need to have increasingly larger places to store it). The first reflections on information management focused on its physical nature: to reduce excess, optimize circulation, accurately identifying what is necessary, and discarding useless or redundant information. Many empirical studies have been carried out to determine the types and strategic importance of the various sources of information used in the organizational environment, both in the internal and external environment, using certain established criteria about their quality, taking the organizational objectives as a reference.

The fifth sub-area is the political economy of information. The growing perception of information as a resource has generated, in addition to studies that sought to understand the dynamics of its production and transfer (in the scientific or organizational environment), also a set of concerns about its ownership and its unequal distribution among different countries. In the wake of this concern, studies focusing on the democratization of information, access to information by excluded and marginalized groups and classes, the creation of alternative forms and systems of information, and even studies on counter-information as a way of rejecting hegemonic informational regimes have been developed (Mattelart 1992).

Finally, we must highlight the research field related to information metrics studies, which originated with bibliometrics, the application of statistical techniques to count and establish patterns of regularity in informational items such as the number of books, editions, authors who publish in journals, among others. Such a field was initially developed from the elaboration of empirical laws about the behavior of literature. Among the main landmarks of its development is Lotka's method of measuring the productivity of scientists, 1926; Bradford's law of scientific knowledge dispersion, 1934; and Zipf's model of distribution and frequency of words in a text, 1949 (Tague-Sutcliffe 1992).

In the 1960s, bibliometric studies joined the study perspectives on scientific and technical information with the creation of the Institute for Scientific Information (ISI) by Garfield, with the proposal of analyzing the bibliographic citations present in articles published in scientific journals.

Together, these six subfields have contributed to an effective broadening of the problems in the field of information science, diversifying informational, both in terms of empirical realities to be studied and the different dimensions and aspects of information, as well as the involved issues.

The contemporary perspectives

As the subfields evolved, the very concept of information became the object of theorizations and reflections. Several authors have presented proposals for the historical mapping of these theorizations. In the first years after the emergence of the area, several initiatives sought to define what information science is, to identify its object of study and related concepts (Taylor 1966; Mikhailov, Chernyi, and Gilyarevsky 1966; Hoshovsky, and Massey 1968; Hayes, 1969). In the following years, there was an effort to identify the scope and limits of the area (Wersig, and Nevelling, 1975; Farradane, 1980), still within the same conceptual framework around the concept of emerging information in the 1960s. Some more recent works seek to systematize knowledge within information science, based on the same intellectual framework as the 1960s, but incorporating new themes, especially technological ones (Norton, 2000; Davis, and Shaw 2001; Gilchrist, 2009). In a complementary perspective, however from a philosophical basis, one should also mention the work of Floridi (2019). In the end of the 1970s and early 1980s, an initiative started to support information science based on the concept of knowledge (Belkin, and Robertson, 1986; Brookes, 1980). This perspective of conceptualizing information from the notions of data and knowledge is consolidated later in several works, such as, for example, Zins (2007).

There is another set of authors, which have in common the fact that they identify three major study concepts or models of information present in the information science history. Are authors from several countries: Germany (Capurro, 1992), United States (Saracevic, 1999), Denmark (Ørom, 2000), Spain (Fernández-Molina, and Moya-Anegón 2002), Portugal (Silva, and Ribeiro 2002), Canada (Salaün, and Arsenault 2009), United Kingdom (Bawden, and Robinson 2012), Mexico (Rendón Rojas, 2013), and Brazil (Araújo, 2018). Although they use different terms, their discussions are very similar. In all of them, it is emphasized the idea that there was the first form of studying information (physical, as an objective phenomenon, as a sign, as something on the syntactic level) in which it was understood as something existing in itself, independent of subjects and contexts, as a “data”, endowed with properties and characteristics that could be measured and explained through the formulation of laws. In their presentations of this concept, the authors link “information” to notions such as signal, sender, receiver, transport, transfer, system, retrieval, recovery, probability, precision, revocation, message. Also in all authors, there is the idea that a second way to study information has emerged (as something cognitive, semantic, subjective), in which the articulation between data, the existing elements of reality independently of the subject, and knowledge, that which individuals know or are aware of, began to be considered, information is the measure of the change of this state of knowledge, or, in other terms, the product of the interaction between data and knowledge, at the individual’s level. In presenting

this study's perspective, the authors approximate the concept of "information" to those of data, knowledge, processing, individual, person, gap, filling, modification, change, and meaning.

Once again, in all aforementioned authors, there is the idea of a third model, which in some appears as a trend still under construction, but already more established in others. Terms such as pragmatic, intersubjective, sociocultural are used to describe it, pointing out that information is something not only of the objective or subjective realm but also of the collective, of social construction. In these descriptions, "information" appears linked to terms such as document, knowledge, action, context, culture, memory, collective, society, and history.

In this sense, it is possible to identify several contemporary trends, developed in the last twenty years, comprising information science, and developed in the wake of the social perspective presented above. In the present research, thirteen current perspectives were identified, which are presented next.

The first of them is domain analysis, an area of research that emerged, in the field of information science, from the publication of the first article by Hjørland and Albrechtsen (1995). This area has as precedent the idea of "literary guarantee" worked in library science, and developed from a central concept: "discursive communities". This concept designates collectives, social groups that have certain (shared) ways of thinking, of expressing themselves, and of knowing reality. Applied to the field of information science, domain analysis allows us to see the conditions under which scientific knowledge is constructed and, thus, to realize that what is relevant in a given field reflects a social construction, an intersubjective agreement. The fundamental contribution of the domain analysis perspective is the understanding that it is not one subject, in isolation, who has needs, ways of seeking and using information. "Information need" is something that arises collectively, it is a group of people who develop certain patterns of what kind of situation or activity needs information, what kind of information one should need in each context, and so on for other actions and aspects related to information.

A second contemporary perspective is altmetrics. Appeared in the context of Web 2.0 and the consequent development of the so-called scientometrics 2.0, the field of metric studies sought to seize the opportunity and improve the study of citation dynamics, starting to consider the context and the role of different types of publications and, particularly, the various ways in which the impact of scientific production can be expressed - by measuring accesses, comments, links and citations on social networks, which are "social interaction indicators". The origin of this field of applications and studies is linked to a manifesto (Priem, Groth, and Taraborelli 2000) in which the area is defined as the study of scientific communication on the social web, through the development and use of indicators for viewing, downloading, citations, reuse, sharing, tagging and comments (Souza, 2014). The importance of its development is the research guidance in the field of information not only to the formal environment of science, but the study of science immersed in social life, in the dynamics of human life.

A third current trend, in line with advances in the area of administration, is the approach linked to the idea of organizational culture. This notion designates the study of informational phenomena development (need, search, sharing, and use) at the individual and collective levels in organizations, seeking the articulation between both through the identification and analysis of the culture that pervades them. The origin of this field in information science is linked, among others, to the work of Davenport and Prusak (1997) around the study of continuous learning, the organizational

environment, and ambiance as enablers of common ways of thinking and acting or, in other terms, the “set of values, beliefs, socialization, data sharing, and use, information and knowledge at the corporate level”. (Nonaka, Takeuchi, 1995). Along the same lines, a more specific perspective developed was information orientation (Marchand, Kettinger, and Rollins 2001), which, based on the study of organizational culture, seeks to create tools to measure and optimize the ability of corporations to use information.

Another current perspective is digital curatorship, which is, actually, more a field of professional and institutional activity than a theoretical proposal. Digital curatorship can be defined as the practice and study of the processes of selecting, preserving, maintaining, collecting, and archiving digital data, with the consequent establishment of repositories and/or participatory digital platforms. Its origin is linked to the perception of the importance of reliability certification, obsolescence, and the evolution of formats (with the risk of loss by technological evolution and fragility of digital media). A more specific application of this field has been given, in information science, concerning scientific activity, seeking to cover the entire spectrum of activities, from capture to validation and archiving, discovery, and reuse of data. Thus, it can be understood as the management of the digital object during its entire life cycle (Pennock 2007), and some models of the digital data life cycle have been developed for this purpose, such as those of Higgins (2018). The most relevant contribution of this area is its concern with the whole, that is, with the connection and interdependence between the various aspects, moments, and instances related to information.

A fifth area is folksonomies, which represents a new concept for organizing digital resources on the web. This is the consideration of free indexing, performed by the users themselves, in information professionals’ work, to provide better information retrieval, work developed in an open and sharing environment, therefore of joint construction (Noruzi 2006). The term folksonomy was coined in 2005 by Vander Val to designate the labeling of web resources in a social environment by users themselves. It emerged with Web 2.0 and its proposal for a participatory architecture and, in the field of information science, articulated with decentralized dynamics of information representation actions (Ding et al 2009).

Another trend is intercultural ethics of information, whose focus is on the intersection between global principles and local singularities. This approach originated with the creation of the International Center for Information Ethics, in Germany, in 2004, around a fundamental question: “information for whom?”, and it also sought to discuss and problematize informational issues debated in the scope of the World Summit on the Information Society, in its different editions. It is in this line that the intercultural ethics of information was developed, focused, according to Capurro (2007), on the study of challenges such as privacy, intellectual property, free access, the right to expression, and digital identity issues.

A seventh recent theory is neo-documentation. As its name indicates, it seeks to revitalize another movement, which took place in institutional, professional, technical, and theoretical dimensions - that of documentation originated with Paul Otlet at the dawn of the 20th century and continued by, among others, Suzanne Briet in France, Lopez Yepes in Spain and Bradford in the Anglo-Saxon world. The neo-documentation proposal, developed in the field of information science by authors such as Rayward, Day and Frohmann, proposes the replacement of the term “information”, as used in information science, for the term “document”. Such an idea is understood not as a deviation, but as

a referral – information is understood, for such authors, as the effect or derivation of documents (Lund 2010). For authors linked to this approach, by abandoning the document and focusing on information, understood as the “objective content” of documents, information science has divorced itself from the social, political, economic, and cultural practices in which information is produced. The “document” bears the marks of its context, of who produced it, of the medium on which it is inscribed, of its dimensions and size, aesthetic aspects, among others. By disregarding all of this, seeking only the “data” contained therein, information science has lost very important dimensions of the informational phenomena. Neo-documentation thus seeks certain reconciliation between the study of information and social life.

An eighth contemporary field is the digital humanities. It is a broad movement, carried out in several countries in the past few years, which has produced differentiated impacts in scientific disciplines (Schreibman, Siemens, and Unsworth 2004). In broad terms, it aims to break with the separation seen, in recent decades, between digital technologies and the humanities, seeking, precisely, to reconcile the humanities and social sciences methods with the digital world characteristics, potentialities, and procedures. In information science, the main dialogue with the digital humanities has been in the field of discussions about the preservation of cultural heritage in contemporary societies, the promotion of universal access in a democratic way, and the critical basis for elaborating public policies for technological development.

There is a ninth trend, the archaeology of the information society. Several researchers have raised questions about the “novelty” character of the information society phenomenon, vaunted since the 1960s, as well as the promotional discourse involved around the notion. One of these authors, Burke (2000), sought to demonstrate how, throughout its history, humanity has developed distinct ways to collect, analyze, disseminate and use information, relativizing part of the discourse around the information society that presented many processes as original or unprecedented in history. Another author, Mattelart (2001), has studied the link between information society’s euphoric discourse and the domination processes and projects in planetary geopolitics, the consolidation of hegemonies, through the concept of ideology. Along the same lines, Day (2001) sought to critically analyze how the notion of information society was developed and what interests were articulated in the development of the concept.

Another field, which has always developed with relative autonomy in information science, was user studies. In the mid-1990s, from a group of Finns’ initiative (Tuominen, Talja, and Savolainen 2002) another approach began to be developed in this field: the studies in informational practices, that is, the study of the movement through which individuals act in the world, modeled by culture, and at the same time constitute the culture that influences them and the reality in which they act. Initially, such an approach focused on studies of users in everyday life, as opposed to traditional studies focused on the scientific, governmental, and business environment (Savolainen 1995), but later it became a perspective for all kinds of empirical reality. Among the contributions of this line of investigation is the idea that there is no outside world, “out there,” independent of the subjects and their actions. It is the subjects who, in their actions, create and update the social rules and norms. Moreover, these studies, in their critique of the informational behavior proposal, have advanced the understanding of information not as the filling of a cognitive gap, nor as a process exclusively experienced from the

individual perspective. The processes involved with information use enclose imagination, ownership, questioning, tensions, and such processes are experienced from socially constructed categories.

Another perspective, widespread in the contemporary setting of information science, is the approach known as information regimes. This approach is based on Karl Marx's notion of production mode applied to the informational field. An information regime thus designates a dominant informational mode in a society, that is, who are the subjects, organizations, rules, authorities, resources, and hierarchies that shape a given regime, that is, certain conditions of existence of discourses and enunciations. This idea has been developed by, among others, Sandra Braman (2004) through the notion of information production chains in the analysis of the circulation of information in different countries and the formulation of public policies in the sector. The authors linked to this line of studies have mainly analyzed information policies, but not only in their normative or operational aspects but in their immersion and interrelation with the various dimensions of human life – the social, cultural, economic, political, regulatory, among others (Frohmann 1995).

Memory is a topic or concept that has always been present, in some way, in the field of information science. In the last two decades, however, it has had a greater prominence and started to assign areas of investigation, lines of research in graduate programs, and working groups in scientific associations. This movement has also occurred with the progressive abandonment of a technicist perspective of the idea of memory (linked to information processing and retrieval, the capabilities and potential of computers and networks) and its problematization based on contributions from history and anthropology, among others (Hjørland 2000).

From an individual perspective, related to human capability, the understanding of memory came to be seen within a framework of its social construction and its role in the constitution of culture and reality itself. Moreover, how different individuals and groups participate in this process has led to an understanding of memory as a “battlefield”, in which the actors fight to establish the criteria for deciding what will be collectively remembered and forgotten, valued and disregarded (Bates 2007). Recent studies have focused on production conditions (and the right to participate in this production), circulation (and the importance of plurality and diversity in this process), and access (ensuring that it is as democratic as possible) of information in the development of memory.

Six dimensions of the information concept

As we have seen, studies in the field of information science have been carried out over the decades, and several research findings and theoretical elaborations have promoted a series of changes in understanding the informational phenomena. It is important to highlight that such evolution has occurred not only by the evolution of subfields, but also by the attempts to characterize the field (as an interdisciplinary, social, and postmodern science), their manifestations in different countries, and the discussion about the very concept of information (along with the three major models seen in the previous topic). Another way to analyze the evolution of the concept of information can be carried out from the decomposition of the concept in some dimensions and the way these dimensions have been studied. In this sense, a detailed analysis of the various theories formulated allows us to visualize these changes grouped into at least six dimensions, three of them related to the core ideas of the physical model and three of the cognitive model.

The first relates to the concept of knowledge used in the studies and the increasingly clear perception in research that knowledge is not just an accumulation, a sum of data, involved with the processing of information, as presented in Brookes' equation. Several authors have shown that the process of knowing is dialectical, involving a tension between the subject and the reality, relating accommodation and assimilation, coding/decoding, appropriation, and use of imagination processes.

A second change refers to the understanding of subjects, which are no longer understood only as mentalist beings, living in a numeric world, as if they were only data processing brains (i.e., taken only in their dimension of cognoscente beings). In contemporary research in information science, subjects are understood as beings that act, interfere, and develop different lines of action in the world, as configured by the notion of praxis.

A third change relates to the verification that the informational phenomenon is not the only individual; it does not only take place between the individual and the data. People cannot be understood only as isolated entities. Information is something of a collective nature, it is of an intersubjective nature, of the realm of interactions, it is constructed through the reciprocally referenced action of actors – as well as the other actions and existence of the subjects.

A fourth change relates to subjects' actions. More recent perspectives have emphasized that individuals not only search for information (as emphasized in the centrality of the idea of information retrieval in the counter paradigm of the 1960s model), but they also perform other actions, they create content, share, and dismiss the information.

There is a fifth change, the idea that information is not something that happens only inside a system (its input and output mechanisms), it does not have only a technical dimension, that could be automatable and determined by laws, analyzed in its internal elements. Information is imbricated in a context; it is in the order of contingency. Information is not just the delivery of something from a sender to a receiver, it produces effects, it is a way of acting in the world – it must, therefore, necessarily be understood in its links to social, cultural, political, and economic dimensions. It does not exist in itself but is an aspect of broader relationships; it is inscribed in larger dynamics.

Finally, one last finding on informational research relates to the idea that information is not just a process of transporting data, transferring something from one point to another, but rather a process through which culture and collective memory are constructed, as well as the subjects' identities and action lines.

These aspects related to the understanding of information phenomena have characterized what some authors call “sociological turn”, “social paradigm” or “sociocultural model” (Capurro, and Hjørland 2003; Cronin 2008; Hjørland 2018; Capurro, 2014) and, although they have not led to a new general model of information studies replacing that of the 1960s, they increasingly highlight the complex nature of information phenomena, pointing to certain exhaustion of both the hegemonic physicalist explanatory model of the 1960s and its continuity through the cognitive model.

In a well-known text about the concept of information, Capurro and Hjørland (2003) ask what difference it makes whether we use one or another concept of information. We know that concepts are the researcher's creations, they do not exist “there, in reality”. What we have before us are facts, phenomena such as, for example, people going to the library, document preservation policies being formulated, digitalization processes taking place, communities interacting through social networks, people visiting museums, audiences watching television, classes taking place through

videoconferences, people accessing search engines, etc. The empirical is there – what changes is our way of understanding it. Each of these processes can be analyzed in terms of data transfer, changing states of knowledge, or collective construction of knowledge and identities.

Information science has been moving towards the consolidation of perspectives based on aspects of the so-called social paradigm. This shows a trend, which is also a more attentive look at the phenomena' complexity, the interrelationship of its elements and dimensions, as well as the new aspects of empirical realities demanding new explanatory models.

Conclusion

In the few decades of its existence, one can see that the foundations of information science have been increasingly better defined, based on the enrichment fostered by many contributions. Thus, its emergence has already marked a consolidation of some concerns already worked on by other areas (library science, bibliography, documentation, information retrieval): dealing with the “objective content” of documents, thinking about information flows in different contexts, developing products and services for the organization, dissemination, and promotion of information use. Such aspects, although criticized and challenged, are still part of the information science field. In the decades from 1970 to 1990, however, there was an addition of problems, concepts, and methods with the development of different subfields and their respective theoretical currents: studies in scientific communication, information representation, users studies, knowledge management, the political economy of information, and metric studies. In parallel, the very concept of information evolved from a physicalist perspective, focused on systems and records, to a cognitivist approach, incorporating the subjects' cognitive dimensions, up to the more recent design also focused on the study of contexts and subjects' real actions. Different perspectives unfolded in the last two decades as an outcome of this enrichment process, presented in this paper through the 12 theories/approaches to the informational phenomenon.

A close look at contemporary perspectives allows us to identify aspects of the questioned physical and cognitive models. The information has an objective dimension that clearly can be identified, but it involves transportation, a transfer of something from one subject to another (and therefore information involves signal, transmitter, receiver, system, recovery). Information also involves a change in the cognitive status of an individual, the transformation of data into knowledge (and hence information relates to concepts such as data, knowledge, gap, person, fulfillment, need, search, use). But information is also something broader and more complex than that, and it exists in dimensions that are beyond the actual operational and mechanical dimension. It is, as pointed out and expressed by the thirteen aforementioned trends, a process in which the subjects' identities are built and culture is constituted from the creation and appropriation actions of the knowledge records (documents) by subjects acting in a reciprocally referenced way in the construction of knowledge. Information is therefore related to concepts such as culture, memory, appropriation, mediation, document, and knowledge.

This richness and diversity of the informational field may, sometimes, become a problem in establishing dialogues and global understanding of the area. But it must be seen, above all, as something positive: an expansion of theoretical possibilities, the mutual fertilization of research

traditions, and pertinence of the most distinct empirical phenomena as objects of study in the field. Nevertheless, this diversification movement must be also marked by systematization attempts that help in consolidating the field's identity. The present text intends to be a contribution towards this goal.

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