

Documentation / Information and Their Paradigms: Characterization and Importance in Research, Education, and Professional Practice[†]

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ABSTRACT: Since 2004, the authors have designed a proposal of paradigms for the Documentation-Information field, which starts from a comprehensive meaning of the concept and is based on identifying the presence of a custodial, cultural, historicist-and-humanist, and technicist paradigm that has shaped the professional activity, education, and public policies of the archival, librarian, and museologist universe from the early 1800s to the mid-20th century. It also includes pointing out the emergence of a new post-custodial, informational, and scientific paradigm, generated by the profound changes taking place worldwide and that are summarized in strong, yet too generic, expressions such as “information era” or “globalization.” This paper characterizes the two paradigms proposed, highlighting their dominant traits and showing their operational relevance at the level of education, research, and professional practice.

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1.0 Paradigms and scientific activity: the legacy of Thomas Kuhn

The Greek root *parádeigma* means “model, example, norm,” which, in an extensive and generic way, the North-American physicist and science “historian/sociologist” Thomas Kuhn recovered in his book *The structure of scientific revolutions* (1st ed. 1962), making the concept of paradigm compulsory in the epistemological debate about the internal and social dynamics of “normal science.” It is, therefore, only natural that we begin this paper by referring to the sense given by Kuhn, which others have appropriated, to the present time. In fact, with regard to the scientific field of Documentation-Information, the proposal launched by Rafael Capurro in 2003 has special relevance here and needs to be confronted with the words of Kuhn, collected in his seminal work.

It is important to understand if the author wanted to give the word "paradigm" the meaning of theory or a theoretical perspective designed by a scientist and espoused by one or more disciples in the midst of a multiple range of interpretation and experimental possibilities, or if, on the contrary, it corresponds to something more stable, homogeneous, and profound. Interestingly, the answer to this question emerges in the first chapter of “The route to normal science” (Kuhn 2000, 29-42), in which, at one stage, we read:

Aristotle's *Physics*, Ptolemy's *Almagest*, Newton's *Principia* and *Optics*, Franklin's *Electricity*, Lavoisier's *Chemistry* and Lyell's *Geology* – these and many other works served for a time implicitly to define the legitimate problems and methods of a research field for succeeding generations of practitioners. They were able to do so because they shared two essential characteristics. Their achievement was sufficiently unprecedented to attract an enduring group of adherents away from competing modes of scientific activity. Simultaneously, it was sufficiently open-ended to leave all sorts of problems for the redefined group of practitioners to resolve.

and (Kuhn 2000, 30):

Achievements that share these two characteristics I shall henceforth refer to as ‘paradigms’, a term that relates closely to ‘normal science.’ By choosing it, I mean to suggest that some accepted examples of actual scientific practice – examples which include law, theory, application,

and instrumentation together – provide models from which spring particular coherent traditions of scientific research The study of paradigms, including many that are far more specialised than those named illustrative above, is what mainly prepared the student for membership in the particular scientific community with which he will later practice. Because he there joins men who learned the bases of their field from the same concrete models, his subsequent practice will seldom evoke overt disagreement over fundamentals.

Inseparable from the notion of paradigm, in the Kuhnian analysis, is the notion of “normal science” understood as a very determined activity, but that need not be wholly determined by rules, and hence the notion of “shared paradigms” that are sources of coherence to the traditions of normal research: “Rules, I suggest, derive from paradigms, but paradigms can guide research even in the absence of rules” (Kuhn 2000, 66). We therefore have to understand that “normal science” is the activity that solves “puzzles;” it is a cumulative enterprise, “eminently successful in its aim, which is the steady extension of the scope and precision of scientific knowledge” (Kuhn 2000, 77). It therefore fits the usual idea we have of scientific work, and, in this sense, does not include the discovery of “novelties of fact or theory; and when successful, finds none” (Kuhn 2000, 77), that is, “normal science” is driven by a stable paradigm and continues in its path not without discoveries and new theories, but without causing an immediate revolutionary effect on the prevailing *status quo*. There will come a time, however, when the scientific revolution will occur, and then a shift in paradigm is required (Kuhn 2000, 192):

The transfer of allegiance from one paradigm to another is a conversion experience that cannot be forced. Lifelong resistance, particularly from those whose productive careers have committed [sic] them to an older tradition of normal science, is not a violation of scientific standards but an index to the nature of scientific research itself. The source of resistance is the assurance that the older paradigm will ultimately solve all its problems, that nature can be shoved into the box the paradigm provides.

Still, to say that resistance is inevitable and legitimate, that paradigm change cannot be justified by proof, is not to say that no arguments are

relevant or that scientists cannot be persuaded to change their minds. Though a generation is sometimes required to effect the change, scientific communities have again and again been converted to new paradigms.

By the examples given, Kuhn emphasises under the term "normal science" the exact sciences, and, in particular, the natural or "hard sciences;" however, we know that the success of this test is also reflected in the impact it had in other scientific and even professional fields. Evidence of the impact achieved is the interesting postscript dated 1969, in response to existing critique and comments. We have a timely clarification on the notions of paradigm and scientific community. The relationship between both is very narrow: paradigm is what the members of a community share; and, in turn, a scientific community consists of practitioners of a specialty discipline—"To an extent unparalleled in most other fields, they have undergone similar educations and professional initiations; in the process they have absorbed the same technical literature and drawn many of the same lessons from it" (Kuhn 2000, 220). A further explanation derives from this and deserves to be highlighted. It has to do with the transition from a pre- to post-paradigmatic period during the development of a scientific field (Kuhn 2000, 222):

Before it occurs, a number of schools compete for the domination of a given field. Afterward, in the wake of some notable scientific achievement, the number of schools is greatly reduced, ordinarily to one, and a more efficient mode of scientific practice begins. The latter is generally esoteric and oriented to puzzle-solving, as the work of a group can only be when its members take the foundations of their field for granted.

The details of the afterword are sufficient for the purpose of this paper: to justify proposed paradigms for the scientific field of Documentation-Information, which is a part of a scientific group that is different from the one included under the notion of "normal science" as espoused by Kuhn. It is true that we cannot say at the outset that the Social and Human Sciences will be excluded in this essay from the operative characteristics of "normal science" governed by paradigms and subject to scientific revolutions. However, we must remember the "genetic uniqueness" of these sciences that places them on the sidelines of the debate, depriving them even of the minimum scientific

status. Michel Foucault, referring to the human sciences, was peremptory (Foucault n.d., 476):

It is useless, then, to say that the 'human sciences' are false sciences; they are not sciences at all; the configuration that defines their positivity and gives them their roots in the modern *episteme* at the same time makes it impossible for them to be sciences; and if it is then asked why they assumed that title, it is sufficient to recall that it pertains to the archaeological definition of their roots that they *summon* and receive the transference of models borrowed from the sciences. It is therefore not man's irreducibility, what is designated as his invincible transcendence, nor even his excessively great complexity, that prevents him from becoming an object of science. Western culture has constituted, under the name of man, a being who, by one and the same interplay of reasons, must be a positive domain of *knowledge* and cannot be an object of *science*.

Following Foucault, the transposition of the debate on paradigms to the Social and Human Sciences, and in particular to the Documentation and Information Sciences, commonly understood as belonging to this more general field, would, from the outset, be blocked. And if this has not been the case, it is because there has been an inability to refute Foucault and to resist the academic interests that have ultimately imposed an opportunistic consensus on accepting a relative or relativised science, subsumed in comfortable and vague interdisciplinarity.

2.0 Profession, science and paradigms in the field of documentation-information

It is not our purpose here to analyse this interesting topic in detail, just to point out that we have chosen a different path—we find it appropriate and useful, along with Rafael Capurro and even José María Izquierdo Arroyo, to bring into our professional field the operative concept of paradigm and its implementation, because we accept the assumption that our field of work is also scientific (Silva and Ribeiro 2002; Silva 2006). We have therefore overcome Foucault's argument using a rather unknown and little discussed methodological proposal, but which is essential to the perspective we have been constructing—it is the qualitative and quadripolar research designed specifically for the social sciences (general and

applied) by the Belgians, Paul De Bruyne, Jacques Herman, and Marc de Schoutheete (1974). We only refer to it to understand that the paradigmatic proposal, as opposed to the proposals of Izquierdo Arroyo and Capurro, which will be characterised according to the dimensions of training, research and professional practice in the next section, cannot be based on empty grounds; on the contrary, it has epistemological grounds.

We will then begin to analyse the possible paradigms that enable the evolution and scientific maturation of the Documentation-Information field, with regard to which we need to clarify an elemental aspect. These two terms are generally used to designate an area of scientific study that, according to the epistemological perspective adopted, aggregates either several disciplines or a single discipline. If the perspective is "cumulative or fragmentary," which is still prevalent, the terms cover disciplines related to each other, but are seen as independent because they correspond to well-defined occupations (in this sense, profession and science are confused), which were formed and consolidated at least from the early 19th century, such as Librarianship, Archives, Documentation, and Information Science (or North American Information Science). If, in contrast, the perspective is the "evolutionary" one, although in minority, but which we clearly endorse, these disciplines, to which we can add Museology, share key (and instrumental or organisational) aspects of the same object of study (information recorded in any type of medium and converted into a document). They are therefore permeable to a transdisciplinary dynamic that aims to achieve a new stage (paradigmatic and scientific), in which a unified discipline emerges (resulting from the interpenetration and fusion of several practical disciplines), capable of preserving a strong interdisciplinary vocation, without being limited to the status of "interdiscipline." This would mean an unstable set of dissociated disciplinary contributions that are linked and work towards solving problems, but which refuse to evolve into more natural or demanding forms of interaction or integration.

In a large-scale study on the contributions of Paul Otlet to Information Science, called *La Organización documental del conocimiento* (1995), José María Izquierdo Arroyo raises three paradigms from the thoughts of the Belgian visionary, founder of *Mundaneum* and author of *Traité de la Documentation* (1934) (Levie 2006), namely: the Librarianship or pre-documentary paradigm (BP); the current paradigm or the Normal Science of Documentation (NSD); and the

semiotic-documentary or inter-documentary paradigm (SDP). These are the three paradigms that Izquierdo Arroyo distinguishes according to the historical sequence they have had and in relation to the seven phases of traditional research (Izquierdo Arroyo 1995, 19-20):

0.^a Conservación físico-topológica de documentos; 1.^a Acopio pertinente y exhaustivo de documentos; 2.^a Lectura de cada documento de 1.^a; 3.^a Segmentación interna de cada documento, produciendo fichas-citas (textuales, o condensadas) depositables en un fichero; 4.^a Esquematización de segmentos tomados de 3.^a; 5.^a Cotejo y contrastación de segmentos y/o de esquemas teóricos derivados de su síntesis (3.^a/4.^a); 6.^a Creatividad: establecimiento de nuevas relaciones, combinaciones, etc., para la elaboración de nuevos documentos, a partir de 5.^a"

For this author, the first paradigm (BP) corresponds to the "grado cero de la Documentación" and covers only "una ordenación de documentos en el "espacio físico" (the "espacio documentário," en tanto que los otros dos paradigmas actúan ya sobre la idea de "espacio documental;" the second paradigm (NSD), classified under Documentary Linguistics, only provides the action of the documentalist in the first phase, the remaining tasks being the responsibility of the researcher; and the aim of the third new paradigm is that phases 2 to 5 (and in some way phase 6) be developed by the new documentalist, providing an "espacio documental continuo" (Izquierdo Arroyo 1995, 20-21).

Although Izquierdo Arroyo does not take time to explain the operative concept of paradigm, he does firstly analyse in detail the idea of Paul Otlet, who is seen as the founder of a science completely separate from Librarianship and Bibliology of the 19th century. And in this sense, as a second comment, the creation and institutionalisation of Normal Science of Documentation (it seems reasonable to assume that the normal adjective may be used in a sense very similar to that used by Thomas Kuhn) clearly corresponds to a new scientific-professional paradigm, although limited in its actual endorsement of scientificity. Third and lastly, the full correspondence between the research activity (science) and the activity of the modern documentalist, capable of taking the visionary ideas of Otlet to the ultimate consequences, who distinguished documentation and information, and introduced hyperdocumentation long

before the context of hypertext emerged. We therefore have paradigms that refer solely and largely to the work and activity of Paul Otlet. Archives and Museums, as well as the “heterodox idea” that, despite the theoretical and practical developments embodied in the *Traité de la Documentation: le livre sur le livre*, there was no radical change from the previous bibliographical doctrine from a technical and instrumental point of view (describing, cataloguing and locating a book), are elements that were excluded from this author’s paradigmatic analysis.

The position defended by Rafael Capurro, following his own line of thought, in which Documentation Science is seen as a precedent discipline, similarly to Librarianship, was put forward at a 2003 conference available at his website. It is a very interesting text with a variety of topics worthy of discussion and reflection, but we have little room to do so in our paper. We thus have to focus on the part in which he applies the concept of paradigm to Information Science. And it is very important to understand how he introduces Kuhn’s operative concept:

As the word paradigm indicates – from the Greek *paradeigma* = exemplar, show (*déiknumi*) something with a reference (*pará*) to another – the paradigm is a model that allows us to see something in analogy with another thing. Like any analogy, there comes a time when its limits are evident, producing a crisis or, like in scientific theories, a “scientific revolution,” in which we drift from the “normal science” to a “revolutionary” period, and then to a new paradigm. Kuhn identifies the existence of a “pre-paradigmatic situation” in which scientific progress is not made, as would be the case of the social sciences, and also information science. David Ellis is right when, taking on the Margaret Masterman’s critique of Kuhn, he shows that both the situation of dualism and the multiplicity of paradigms are not necessarily signs of a pre-paradigmatic scientific state, rather characteristics of normal science (Ellis 1992). In other words, the dichotomy between “normal science” and “revolutionary period” is too schematic if we consider that the crises, ruptures, errors, misunderstandings, misconceptions, analogies, empirical data, concepts, hypotheses, doubts, setbacks and dead-end searches, as well as institutions, instruments, visions and passions that support, so to say, the cognitive processes, constitute the very core of it, partly latent and partly explicit,

of the entire scientific field, because success or the prevalence of a scientific paradigm is always partly constrained by the social structures and the synergy factors, including events outside the scientific world, the multicausal effect of which is not only difficult to predict, but also to analyse *a posteriori*.

Capurro’s thesis, according to his own words, is that Information Science emerged in the mid-20th century with a physical paradigm confronted by an idealistic and individualistic approach, which, in turn, was replaced by a pragmatic and social paradigm, named alternatively by Jesse Shera and his collaborator, Margaret Egan, as “social epistemology” (1961, 1970).

Looking at them more closely, and starting with the physical paradigm, we see that at its root lie the “Mathematical Theory of Communication” by Claude Shannon and Warren Weaver (1949) and “Cybernetics” by Norbert Wiener (1948), wherein there is something, a physical object that a sender transmits to a receiver. This paradigm, applied to the field of Information Science, excludes “nothing less than the active role of the knowing subject, or to put it more concretely, the user, in process of recovering the scientific information, in particular, as well as in the informative and communicative process, in general. Not coincidentally, this theory refers to a ‘receiver’ of the message. It is not surprising that the limits of this metaphor have led to the opposing paradigm, the cognitive paradigm” (Capurro, 2003). A paradigm proposed by Bertram C. Brookes (1977, 1980) and influenced by Popper’s three worlds ontology (the physical world, the world of mind or psychological states and the world of the intellectual contents of books and documents, in particular of scientific theories):

Brookes subjectivises, so to speak, this model, in which the intellectual contents form a sort of a network that exists only in cognitive or mental spaces, and calls these contents “objective information.” Given its potential cognitive nature for a knowing subject, it is not surprising that Peter Ingwersen tries to integrate in a dynamic way the lost object of that cognitive paradigm without a knowing subject, which is the user (Ingwersen 1992, 1995, 1999). But despite this social emphasis, his perspective remains cognitive in the sense that we try to find out how the informative processes transform or not the user, understood, first, as knowing subject having the “mental models” of the “exten-

rior world" that are transformed during the informational process. Ingwersen takes elements of the theory of "anomalous state of knowledge" - ASK, developed by Nicholas Belkin and others (Belkin 1980; Belkin, Oddy, Brooks 1982). This theory assumes that the pursuit of information has its origin in "need" that arises when there is the anomalous state of knowledge, in which knowledge within the reach of the user, to solve the problem, is not enough.

The third paradigm—pragmatic and social—is a reaction against the cognitive, that is, against the idea of considering information as disconnected from the user, constrained by the world in which it actually stands and acts. Capurro cites Bernd Frohmann in his critique of the cognitive paradigm, considering it idealist and asocial, and suggests the assumptions of hermeneutics of human existence projected by Martin Heidegger, associating them with the essentials of the Critical Theory (Karl-Otto Apel and Jürgen Habermas), defending that both contributions can provide an epistemological framework for Information Science ... and, with this, achieve the social-epistemological paradigm or "domain analysis" defended by Birger Hjørland and Hanne Albrechtsen (1995), wherein the study of cognitive fields is linked to discourse communities, that is, distinct social and work groups that form a modern society:

A practical consequence of this paradigm is to abandon the pursuit of an ideal language to represent knowledge or an ideal algorithm to shape the retrieval of information to which the physical and the cognitive paradigm aspire. A bibliographical database or of full texts is polysemic or, as we might also call it, eminently polyphonic. The terms of a lexicon are not something definitely fixed. The object of information science is the study of relationships between discourses, areas of knowledge and documents in relation to possible perspectives or points of access of different communities of users (Hjørland 2003). In other words, this means an integration of the isolationist and individualistic perspective of the cognitive paradigm within a social context in which different communities develop their selection criteria and relevance.

The impact that Capurro's proposal had on the community of information scientists of Brazil soon showed. In 2005, the Brazilian journal *Perspectivas em*

Ciência da Informação (no. 2, Jul./Dec.), of the School of Information Science of the Federal University of Minas Gerais (Belo Horizonte) published an article by Renato Fabiano Matheus, in which he analyses the overall contribution to Information Science by the Uruguayan philosopher living in Germany, and retired Documentation and Communication lecturer at the *Hochschule* of Stuttgart. This is an interesting article that we have cited here, since it is an interpretation of the proposed paradigms of Capurro. Rafael Matheus outlines that Capurro himself recognises that it is rather schematic, albeit appearing repeatedly in his work, when he refers to his analysis of the paradigms (Matheus 2005, 159):

The problem resides in that an analysis based on *scientific paradigms*—an expression made popular by Thomas Kuhn (1975) in his analysis of scientific knowledge in the natural sciences—highlights competition among theories and research groups, where the competing paradigms are considered mutually exclusive. Taking into account Capurro's approach to the specific area of Information Science (IS), we could as far as to say that competing paradigms have points of contact, but not that they are complementary.

According to Rafael Matheus, such a position contradicts the need for interdisciplinary collaboration in Information Science, and, to solve this dilemma, he suggests we abandon the term paradigm, reinterpreting it through the word "approach" (Matheus 2005, 159):

Under this view, complementary approaches have emerged historically with the broadening of research interests in IS, a broadening which focused on different objects over time. Following this line of reasoning, it is possible to associate objects of study to each of the approaches (previously paradigms). The physical approach would thus be associated to technology and information systems; the cognitive approach to the needs of users and their interactions with the systems; and the social approach would study the users and their interactions with the systems, as well as different social groups and contexts, within institutions and communities. Thus, it would be possible to understand that the previous approaches continue to be essential to the study of problems associated with information, based on the different aspects analysed by each one.

Rafael Matheus adapts Capurro's proposal to the complex universe of the Social Sciences and to the specificity of Information Science, contradicting Kuhn's thesis, which Capurro partly follows, of the opposition between paradigms and the transition between them through rupture, that is, through a process of scientific revolution. Thus, there is a shift of meaning in relation to the Khunian "paradigm" and the introduction of the approach concept implies the possibility of different authors being able to work on the same object from different angles without changing the common theoretical and methodological background. This means that, according to what we have said at the beginning of this section, of Kuhn's "doctrine," several approaches can fall within the same paradigm, and that, to achieve a revolutionary change, there has to be a new theoretical, methodological, and epistemological concept to confront the resistance of older scientists and force them to change or allow change. However, and this is relevant, the paradigmatic transition observed or defended by Kuhn in the "hard" sciences may occur differently in the "soft" sciences, both the old and the new paradigms being able to coexist with each other. It is not clear that there is a revolution, but to have a paradigm shift there must be much more than the simple emergence of new approaches and theories (as Matheus concludes in his reading of Capurro) that do not affect the principles and epistemological foundations on which a specific scientific or professional community was formed or taught in a long period covering one or more generations.

We are therefore faced with some essential aspects that help us introduce the alternative proposal that has been developed since the publication of Vol. 1 of *Arquivística: teoria e prática de uma ciência da informação* (1999), in which we distinguish the three possible phases in the evolution of the archival practice and the emergence and transmutation of the archival discipline; the technical and custodial phase; and the scientific and post-custodial phase (Silva et al. 1999, 210).

The draft of this proposal developed over the years as the authors opted for a more radical and paradigmatically distinct concept of the epistemic position and of the relationship between professional and practical disciplines that emerged from late 18th century, such as archives, librarianship, museology, documentation and information science (North American). As mentioned before, there are two concepts in conflict: a cumulative and fragmented one, and a transdisciplinary and evolutionary one. The fact that these authors chose the latter implied a clear distance from the re-

strictive use of the concept of paradigm, as shown in Izquierdo Arroyo and Rafael Capurro. The former applied the concept of paradigm to the transition of librarianship to documentation science, founded on the theory and practice postulated by Paul Otlet: the librarianship paradigm was physical and pre-scientific. With Otlet, we had the paradigm of "normal documentation science," more consistent than the previous one, but without the scientific completeness of the current "semiotic-documentary or interdocumentary" paradigm. Capurro confined himself to information science, which appeared in the 1950s as the result of the adaptation of documentary techniques of description, classification and analysis of the automation potential, in a first stage, and then of the possibilities of informational processing of computers and "computer systems." Both tacitly accept the cumulative and fragmentary concept, in which the various disciplines mentioned above appeared and have remained distinct and independent, albeit related interdisciplinarily in the space-time and (internal) theory-practice dimensions. And both understand the operative concept of paradigm linked more to the theory formulation than to a broader process in which the basis, evolution, and metamorphosis of the theories are done through training action (education in universities and institutes), of research practices and the relations and interactions taking place within the scientific and/or professional communities.

In "Das "ciências" documentais à Ciência da Informação" (Silva and Ribeiro 2002), the authors justified the option for the evolutionary concept, in other words, the realisation (based on a global diachronic retrospective that strongly marked the end of the 18th century and again in the post-World War period) that the so-called "documentary sciences" (archives, librarianship, and documentation) were formed on the foundations of a common scientific denominator—humanities, namely history, philology, literature, also known as the field of arts. They were later linked to the human and social sciences—which accommodated the practical or technical aspect that had long consisted in identifying the contents of documents and the nature of their support in order to allow its retrieval and consultation. Both in archives and in librarianship, and even in museology, improvements have been made at this level rather than in the scientific level. Paul Otlet and Henry La Fontaine, in respect of Librarianship, have broadened the concept of document, going beyond the book or journal and magazine, standardised bibliographical description, converted the *Dewey Decimal Classification* in the

famous Universal Decimal Classification, advocated criteria and principles that value access to the contents of documents (i.e., information) taking into account the needs of users, etc.. But did this and much more of their legacy, as well as the contributions from other authors at a later period, represent a rupture in paradigm?

The answer to this question is crucial and calls for a clear notion of paradigm. If we understand that paradigm is a fusion between the less restrictive sense given to it by Thomas Kuhn and the imperative of applying it to the Social Sciences ("pure" and applied), maybe we can accept the following operative definition: "it is generally a common way of seeing/thinking and acting of a large majority of scientists (within their specific disciplinary field) of different languages and nationalities, spread over more than one generation. This homogeneity is compatible with the coexistence of different theoretical formulations and "schools" provided they do not jeopardise or endanger the general scheme of seeing/thinking and acting (paradigm) reproduced by university and polytechnic education and by scientific [and professional] societies" (Silva 2006, 158). If we accept it, our analysis, for which we will provide the essential elements in the third and last section, has provided—especially since 2004 and with successive adjustments—two major paradigms for the field of Documentation-Information, involving all related disciplines and covering a long period of time between the 18th century and the present time. Thus we believe that with the need for the professional training of archivists, librarians, and museologists, following the establishment of national and public libraries and national museums of art, archaeology and ethnography, a custodial, patrimonial, historicist, and technicist paradigm was formed that still survives despite the escalating crisis in the information or digital era in which we live, in an increasingly globalised world. In this paradigm, we are able to identify a scientific knowledge base, but it is not evident in the descriptive or cataloguing and custodial practice of archivists, librarians, and museologists, but rather in the methodical-scientific erudition of general history, history of art, philology, linguistics, and literary studies. That is why the emerging paradigm—post-custodial, informational and scientific—was prepared by a number of theoretical and other contributions, some of which appeared with and after Paul Otlet, aiming to establish in the research field, more than in the technical field, the adoption of scientific principles. We refer to the authors evoked by Rafael Capurro and to others who clearly aim to provide op-

erative concepts and theoretical-methodological elements capable of providing the documentation or information manager profession with scientificity.

In the next section, we will show the indicators that underlie the proposal of only two major and effective paradigms.

3.0 Education, research, and professional practice in light of the paradigms in review

The analysis of training models, the development of applied research and of professional activity in the field of documentation-information lacks the paradigmatic contextualisation as explained in the previous section, so that the changes that occurred (or still in progress) within the framework of the information era become intelligible and may be explained in a systematic (and necessarily brief) way in this short essay.

3.1 *The historicist, custodial, patrimonial, and technicist paradigm*

In most European countries (including Portugal), the United States of America, and in countries in other parts of the world, training of library and archive (as well as of museum) professionals was first obtained from field experience and based on the reproduction of "know-how" that, in an empirical way, accumulated from generation to generation. In the 19th century, libraries and archives were the unparalleled centres of professional training, although classical schools had begun to emerge in Europe, designed to train learned archivists-paleographers and librarians, for example the emblematic École Nationale des Chartes, established in Paris in 1821. The aim was to train skilled staff required to process documents transferred to state-owned archives and libraries following the nationalisations that took place after the French Revolution and similar liberal revolutionary movements influenced by the French model in other European countries. The ideological concepts of the Enlightenment, which led to the ideals of the liberal regime, associated to the development of Positivism and Historicism, throughout the second half of the 19th century, were based on the Idea of the State-Nation and valued documentary sources, both to legitimate in legal and administrative terms the transfer of land power to the hands of the bourgeoisie and to support the writing of the nation's history. The establishment of archives, libraries, and public museums (owned by the State), designed as institutions that served to preserve national memory,

creates a new reality maintained throughout the 19th century and consolidated in the following century, expressed as the paradigmatic view, which we consider traditional and is announced and referred to as “custodial, historicist, patrimonial, and technicist.”

The characterisation briefly described below of the 19th-century information services is a key indicator to support this traditional paradigm:

Legal nature	Free public service (national, regional, local / /municipal)
Mission	Store, process and disseminate documentation of historical and cultural interest / instruct, educate
Name	Archive / Library
Collection	Documentation of administrative nature of historical interest / books, magazines, cultural and/or scientific journals
Staff	Archivists-paleographers and learned librarians; curators and clerical staff
Activities	Organisation of indexes, inventories, catalogues and repertoires / Classification and listing of documentary species / summary and transcription of documents / publication of documents of historical interest
Type of access	Reading room consultation, although in many cases the room is not different from the places of storage / research on the shelf or in access tools (indexes, inventories, catalogues...)
Users	Historians, researchers, learned intellectuals / common people and the bourgeoisie (leisure reading)

Table 1. Characterisation of 19th-century information services

Professional training was obtained on-site and according to the mission and activities developed by the staff. According to the current paradigm, it is not surprising that the matrix of this training was historical-classical and focused on the issues of custody and the preparation of access tools to support the work of historians.

Academic training took a long time to be established, although in the third quarter of the 19th century, there were several universities in Europe that offered archivist training (e.g., the universities of Bologna and Macerata, in Italy), or in the United States, training for librarians (Columbia University). But these were very exceptional cases, training being provided in most countries by courses taught by profes-

sional associations of librarians or archivists. In fact, before the 1940s, it cannot be said that the training of librarians, museologists, and even documentalists was not in the least introduced in the university world (Ribeiro 2006), which is an obvious symptom of its professional nature rather than a scientific, academic, and research-oriented foundation.

The French model—custodial, historical-positivist, and patrimonial—which gained force throughout the 19th century due to socio-economic effects caused by the second and third waves of industrialisation, the bureaucratic complexity of administrations, and technological and scientific advancements, took on new dimensions at the end of the 19th century, resulting in the intensification of technical aspects and a growing autonomy of archives and librarianship in relation to history, asserting themselves as disciplines of individual knowledge. This emphasis on librarianship and archival techniques in both Europe and the United States of America can be illustrated briefly with many significant examples:

- In Italy, the activity of the school of Florence is particularly relevant, where thanks to the work of several archivists/historians—such as Guasti, Bongi and, in particular, Francesco Bonaini—the chronological and thematic methods of sorting documents were criticized, and in contrast, the “historical method” was defended (1867), claiming the “respect for the original order” based on the history of each institution;
- In the United States of America, the *Dewey Decimal Classification* was edited for the first time in 1876, inspiring the Universal Decimal Classification (UDC). It is considered a pioneering example of bibliographical classification designed to organise information contents, rather than the material arrangement of documents as in previous classifications;
- In 1876, the American librarian Charles Ammi Cutter published the *Rules for a Dictionary Catalogue* and his *Expansive Classification*, establishing the standards for the technical processing of information;
- At about the same time, the professional associations—the American Library Association (ALA), in 1876, and the Library Association (London), in 1877—began to develop important work in the training of professionals, given the lack of university training;
- In 1895, in Belgium, Paul Otlet and Henri La Fontaine founded the International Institute of

Bibliography, an organisation that played a key role in the development of technical procedures to process information and in the development of the Universal Decimal Classification;

- In 1898, the famous “Manual of Dutch Archivists” (Muller, Feith, and Fruin 1898) was published in Holland, marking the entry of the archive discipline into a new era, empowering it through the technique of Historical Science which had until then remained limited to an ancillary and instrumental position;
- In 1905, the *Manuel du Répertoire Bibliographique Universel* by Paul Otlet and Henri La Fontaine was published, the first edition of the future Universal Decimal Classification;
- In 1908, the Anglo-American cataloguing rules were published after several revisions, and today are still the “international standard” of cataloguing;
- In 1910, the International Congress of Archivists and Librarians was held in Brussels, gathering famous European and American professionals.

The intensive technical aspect of organising and processing information had effects on professional training, which incorporated a range of skills that had not been considered before, but which, in essence, did not represent a change in the prevalent paradigm. In fact, the patrimonial and custodial matrix remained essential, tinged with just a technical touch that was needed to meet the demands of users, avid to consult the documents kept by the public services (remember that the French Revolution was also responsible for the enactment of the law that established the right to access information for all citizens), and, naturally, triggered concerns with the access, with the descriptive standardisation, and with research tools and professional training in which the technique became essential. This increase was most pronounced from the moment the technological revolution, begun in the mid-19th century, raised new challenges and showed the limitations of the training offered to wholly respond to the problems placed by the information era.

If the training models are a key element to support the paradigmatic characterisations, research is no less important, although with regard to the custodial and technicist paradigm, it is more appropriate to speak of lack of research as one of its dominant features. In this regard, the words of Emilio Delgado López-Cózar are quite revealing when he states that “en el desarrollo de la ByD [Biblioteconomy and documentation] la teoría siguió a la práctica, no la dirigió ni la guió. La investigación, en particular, y la ByD como disciplina, en

general, hunden sus raíces en la práctica bibliotecaria” (Delgado López-Cózar 2002). Indeed, in the absence of a theoretical-methodological background capable of supporting the research work (even if seen as applied research), it is not possible to grant the practical and professional activity the status of research activity.

Professional activity is, precisely, the third vector we have taken into consideration to support the existence of the two paradigms mentioned in the previous section. In the field of documentation-information, the professional practice has dominated (and still dominates) the activities developed, and it is symptomatic that, in various countries (USA, UK,...), the professional associations have the power to produce guidelines for the development of the curricula of universities. The work of the librarians, archivists, and documentalists, traditionally the keepers of documents and mediators in providing services to users who need to research information, has been based on a set of technical-normative guidelines, aimed more at organising and representing information so that it can be accessed rather than the knowledge of contexts generating that same information and its transmission in a way that matches the needs and informational behaviour of users. The fact that the object of study and work is the “document” (static physical entity, materially separated from the producer who originated the information contained in it) causes the analysis and representation of its contents to be somewhat confined to the application of normative procedures, not quite clear in light of interpretative theories and using qualitative/quantitative research methods, as is adequate in the field of the social and human sciences.

The three vectors analysed allow us to summarise the features that characterise the historicist, custodial, patrimonial, and technicist paradigm, according to what has already been done by the authors in previous works:

- overvaluation of the custody or guardianship, preservation and restoration of the object, as the basic purpose of the professional activity or archivists and librarians;
- identification of the custodial and public service mission of archive and library, with the preservation of the “classical” culture, in more or less explicit contradiction with popular, “mass” and entertainment culture;
- emphasis on memory as the legitimating source of the nation-state and of culture, as an identity booster of that same state and its people, under the aegis of nationalist-biased ideologies;

- the growing importance of access to “contents,” through research instruments (guides, inventories, catalogues, and indexes) of documents and the thorough knowledge of classification and index models, from the important technicist and normative legacy of the Belgians Paul Otlet and Henri La Fontaine, with an impact on the field of scientific and technical documentation, allowing for the multiplication of Documentation-Information centres and services less directed at custody and more at the dissemination of information;
- prevalence of the division and professional assumption deriving from the establishment and development of the archive and library services and institutions, inducing an entrenched and instinctive corporative spirit that fosters confusion between science and profession (there is a persistent misconception that the professions of archivist, librarian, and documentalist naturally generate independent scientific disciplines such as archives, librarianship, or documentation) (Silva and Ribeiro 2010, 25).

3.2. The post-custodial, informational and scientific paradigm

The social, economic, cultural, and mainly technological changes which occurred from the mid-20th century, have further accentuated the crisis that the traditional paradigm was already showing, questioning its essential foundations and creating the conditions for the irreversible emergence of a new paradigm. This new paradigm, which we have called post-custodial, scientific, and informational, is brought into confrontation with the previous one, if we focus on its essential features:

- the value of information as a human and social phenomenon, materialised in any type of support as an epiphenomenon;
- the observation of the incessant and natural information dynamism, as opposed to documental “immobility,” the former being a trinomial natural creation-selection *versus* access-use, and the latter the ephemeral antinomy *versus* permanence;
- maximum priority is given to access to information for all, in well-defined and transparent terms, because public access justifies and legitimises custody and preservation;
- the imperative to question, understand and explain (know) social information, through theoretical-methodological methods which are increasingly more demanding and effective, instead of the

closed and rudimentary universe of empirical practice formed by a uniform and uncritical set of modes or rules of doing, of procedures only apparently “aseptic” or neutral of creation, classification, listing, and recovery;

- the change of the current theoretical-functional framework of the disciplinary and professional activity into a different approach, in tune with the dynamic universe of the social sciences and committed to understanding the social and the cultural, with obvious implications in the training models of the future information professionals; and,
- replacement of the instrumental rationale, as reflected in the expressions “document management” and “information management,” by the scientific-comprehensive rationale of information in management, i.e., social information is implied in the management process of all entities and organisations, and, therefore, informational practices derive from and are articulated with the conceptions and practices of managers and actors, and with organizational structure and culture, and the information scientist, instead of or before establishing operative rules, must understand the meaning of such practices and present, within certain theoretical models, the more adequate (retro or) prospective solutions (Silva and Ribeiro 2010, 41).

Under this new paradigm, the dimensions of education, research and professional practice have obviously gained a new profile and different approaches. The issue of the training model adapted to the new paradigm has already been discussed by the authors in various texts (Silva and Ribeiro 2001, 2004; Ribeiro 2006, 2007), therefore we will only list some of their essential assumptions. The socio-economic, technological, political-institutional and cultural framework of the second half of the 20th century has suffered so many rapid changes that the field of Information and Documentation could not stay immune to this fact. What is the proper training for information and documentation professionals?

It seems obvious that one should distinguish between two modes of theory-practice intervention, one of them essentially technical in nature—average level of education, for a technical vocational level, that can be ensured by vocational schools or secondary schools—and one with a more comprehensive and explanatory level—a know-how based on study and mono-, inter-, and multidisciplinary research, using the social sciences and the central axis and derivation point to be crossed with other scientific disci-

plines, which should be the responsibility of universities and polytechnic schools.

The training of technical professionals, whose skills and competencies require proper computer training, meets the practical requirements demanded by information management (in a broad sense and across all sectors of human and social activity), in an essentially operative perspective. University education (starting with bachelor's degrees but progressing into master's and PhDs) must follow a curricular design that aims to bridge the artificial separations that occur in traditional training through "branches" of Archive and Library and Documentation, in which, for example, operations representing information (such as description or classification) are girdled by different disciplines depending on whether they are archives or libraries. This unitary perspective also seeks to merge with area of the so-called (technological) information systems (IS), which has gradually become more independent from the traditional computer sciences and computation, taking on the organisations in general as the basis for their sphere of work and professionalisation.

The model we espouse is based on the theoretical-methodological assumptions that support information science, as conceived and developed at the University of Porto (Silva and Ribeiro 2002). This model gathers in the nuclear scientific area—of Information Science—a group of disciplines that, on the one hand, ensure a single theoretical and methodological element, and, on the other hand, account for the dimensions applied in this area of knowledge, with its particular specificities. The "core" curriculum has to be necessarily open to interdisciplinarity, establishing more or less close relationships with other fields, and these relationships must be expressed in a curriculum through the presence of varied disciplines, some compulsory and some optional, but always complementing the subjects of the core scientific area.

The research dimension cannot also be disconnected from the theoretical basis (preferably by the systemic theory) nor from the methodological approach (Quadripolar Method) (Silva and Ribeiro 2002), which, at the outset, is an essential difference compared to the traditional paradigm, in which theory and method are absent or are confused with (and are exhausted in) technical activities. To research acquires the meaning of knowing, analysing, interpreting, and explaining, and not only describing using rules applied uncritically. To research, in Information Science, is an essentially applied activity and, as such, is translated into a professional practice with new forms of intervention.

Let us see, then, how, in practice, this new approach is materialised, and what are the essential features that characterise it:

- To elect information (under the systemic theory) as the subject of work and study obliges us to look at this phenomenon in a totally different way than has hitherto been done with the document (physical unit that we classify, describe and store, assigning it the coordinates for future tracking). To understand information implies, first and foremost, knowing the context in which it was produced, which is what occurs before it is materially recorded on a physical media. And it also implies knowing the use that was or is given to this information, that is, who are its users, for what purpose do they use it, how they research it, how frequently, etc. To think about information in a systemic manner means that, more than structuring services (e.g., libraries, archives, etc.) within the organisations, it is important to understand holistically the contexts of its production and use, in an integrated view that does not separate (or generate) artificially archive information, or library or digital information, but analyses, in an integrated way and as a system, all its components.
- To understand the work of the information professional as a research process that aims to understand and accurately represent the reality of the information under analysis also has various consequences, because it fails to act as a simple technician who applies rules and uniform standards to produce more or less standard tools, in order to make access to information feasible, and will now assume the role of the information scientist who delivers results validated by a scientific methodology, and questions (problematises, formulates hypotheses) the actual action, always with reference to paradigms and theories that are constantly being validated (or revised).
- To apply the quadripolar research method emphasises the organic and functional analysis, an essential requirement to achieve the thorough knowledge of the system's structure and the functions and responsibilities of the various sectors that form that structure, because only then is it possible to accurately characterize the context of production of the information under analysis.
- To seek to understand the external and internal systemic relationships and how they reflect on the production of information leads to a systematic research to identify eventual subsystems of informa-

tion, or to understand the relationships between, for example, the various systems that form a super system of information among themselves.

- To analyse the entire functional component of the system leads to certain operations that have to be implemented as regular “prophylactic” measures intended to optimise the operation of the information system itself; among these, for example, is the retro/prospective evaluation, a key operation to detect redundancies and information “waste.”
- To understand the technical operations of description, classification and indexation as the natural result of the entire process of knowledge triggered upstream, and not with the limiting aim of providing access for the sake of access to information is also important so that the research tools (catalogues, indexes, inventories, databases ...) produced can guarantee a proper representation of the information under analysis.

In short, to think about information under the new paradigm implies having an integrated vision, in which it makes no sense to organise information services with a merely instrumental purpose, separating artificially the various components of the whole—information in an organisational context is generated by the various agents that act in the same context, whether in the administrative area or in the technical or scientific areas. Rather, information systems should be designed, in which the functional component materializes in the structuring of services that aggregate all informational components.

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