The Terminological and Disciplinary Origins of Information and Knowledge Organization

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Abstract

The intellectual origins of information organization (IO) as a field of study are examined by tracing the use of the terms, “information organization”, “knowledge organization”, “bibliographic control”, and their variants, and by surveying the educational texts dealing with the various component activities of IO, along with reports and discussions of corresponding curricula, across the twentieth century. Analysis reveals that the notion of a single, composite field covering cataloguing, classification, indexing and the other IO activities, only became established in the late twentieth century, mirroring the broadening of the Library and Information Science curriculum toward that advocated by the “iSchool” movement. Prior to this, three phases of curriculum development are identified: the teaching of cataloguing and classification as distinct fields in the initial decades of Library Science education; these two activities then being taught as the combined field of “cat and class”; and, a growing coverage of other activities of “bibliographic control” from the 1960s onwards, such as those emphasizing the “subject approach” to IO. This last phase can be seen as a precursor to the establishment of IO as a generic field of study. The validity and prospects of the field are discussed in light of the historical account.
1. Introduction

Today, the term and concept of “information organization” (IO) would be familiar to many of those involved in the (English-language-based) teaching and practice of the library and information professions. The term is commonly used to refer to the provision of intellectual access to information resources through the development of various tools and systems that conceptually organize them in ways that help people find those resources that best meet their information needs. It is likewise used to represent the study of this provision, as a field of education as well as a field of practice. This is demonstrated by its use, and the use of variants such as “organizing information”, in both professional resources, such as policies and blogs [1, 2], and educational resources, such as curricula [3] and textbooks. Indeed, one of the most commonly used educational texts covering the field is titled, The Organization of Information [4, 5, 6]. Currently in its fourth edition, originally authored by Arlene Taylor, and now by Daniel Joudrey and Taylor, the text covers not only the various activities associated with the provision of intellectual access to information in libraries, but also in related environments, such as archives and museums, and the Internet in general, as corresponding tools such as catalogues, bibliographies, indexes, finding aids, registers, and search engines. It is in this sense that the abbreviation “IO” will be used in this article.

Most readers of this journal would be aware that several of the component activities of IO, such as bibliographic classification and library cataloguing, have been practiced and studied for many decades. In this article, we shall explore when, and how, the concept of IO, as a composite field of study covering these various activities, developed. To the extent that the field of study mirrored a field of practice, we shall consider the origins of the IO field in general, although the primary focus will be on its educational roots. In light of this historical analysis, some comments on the prospects for IO, as a field of education and research, will be offered.

The historical study reported here is based primarily on three methodologies. First, the use of terms that presently represent, or sometimes represent, the field as a whole, or something close to it, is traced back across the scholarly literature of the last century. The strength of the concept of a
composite field through the period can thus be gauged; the way the field is conceived will affect the design of the curriculum in which it is taught. As well as “information organization” and its variants, the terms, “knowledge organization”, “bibliographic control” and “bibliographic organization”, and their respective variants (both in word form and spelling), are considered. Second, the coverage, as well as the terminology, of key educational texts pertaining to the main component activities of IO, published across the last century, is examined. These works provide an indication of how different elements of IO featured in the curriculum: as textbooks and other teaching resources, they likely represent popular ways of thinking about these elements, and tend to cover what are considered, at least by the authors, as discrete “fields”. Third, reports of surveys, and contemporary discussions, of curricula and syllabi of relevant programs offered since the late nineteenth century, are compared to the findings from the survey of educational texts.

A summary of the etymological analysis is first presented to confirm the relative newness of the concept of the broad field as covered by Taylor’s book. The story of how this conceptualization was arrived at is then related, chronologically, through the survey of educational texts and curricular commentaries.

### 2.1 Etymological Analysis

A systematic search was conducted on the bibliographic databases, *Library and Information Science Abstracts and Library* (LISA) and *Library, Information Science & Technology Abstracts* (LISTA), the author’s University Library’s discovery tool, Primo, and OCLC WorldCat. All available content was searched, which, in the case of LISA, LISTA and Primo, for the most part included titles and abstracts; the text was also indexed in the case of a small minority of materials, though this included articles from older issues of some relevant periodicals (e.g. *The Library World*). The terms searched were: information organi*ation; organi*ing information; organi*ation of information; knowledge organi*ation; organi*ing knowledge; organi*ation of knowledge; bibliographic control; bibliographic organi*ation. The materials represented by those hits that suggested the use of one of the terms in the
“IO” sense, or in a closely related sense, were retrieved and inspected. The following subsections summarise the findings of this exercise.

2.2 Uses of “Information Organization” and Variants

It is worth noting that the Library of Congress Subject Heading, “Information organization”, is based on Taylor’s book [4], suggesting that few, if any, earlier books specifically covering the topic and using the term in their title are held in the Library of Congress collections. Notable books about the field and using the term published subsequently include Elaine Svenonius’s, *The Intellectual Foundation of Information Organization* [7] and *New Directions in Information Organization* [8].

The term and its variants do, however, occur in the literature prior to *The Organization of Information*. The first prominent occurrence in the Library Science literature appears to be in the subtitle of James Duff Brown’s third edition of *Subject Classification: For the Arrangement of Libraries and the Organization of Information* [9]. The term was added by the edition’s editor, James D. Stewart; however, no explanation for the new subtitle was given in the edition. Another prominent early use of “Organization of Information” was as the name of a section in the journal, *American Documentation*, from 1950-2, which listed notable works in the whole “documentation” field, which was broader than IO, covering the management of documents more generally. The term and its variants were then used in a few titles connected to the development of automated information retrieval (IR), in the 1950s and 60s, such as *Machines and Classification in the Organization of Information* [10], the monographic series, *Rutgers Seminars on Systems for the Intellectual Organization of Information* [11], and Gerald Salton’s *Automatic Information Organization and Retrieval* [12].

These early titles suggest that the term’s origins, within Library and Information Science (LIS), lie more in the strand of the field formerly known as “documentation” and latterly as “information science”. There appears, however, to be no consistent and established use of the term through most of the last century. Not until the 1980s do we first encounter book titles employing the term to mean the IO field, such as Doreen Goodman’s *Information Organization: Principles & Practice* [13] and
Christopher Turner’s *Organizing Information* [14]. Similar patterns, or lack of patterns, or even usage, are evident in the journal literature. At the level of title, Slamecka and Taube use the term in a very broad way, similar to the *American Documentation* usage, for their *Library Quarterly* article, “Theoretical principles of information organization in librarianship” [15], while Vallee and Askevold employed the term in the “automated IR” sense in their *Journal of the American Society for Information Science* paper, “Information organization for interactive use” [16].

### 2.3 Uses of “Knowledge Organization” and Variants

Another term that is sometimes used instead of “information organization” is “knowledge organization”. Indeed, Wikipedia [17] has “Knowledge organization” as its preferred term, with “information organization” as a variant, for the “branch of Library and Information Science (LIS) concerned with activities such as document description, indexing and classification performed in libraries, databases, archives, etc.” The two terms are sometimes merged, as in “Organising Knowledge and Information”, which is, for instance, one of the top-level categories in the Professional Knowledge and Skills Base developed by the Chartered Institute of Library and Information Professionals [18]. Although the two terms are often used interchangeably, “knowledge organization” is also used in a narrower sense, particularly for classification, including bibliographic classification, as we shall discuss later.

The use of the two terms interchangeably is reflected in the British equivalent of the Taylor text, namely Jennifer Rowley’s *Organising Knowledge* [19, 20]. First published in 1987, its original subtitle was “An Introduction to Information Retrieval”, and its later one, “An Introduction to Managing Access to Information” [21]. Rowley’s and Taylor’s books cover much the same ground, although the overlap is not complete: Rowley’s book includes more detail on the mechanical aspects of digital information retrieval, while Taylor’s book covers access to archival and museum content in more depth. Essentially, however, the two books are both introductions to the same field of activities that support intellectual access to information resources, or what Taylor [4, p. 2] calls “information packages”. Other more recent examples of the term and its variants used in this sense include Ross
Harvey’s textbook, *Organising Knowledge in Australia* [22], which became *Organising Knowledge in a Global Society* [23, 24], *Relationships in the Organization of Knowledge* [25], which covers bibliographic as well as subject relationships, and Andersen and Skouvig’s *Library Quarterly* article, “Knowledge organization: A sociohistorical analysis and critique”, which defines “knowledge organization” as “the organization and representation of texts in various forms of information systems (e.g., databases, classification systems, library catalogs, the Internet, libraries, archives, etc.) for the purpose of mediating, supporting, and producing social practices that constitute every kind of information system” [26, p. 302].

There are also instances of the term’s use long before Rowley’s book. Henry Bliss would appear to be the first librarian to use the term in a prominent way, in his book, *The Organization of Knowledge and the System of the Sciences* [27]. The book laid the foundation for Bliss’s own classification scheme, the development of which he discussed further in *The Organization of Knowledge in Libraries and the Subject-Approach to Books* [28]. Bliss thus uses “knowledge organization” in the sense of classification, and not as a label for a generic IO field.

The next LIS book to use the term in its title, three decades later, appears to be C. D. Needham’s *Organizing Knowledge in Libraries: An Introduction to Classification and Cataloguing* [29, 30]. As the original subtitle indicates, the text covered cataloguing as well as classification. Furthermore, as its later subtitle, *An Introduction to Information Retrieval*, suggests, it also covered “other retrieval devices”, in a chapter towards the end of the first edition, and in two chapters, on post-coordinate systems and index languages, in the second edition. These chapters are included in the part of the book devoted to the “subject approach” (as per Bliss’s title); another part covers the “author approach”. Although Needham did not, in fact, mention “organizing knowledge” in the text itself, in either edition, and instead labelled the field of “organization and control of publication and publications” as “bibliographic organization” [30, p. 11], his title represents the first prominent use of a variant of “knowledge organization” in something approaching the broad IO sense. We shall return to this book later.
Jesse Shera’s Libraries and the Organization of Knowledge [31] was published shortly after Needham’s text, but again the term was used in the sense of classification, à la Bliss. Shera did in fact conceive of a broader field of practice, but employed the term “bibliographic control” for it, and the term “bibliographic organization” for an even broader field. There are hardly any further uses of the term or its variants in monographic titles until Rowley’s Organising Knowledge, which was, in fact, an explicit update of the Needham book. In the 1970s, the term was sometimes used in Sociology, when analysing the ways in which knowledge institutions, such as universities, were organized (e.g. Organized Knowledge: A Sociological View of Science and Technology [32], Knowledge and its Organization [33], and The Organization of Knowledge in Modern America, 1860-1920 [34]). In the 1980s, the term also began to be used more in Computer Science, for formal ontologies (e.g. Knowledge Representation and Organization in Machine Learning [35], and A General Organization of Knowledge for Natural Language Processing [36]).

The earlier LIS journal literature reflects similarly spasmodic and inconsistent usage up until the late 1980s. An early use of the term in an article title, from 1955, was for Verner Clapp’s, “Implications for documentation and the organization of knowledge” [37]. However, in the same year, Clapp and Murra [38] employed “bibliographic organization” for the same concept, in their historical survey, “The improvement of bibliographic organization”. Again, “knowledge organization” was used slightly more often in other journal literature (a typical example from Computer Science being Rau’s “Knowledge organization and access in a conceptual information system” [39]).

We may conclude, then, that the term “knowledge organization” was used in the literature for the concept of the broader IO field no more frequently or prominently than was “information organization” through most of the twentieth century. However, this began to change with the publication of Rowley’s Organising Knowledge, in which the “organization of knowledge” is introduced as a “process” that allows for its subsequent retrieval [19, p. 3]. Indexing, as well as cataloguing and classification, are fully covered in the book. The emphasis, particularly in the first
edition, as one might expect, is on the human organization of documents, although automatic indexing and classification are touched on. In the Acknowledgements, Rowley notes that the “field … can be called the Organization of Knowledge” [19, p. xx], suggesting that the term was still in the process of becoming established, at the same time as Goodman’s and Turner’s texts were helping to establish the term “information organization” for the same concept [13, 14]. It was at this point that the term became used much more frequently, although often in the narrower sense of classification, due to the founding of the International Society for Knowledge Organization and its journal, Knowledge Organization, a development discussed further in section 6.

2.4 Uses of “Bibliographic Control” and “Bibliographic Organization”

An alternative term for “information organization” can be found in Taylor’s own books: she uses “bibliographic control”, both prior to, and alongside, her use of “information organization”, for the “context” of cataloguing and classification [40]. This term is likewise employed by Lois Mai Chan for “the operation by which recorded information is organized or arranged and thereby made readily retrievable” [41, p. 3]. It also can be found in modern glossaries of librarianship, including the A.L.A. Glossary of Library and Information Science [42] and Harrod’s Librarians’ Glossary [43].

The term “bibliographic control” came to prominence in the early 1970s, when the goal of “universal bibliographic control” was institutionalized by the International Federation of Library Associations [44]. This goal, however, dates back to the original “documentation” movement, embodied in the International Institute of Bibliography (much later, the International Federation for Information and Documentation), founded by Paul Otlet and Henri La Fontaine in the late nineteenth century [45]. The term itself can likewise be traced back to these beginnings: “bibliography” can be regarded as the first step in what Otlet called “documentation” [45]. The various bibliographic processes, including cataloguing and indexing, took some time to mature, but by the middle of the twentieth century were sufficiently established, collectively, to warrant their own generic term, highlighting the activities’ cross-over. However, as we shall discuss further in section 3.3, by this stage the term “bibliography” was being used (in English) much more for one of these processes in particular, i.e. for the
construction of bibliographies, in contrast to catalogues and other IO tools, leaving a vacancy for the more generic term.

Thus in 1949, Margaret Egan and Jesse Shera [46] championed the cause of “bibliographic control”, which they considered to be the term for “what the Europeans call documentation”. This is probably not the first instance of its use, but it appears to be relatively new. The term is not to be found in, for example, the original edition of The Librarian’s Glossary [47] or The Library Science Glossary [48]. The following year, in 1950, Shera and Egan convened an influential conference on Bibliographic Organization [49]. In the proceedings, “bibliographic organization” tends to be used in a very broad sense, for all activities that support access to documents, both physical and intellectual, whereas the focus of many of the papers was, in fact, on the provision of intellectual access, by means of “bibliographic control”.

Various books covering “bibliographic control”, or specific aspects of it, were published in the 1960s and 70s, including Proceedings of Work Conference on Bibliographic Control of Newer Educational Media [50], Bibliographic Control of Federal, State and Local Documents [51], Bibliographic Control of Microforms [52], Bibliographic Control of Nonprint Media [53] and Universal Bibliographic Control [54]. The broadest in scope, however, was perhaps Donald Davison’s Bibliographic Control [55], which attempted to cover the bibliographic control of most library materials, and the full range of associated activities. Davison [55, p. 8] uses the two terms “bibliographic control” and “bibliographic organization” in a similar way to Shera and Egan (whom he cites). Clearly the term “bibliographic control”, if not “bibliographic organization”, had become well established by this time, making it into the fourth edition, in 1977, of The Librarians’ Glossary [56].

Although the focus of “bibliographic control” tended to be, and still is, on published resources, the term sometimes also covered archival materials, grey literature and other items. Likewise, the term often referred to composite resources, as acquired by libraries, rather than on component units, such
as journal articles (see e.g. Doreen Goodman’s *Bibliographic Control of Library Materials* [57]); but again, this was not always the case. As Chan’s definition indicates [41], the term *could* be used in a very general way. Nevertheless, even when used to cover recorded information beyond libraries, it did not stand so much for a field of study as for an endeavour. “Bibliographic control” was *aimed* at particular kinds of material, or else at the entire bibliographic universe. Notwithstanding its use in Needham’s book, the term was typically discussed as a means to an end, rather than as a set of activities that needed to be studied. Patrick Wilson’s work, *Two Kinds of Power* [58], might also be considered something of an exception here, in as much as it explored the nature of “bibliographical control”, but it did so from an instrumentalist perspective, without demarcating a specific set of activities that might constitute a “field” (Wilson also defined bibliographic control entirely in terms of textual resources). Perhaps the nearest instance of either “bibliographic” terms’ use in a textbook title was Ronald Hagler’s *The Bibliographic Record and Information Technology* [59, 60]. While “bibliographic control” continues to be used in library circles, overall its usage, as reflected in the literature, has dropped off somewhat. This is probably more because the goal of universal bibliographic control has been superseded by other library causes, in the age of the Internet, than because it has been superseded as a label for IO.

### 2.5 The Advent of IO

With no other likely candidates for a predecessor term, it would appear, then, that the concept of a generic, IO field of study was not strong enough to warrant its own name tag until the late twentieth century, when it started being labelled, more frequently, as both “information organization” and “knowledge organization” (or at least as “organizing knowledge”). This will be confirmed when we examine, in the following sections, what *was* covered in the earlier educational texts concerned with the various components of IO. We shall start this story at the beginning of formal education for the library profession, the first of the information professions to accredit programs of advanced education.

### 3.1 Before IO: the Subjects of Early Library Science
Librarianship has been practiced for centuries, of course, but formal education for professional employment began only in the late nineteenth century, when Melvil Dewey established the first “library school” [61]. It is at this point that it became what we mean here as a field of study, as well as of practice. Initially labelled “library economy”, and later Library Science, the larger field of study covered several IO activities more or less from the start, including cataloguing and classification [62].

3.2 Cataloguing and Classification

Both cataloguing and classification were at the heart of the early Library Science curriculum, accounting for large parts of it. Typically, the two activities were taught in separate units, and were conceived of as distinct, though cognate, fields of study [63, 64], reflecting librarians’ preoccupations, at that time, with their catalogues and open shelf arrangements. The titles of the texts used in many of the early courses, before the Second World War, demonstrate this conceptual separation. In Britain, these included Brown’s Manual of Library Classification and Shelf Arrangement [65] and its successor, W. C. Berwick Sayer’s A Manual of Classification for Librarians & Bibliographers [66, 67], complementing John Quinn’s Manual of Library Cataloguing [68, 69]. Berwick Sayers’ An Introduction to Library Classification [70, 71] and Quinn’s Library Cataloguing [72], and subsequently Henry Sharp’s Cataloguing [73, 74], might be regarded as the first British “textbooks” for classification and cataloguing, respectively, and were specifically aimed at those studying for the Library Association’s examinations for registration [75].

Meanwhile, texts used in the early American library schools for cataloguing courses, until the 1930s, included Theresa Hitchler’s Cataloging for Small Libraries [76, 77], Dorcas Fellows’ Cataloging Rules [78, 79] and William Warner Bishop’s Practical Handbook for Modern Library Cataloging [80, 81, 82]. The general preference for the dictionary catalogue over the classed catalogue in the U.S. led to a greater curricular emphasis, in that country, on cataloguing, and, correspondingly, a dearth of texts focusing on classification (it also led to greater coverage of subject headings).
Indeed, with classification coming to be seen as something of an appendage to cataloguing in many North American libraries, it was not long before the two fields of study started being merged. This is borne out by the titles of subsequent North American texts. Sometimes, “cataloging” was used as a generic term for both cataloguing and classification, as in Susan Akers’ *Simple Library Cataloging* [83, 84]. More often, though, “cataloging” and “classification” were simply joined together terminologically, as in the title of what could be regarded as the first “textbook” for the combined field, namely, Margaret Mann’s *Introduction to Cataloging and the Classification of Books* [85, 86], first published in 1930. The work offered a relatively systematic and thorough introduction to both the processes and functions of the two disciplines, though its coverage of the broader picture followed Bishop’s lead, employing similar chapter headings. Written specifically for the Library Science student and the American library schools (as part of the *Library Curriculum Studies* series, prepared under the direction of W. W. Charters), it covered the various procedures in detail, but also outlined the context of these activities, and the related management considerations.

Over the middle decades of the twentieth century, Mann’s and Akers’ texts were joined, in North America, by two other widely read books on both cataloguing and classification: Thelma Eaton’s *Cataloging and Classification* [87, 88] and Bohdan Wynar’s *Introduction to Cataloging and Classification* [89, 90, 91]. Although different parts of a text can be used for different courses, these treatments of the combined field point to the merging of units and the gradual reduction in the proportion of the core curriculum covering IO activities. Moreover, they point to a reconceptualization of the two subfields as being sufficiently close to be studied together, as a composite field, often abbreviated to “cat and class”.

In the UK, meanwhile, W. Howard Phillips’ *A Primer of Book Classification* [92, 93] provided an alternative to the Sayers texts, and Dorothy Norris’s *A Primer of Cataloguing* [94] an alternative to Sharp’s book. Not until the 1960s, however, did a textbook covering both classification and cataloguing appear, namely, Needham’s *Organizing Knowledge in Libraries* [29]. From this point, though, texts increasingly covered the combined field, as in North America. The development
coincided, probably not entirely by accident, with the gradual decline of the classed catalogue and the advent of computerized searching on MARC records. As earlier in the U.S., sometimes “cataloguing” was used as the generic term, as in the case of Eric J. Hunter and K. G. B. Bakewell’s *Cataloguing* [95, 96], while other times the terms were conjoined (as in Needham’s original subtitle). Again, the amalgamation was also symptomatic of a gradual squeeze of cataloguing and classification in the Library Association’s curriculum.

Up until the later decades of the last century, the focus of most courses in cataloguing and classification, as demonstrated to a large extent by the corresponding textbooks, was on the *application* of the main cataloguing standards and classification schemes of the time, that is, on procedural knowledge, rather than on the evaluation of the standards and schemes or the theories or principles underpinning them, even if a “balance” between theory and practice came to be seen by many cataloguing and classification educators as optimal [97]. Only occasionally were classification schemes, subject vocabularies and cataloguing rules for specialist collections covered [98]. Even more rarely were other IO activities related to librarianship, such as bibliography, and periodical indexing and abstracting, introduced in these courses; instead, when they were covered in the curriculum, they were taught as separate subjects, in separate units [62].

No doubt this would have been partly because there was already more than enough material to cover in the cataloguing and classification courses. Further, some of these other activities, such as indexing and abstracting, were not as commonly undertaken by librarians, and so tended to be offered as electives. In any case, cataloguing and classification represented, in most library school curricula, a field of study quite distinct from other IO activities that also aim to facilitate the finding and selection of relevant information. This is demonstrated by the lack of coverage of indexing, abstracting, bibliography and so forth in any of the texts cited above; indeed, there is hardly even any mention of them. The only exceptions are the references to other kinds of indexing and retrieval in Needham’s book, the fifth edition onwards of the Wynar/Taylor text, which introduced a chapter on “other types of verbal analysis” [99], and Hunter and Bakewell’s book, first published in 1979 [95]. Likewise,
none of the aforementioned texts, with the same exceptions, contains any specific reference to
“information organization”, “knowledge organization” or even “bibliographic control”.

3.3 Bibliography and Other Subjects of Library Science

In late nineteenth and early twentieth century library practice, the listing and description of books and other materials could have been conceived of as a somewhat similar activity, whether for the purpose of constructing a catalogue to a collection or a bibliography for a subject. However, as library practice developed, cataloguing evolved into a more “industrial” process involving mass produced catalogue cards and a complex and very detailed set of rules and procedures, often carried out by a specialist department, quite distinct from the requirements of “bibliography”, carried out by different staff, located in the library’s “reference” service. From the outset, this service aimed not only to inform patrons of what existed, but to advise patrons of what they might most profitably read; thus the bibliographies reference librarians produced tended to describe and evaluate materials, rather than simply enumerate them. These differences in the activity and function of cataloguing and reference departments were reflected in the establishment of courses, early on in Library Science education, in reference and bibliography, quite distinct and separate from those in cataloguing and classification [62, 63, 100]. Likewise, there were separate texts, although because bibliography was quite a specialized activity, in comparison with reference work as a whole, their numbers have never been large. Furthermore, different kinds of “bibliography” were studied in different courses and through different texts. Examples of more general treatments include Brown’s Manual of Practical Bibliography [101] and, much later, Gaskell’s A New Introduction to Bibliography [102].

The curricular divergence between cataloguing and classification, on the one hand, and bibliography, on the other, only increased through the middle decades of the century, even if the concept of “bibliographic control”, which became established during this period, covered a range of “tools” for its purpose that included both catalogues and bibliographies. When the adjective “bibliographic” was introduced into cataloguing and classification texts, in the 1960 and 70s, it was in the context of the advent of MARC cataloguing, with its “bibliographic files” and “bibliographic records”, and not in
relation to “bibliography”. Conversely, while texts on bibliography mentioned *catalogues* as tools that might assist the bibliographer, they did not cover, or even reference, *cataloguing* as a cognate activity within a broader IO field of practice and study.

Other IO activities, such as indexing and abstracting, were covered in the Library Science curriculum much more spasmodically. Even in the early seventies, a study conducted by Sarah Reed [62] found that “cataloging and classification” courses were offered by 100% of North American library schools surveyed, and in 84% of cases were required, whereas courses in “indexing and abstracting” were offered by just 30%, and in all cases as an elective. Hence there were very few texts specifically on these other activities aimed at the tertiary student, though there were some manuals and the like catering to a wider audience (in the realm of indexing, for example, there were Wheatley’s *How to Make an Index* [103], Clarke’s *Manual of Practical Indexing* [104], Brown’s *Indexing* [105] and Collison’s *Indexes and Indexing* [106]). This situation improved to an extent as the LS curriculum gave way to an LIS curriculum in the 1970s and 80s, as we shall discuss in the next section.

### 4. Proto-IO and the Merging of Library and Information Science

So what led Needham, especially in the second edition of his book [30], to conceive of a field wider than “cat and class”? He would no doubt have been conscious of the efforts that were being made, in the middle of the century, to facilitate the “subject approach” to the retrieval of information resources that extended beyond conventional cataloguing and classification. Many of these efforts were part of the “documentation” movement that had started out, as mentioned earlier, in the late nineteenth and early twentieth centuries. The work of the pioneering documentalists, such as Otlet and La Fontaine, attracted the attention of an increasing number of “special librarians” located in the burgeoning science and engineering sector, who were also looking for effective ways to deal with the ever growing amounts of technical information that needed to be organized for retrieval. The cataloguing rules, subject headings and classification schemes that had been developed for public and college libraries were not so suited to the organization of the documents needed by scientists and engineers: journal and conference papers, and research reports, typically on very specific topics. Some of these
librarians ended up joining and contributing to the movement, developing their own indexes and bibliographic tools [107, 108]. The explosion of scientific documents across the first half of the twentieth century, and the need for their swift retrieval, led to the documentalists’ particular interest in mechanical and automated approaches, and to the “subject approach”. By the 1940s and 50s, their innovative work, and their goals (particularly that of bibliographic control), were of sufficient importance for dedicated journals to be established: the British *Journal of Documentation* (“devoted to the recording, organization, and dissemination of specialized knowledge”) was first issued in 1945 and *American Documentation* in 1950.

Whereas the cataloguing and classification taught in mid-twentieth century Library Science classes, catering primarily to prospective public and academic librarians, still tended to emphasize the application of rules, even at the graduate level, the emphasis in “documentation” was on research and development, producing new technologies and new theories. The new technology led to post-coordinated document retrieval, and ultimately to content-based retrieval and the rise of the field of “information retrieval”. The new theories included those that led to “facet analysis” (developed by the UK-based Classification Research Group (CRG) [109] as well as by S. R. Ranganathan [110]), on which new classification schemes and subject thesauri used to support these new retrieval methods were often based. While the focus might have been on the sorts of materials to be found in science and technology collections, librarians and library educators began to consider the applicability of some of these innovations to the retrieval of library materials more generally, and to the teaching of cataloguing and classification in library schools.

Since several members of the CRG were also teaching cataloguing and classification in the British library schools of the 1950s and 60s [109], it is perhaps not surprising that some of the earliest expansions of the syllabus, as signalled by Needham’s book, occurred in the UK. A. C. Foskett, whose brother Douglas was a leading CRG member, published an early manifesto for a broader treatment of the “organization of knowledge” in library education, in his article, “A new approach to teaching classification and subject cataloging” [111]. In it, he argued that the fundamentally similar
ways in which the gamut of modern information retrieval systems approached subject access allowed for the principles and schemes on which the “subject approach” was based to be studied in the same course. He advocated for coverage to include both old and new schemes, and both pre- and post-coordinated indexing procedures. However, he stopped short of combining the “subject approach” with that of descriptive cataloguing. Thus, instead of a division between cataloguing and classification, a different division was introduced, as it was in Needham’s book, between descriptive and subject approaches to information retrieval. Foskett’s own textbook, which ran to five editions, focused on *The Subject Approach to Information* [112, 113]. It covered “indexing” far more broadly than that of the subject indexing in library catalogues, as well as the classification of all types of documents.

As indicated by the title of his 1933 book [28], this “subject approach” can be traced back to Bliss, whose work directly influenced the thinking of the CRG. For this group, classification was key to the whole enterprise of document retrieval, as it was for Shera, who was one of the main forces in the push to merge “documentation”, or “Information Science” as it became known, with Library Science [114]. This push legitimized, and included, the push for the expansion of the cataloguing and classification syllabus into other IO areas; and it comprised both descriptive and subject approaches. The activities of cataloguing and indexing were increasingly seen as at least closely related. Thus the Library Association’s special interest group started its periodical, *Catalogue and Index*, in 1966. A decade later, Alan Thomas [115] highlighted, favourably, the 13% of North American library schools, in his survey, with “modern integrated courses” that went beyond traditional cataloguing and classification.

On the other hand, just as the transition from LS to LIS was incremental and not entirely smooth, it took some time for the concept of a single field, covering all these related activities, to develop. Over this transitional period, generic terms for such a field were occasionally coined: a decade after Needham introduced “organizing knowledge”, Brunt [116] used “information storage and retrieval”, for example, in the title of a journal article about a broader view of “cataloguing and classification”,

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as he referred to the field in the text. As we have noted, however, these terms did not really stick, at least not during this period; nor did they cover IO tools such as bibliographies, nor those developed outside of LIS, such as in Archival Science.

Why then, given librarians’ interests in bibliographic control and computerized document retrieval in the 1970s, did the concept of a generic field, including both cataloguing and indexing, not establish itself at this time? The similarities of these activities were indeed recognised, as we have noted. Instead, the reason they were not studied together primarily reflected their depth. Indeed, the advent of MARC cataloguing and library automation actually increased the body of knowledge and skill required of cataloguers, even if it ultimately was to reduce their numbers. Thus demand for specific cataloguing and classification skills if anything grew during this period, and most LIS curricula continued to offer courses that focused on them [117]. Indeed, not only did Wynar and Taylor’s *Introduction to Cataloging and Classification* remain well used, through regular new editions, but cataloguing and classification instruction was sufficiently populous in North America to support a second, rival textbook, namely, Lois Mai Chan’s *Cataloging and Classification: An Introduction*, which first came out in 1981 [41, 118, 119]. In fact, the mid-late twentieth century represents a high water mark of cataloguing and classification publishing, with the journal *Cataloging & Classification Quarterly* also launched in 1980, an increasing number of books and articles devoted to particular aspects of practice, such as specific processes, material types and kinds of library, and a wide variety of educational and instructional books, including workbooks, programmed texts and commentaries [82].

Instead of attempting to cover other IO activities into packed cataloguing and classification courses, many of the new LIS curricula simply added new courses for them. Thus more units were offered in “indexing”, “abstracting” (sometimes together with indexing), “thesaurus construction”, “bibliography”, “information retrieval”, and so on [117]. Demand for indexing and abstracting courses grew large enough, even, to support two separate texts: Cleveland & Cleveland’s *Indexing and Abstracting* [120, 121] and Lancaster’s *Indexing and Abstracting in Theory and Practice* [122,
These additional courses were sometimes taught by the same faculty who taught cataloguing and classification, but often they were not. Moreover, the activities themselves tended to be carried out by different personnel engaged by different agencies. They were conceived of as different, though cognate, fields ultimately for practical and industrial reasons.

5. IO and the “Information” Curriculum

If the documentation movement led to the development of an LIS curriculum that linked cataloguing and classification to other activities, but still prioritised “cat and class” in many cases, what led to the establishment of IO as an integrated field of study, as signalled by the publication of the books by Rowley and Taylor, in the late twentieth century? Taylor [4] informs us that she wrote her book as a response to new courses that were being offered to provide an overview of the range of activities and systems that enabled intellectual access to information resources. Ultimately, these courses were developed probably more as a result of the changing employment landscape as much as anything else. In the 1980s and 90s, library budgets came under increasing pressure, and the library job market declined, in the UK, North America and elsewhere [124, 125, 126, 127, 128]. Cataloguing departments were often amongst the first to be downsized, now that automation had been achieved and bibliographic records for most items could be readily procured from external sources [129]. With the demand for cataloguers falling, increasingly LIS programs moved their “cat and class” courses out of the required curriculum and into the elective sets [130, 131]. This left a gap in the core curriculum, which was filled with the broader, IO courses that Taylor was aiming to support. This move was in line with the wider curricular trend toward broader foundation subjects that aimed to prepare students for all kinds of “information work”, and not specifically librarianship. By the mid-2000s, four fifths of North American programs required only the completion of an IO course [132], reversing the situation in 1970, when it was cataloguing and classification courses that were required in 84% of programs [62].

The more generic IO courses that Rowley’s and Taylor’s books support have thus become commonplace in the contemporary, information-centric curriculum. They are used to introduce a
range of activities, allowing for more advanced study of these specific activities later in the program: not just library cataloguing and classification, but also, for instance, indexing (including book indexing) and abstracting, “metadata” and “information architecture” [133]. They are typically not designed to introduce bibliography, however, and remain focused on the provision of intellectual access, although this may include the use of evaluative metadata (to support selection). Potentially, they do now cover the full range of discovery tools, including archival finding aids, created by the various kinds of collecting institutions. Moreover, they cover the vast array of search tools to be found on the Internet, including the ubiquitous search engines [133].

Both the move to LIS and the move to drop “L” and adopt a more inclusive curriculum around all things “information”, represent, to some extent, efforts to improve the academic (and in particular research) standing of the “discipline” within internal, university circles. The latter move has been institutionalised, since the 2000s, in the ever-expanding “iSchools” organization, which originated in North America, but is now quite international in scope [134]. Both moves also represent, however, responses to the weakening economic case, or prognosis, for programs dedicated to professional library education. Whereas the earlier transition, to LIS, was not mirrored by an immediate decline in the demand for cataloguing and classification skills, and so early moves toward a “proto-IO” syllabus were motivated more by the theoretical positions of academics such as Foskett and Brunt, the later transition, toward “Information”, has been mirrored by a decline in cataloguing jobs, and, to a degree, a reconceptualization of cataloguers as a broader kind of information professional, i.e. a “metadata” professional [135]. Thus the dropping of cataloguing and classification units from the core curriculum has been the result, in recent times, of both external and internal forces: there is less demand from industry, or at least less perceived demand, while the theoretical stance of the new Information curriculum makes the presence of specifically library-oriented compulsory units problematic. Those who might still advocate for their retention have fewer arguments at their disposal than they had in the 1970s.
Furthermore, neither has the search for a higher academic standing shone an especially positive light on traditional cataloguing and classification, which has never been identified as a major research field, in contrast to documentation and, in particular, information retrieval. It could be argued that the broader IO field is likely to be taken more seriously in the academy, and to attract more research funding. Apart from topics such as “metadata” holding more traction with funding bodies, than, say, “library catalogues”, the broader field encourages more of a focus on resource description as a phenomenon, rather than as a prescribed set of procedures, making it a richer subject for investigation.

This observation perhaps mirrors Richard Smiraglia’s narrative [136] of the field in the late twentieth century, when the focus on “bibliographic control”, based on pragmatic and rationalist “principles”, shifted to a focus on the development of more evidence-based practice and tools, based on empirical and historicist analysis.

With cataloguing jobs still perceived as under threat, not only economically now, but also technologically, it seems unlikely that “cat and class” will return to the key curricular position that it held in the past. On the other hand, there remains a significant demand for “metadata” librarians with cataloguing skills and knowledge, and while this is so, specialist cataloguing courses are likely to continue to be offered, at least by some schools. Likewise, a steady stream of books and articles on the various aspects of the narrower field continues, recently spurred on by the transition from Anglo-American Cataloguing Rules to Resource Description and Access, and now by the promise that “linked data” holds. Journals dedicated to specific components of IO also continue, including Cataloging & Classification Quarterly and The Indexer. The leading professional associations, such as the International Federation of Library Associations and Institutions (IFLA) and the American Library Association (ALA), continue to support cataloguing activities and groups (although the Cataloging and Classification Section of the ALA’s Association for Library Collections and Technical Services changed its name in 2011 to the Cataloging and Metadata Management Section [137]).

Further, some of the new IO activities, such as taxonomy construction and analysis, can be very profitably taught with reference to the theories and skills covered in traditional fields such as bibliographic classification. Indeed, the cataloguing and classification fraternity remains more
identifiable through its online lists (such as Autocat) and periodicals than does the broader, IO collective. It is debatable, in fact, as to whether there is yet a whole organization dedicated to the broader field. Some might point to the International Society for Knowledge Organization (ISKO), but its scope is somewhat unclear, as we shall discuss next.

6. One IO and Two KOs

While both the terms “information organization” and “knowledge organization” are now employed quite commonly for the concept of the IO field of study, we should note that “knowledge organization” is also still used for the narrower concept that pertains to the “subject approach” to information (or document) retrieval mentioned earlier. This is primarily due to another development that occurred in the late 1980s, while Rowley was publishing the first edition of her book [19], namely the founding of the International Society for Knowledge Organization in 1989. As successor to the Society for Classification, it was established to facilitate the development of the tools of “knowledge organization”, including “classification systems, thesauri, terminologies, nomenclatures” [138]. The term “knowledge organization” was chosen for the English name to represent wider interests than classification, although these did not at first extend to other IO activities such as descriptive cataloguing: it was abstract rather than recorded knowledge that was to be organized into schemes and vocabularies. The use of the term was inspired by Bliss’s titles [139], the origin of an intellectual lineage, as outlined earlier, running through the UK-based Classification Research Group and the work of those LIS educators and researchers involved in improving and articulating the “subject approach”, such as A. C. Foskett.

Along with the new society, came a “new” journal, Knowledge Organization, which succeeded International Classification in 1993, a series of international conferences, and, later, conferences for ISKO’s various chapters, together with corresponding proceedings and other monographic publications. Not surprisingly, the term “knowledge organization” started to appear in the LIS literature much more frequently, from the 1990s onward. (Quite a number of the papers in Knowledge Organization and the proceedings of ISKO conferences include the term in their titles.)
Given the interests of the founding members of ISKO and the reasons why they adopted the term, it is not surprising that the scope of Knowledge Organization and the ISKO conferences was more or less limited to classification and subject indexing in the 1990s. However, a more inclusive approach was heralded by Hope Olson’s editorial in a 2001 issue of Knowledge Organization [140], which questioned the definition of “organization”; a year later, an article on “FRBR” appeared, about the library cataloguing model [141], as did an article by Andersen [142], which explicitly employed a broad definition of “knowledge organization”, encompassing the description of carriers as well as content. Similarly broad views were presented in Birger Hjørland’s 2003 article, “Fundamentals of Knowledge Organization” [143], and again in his 2008 article, “What is Knowledge Organization (KO)?” [144], which included a definition that can now be found on the ISKO website [145]: KO is “about describing, representing, filing and organizing documents and document representations as well as subjects and concepts both by humans and by computer programs.” While the journal’s contents remain very much rooted in the “subject approach”, further articles on various “metadata” and “bibliographic” topics have appeared over the past decade, along with studies of various aspects of a “KO” field broadly defined.

This trend is even more pronounced in ISKO’s biennial and regional conferences, which focussed almost exclusively on the classification, taxonomy and subject indexing in the 1990s, but have adopted a much more inclusive from 2000, embracing a wide range of topics. While proceedings have continued to deal predominantly with classification theory, analysis of established schemes and vocabularies, as well as of “naïve” classifications to be found on the Web, and of many different “domains” (e.g. through bibliometric or terminological study), they have also included a fair smattering of papers on, for example, bibliographic models, OPAC use and database design, the concept of “work”, the cataloguing process, metadata’s role in the Semantic Web, author browsing, digital library evaluation, RDF, scientific metadata, MARC tags, the concept of bibliography, name authority control, search engines, website design and usability, archival description, image retrieval, ratings and reputational tools, knowledge work, document naming, museum object classification,
cross-collection relationships and the concept of authorship, as well as papers on automatic indexing and the development of formal ontologies to support natural language processing [146]. Although a majority of papers would fit the concept of KO in the more literal sense of the organization of concepts, a significant minority either explicitly define KO as the broader IO field, or implicitly demonstrate a view of KO that includes the description of information resources, as well as of information in the abstract.

However, the trend seems to have levelled out, with a number of leading members of ISKO maintaining a narrower conceptualization of KO. For example, Vanda Broughton [147] discusses KO in terms of “subject description and retrieval”, while “Knowledge Organization Systems” are defined by Claudio Gnoli [148] as “any tool for indexing and arranging information resources based on their subject matter”. Likewise, Alan Gilchrist’s recent overview of “knowledge organization” [149] is essentially a discussion of a field dealing with classification and ontology, while Ingetraut Dahlberg [150] remained of the view that “cataloguing” is not part of the KO field. On the other hand, other leading ISKO members take a broader view, along with Hjørland, even if subjects tend to remain at the forefront. For example, in his book, The Elements of Knowledge Organization, Smiraglia [136] points out that the terms “knowledge organization” and “information organization” are often used synonymously, to mean a field that covers the “bibliographic universe”, as theorized by Wilson and Svenonius, amongst others, involving catalogues and the whole gamut of “bibliographical apparatus”.

7. Prospects for IO as a Field of Study

The relatively new field of IO has its challenges for those teaching (and studying) it, some of which it would share with other fields offered in the “Information” curriculum. It might not be easy for IO units, often with quite limited amounts of curricular space, to present a clear overview of a field comprised of fairly distinct activities, and professional and institutional contexts, let alone intellectual traditions and outlooks. This leads also to the question of whether the field reflects the reality of practice. How much in common have, say, library cataloguers and archivists describing their new accessions? The “market test” would be whether employees in these different roles and institutions
actually interchange. If they do, this would be hard evidence that their skills are indeed transferable. While many “cataloguers” are becoming “metadata librarians”, are they starting to go that additional step and becoming “IO professionals”, or “metadata professionals”? It could be that while they are not yet crossing sectors, there is now the potential for them to do so, given the general trend towards convergence among the “LAM” professions [151], and that it is up to employers to recognise this. Or it could be that it would take a lot more than the completion of an IO unit for “metadata” skills to become readily transferable across sectors with quite distinct institutional and information contexts: convergence is unlikely to be complete in the foreseeable future. More research is needed to answer these questions. Of course, it could be that the IO syllabus is simply ahead of its time, just as Foskett’s syllabus might have been. However, IO students, and industry, would need to be convinced that the syllabus is indeed a product of deep foresight, and not of convenient speculation.

Along with these practical questions, the IO field as now conceived in books such as Joudrey and Taylor’s [5] throws up various theoretical considerations. Like all fields, it focuses on certain phenomena at the expense of others; various aspects of this focus may be challenged in the future, just as its component subfields’ foci were challenged earlier. First, IO emphasizes the retrieval of documents, rather than information or knowledge per se. Although the Web is increasingly breaking down text and other content for more granular consumption, the notion that a text, image, or other “resource” is more than the sum of its information parts, would still appear to hold a good deal of currency, at least in some knowledge-seeking contexts, and it does not seem likely that “document retrieval” will become a completely obsolete goal just yet.

Another aspect of IO’s focus pertains to its emphasis on manual methods, even if the construction and application of its retrieval systems are increasingly assisted by computers. This emphasis is, of course, contentious, and has been for many years, having led to the split with the field of “information retrieval”, which focuses on automated search and is increasingly a province of Computer Science. It is possible that the statistical and algorithmic approach to retrieval, including document retrieval, will
eventually prevail, and that “information retrieval” will fully subsume “information organization”. However, the current appetite for manually created “linked data” indicates that the jury is still out.

Third, the IO field stresses the provision of access to all “relevant” documents, allowing the end-user to decide which ones suit their purpose in each given search context. In this way, IO tends to emphasise (support for) the user task of “find”, more than the user task of “select”. While relevance ranking algorithms clearly assist selection, there may also be a case for more “bibliographic” assistance, that is, for professionals and specialists to help evaluate resources and point the user in the “right” direction. In other words, information organization could also become information evaluation or information filtering, more fully combining “descriptive” and “exploitative” bibliographic control, to employ Wilson’s terms [58]. This would represent the closing of another gap in the original Library Science curriculum, between cataloguing and classification, on the one hand, and bibliography, on the other. If the jury finds against the continued investment in manual indexing and classification, for “descriptive control” and “access”, the provision of exploitative bibliographic control might in fact be where IO’s long-term future lies. In such a scenario, we would see a revisiting of LIS education’s “readers’ advisory” roots, as identified by Christine Pawley [152], which centred on an approach characteristic of the humanities, and which gave way to the social science paradigm, to a large degree, in the 1920s and 30s.

Bearing all these considerations in mind, around IO’s future and its present-day practical applications, we might also briefly comment on the field’s present-day identity and organization (in the sociological sense of “knowledge organization”). The identity and reputation of the field might be strengthened if it were to settle on a single name. In LIS, a theoretical distinction is often made between “information” and “knowledge” [153], but this has been less commonly applied by those in the IO field; indeed, Hjørland rejects the claim for a theoretical distinction between IO and KO [154]. As we have noted, Rowley, for example, used the terms interchangeably, while Taylor chose “information” because her dictionaries defined “knowledge” as “in the mind of an individual” [4, p. xvii]. (It would be reasonable to suppose that she also wished to use a title that would distinguish her
book from others, such as Rowley’s.) Taylor’s approach points to the ontological meaning of the term “knowledge organization”, but in everyday usage “information” can also be an abstraction, while “knowledge” can also be made manifest (as in “recorded knowledge”).

It could be argued that neither IO nor KO are, in fact, ideal names, given that they both use “organization” in a slightly counter-intuitive way: resources are organized intellectually, meaning that it is their descriptions, representations and labels that are directly organized. However, no alternative term looks to have much prospect of superseding these terms in the near future. “Information retrieval” and “document retrieval” capture the goal of the field, but were long ago appropriated by the “automated approach” (well before Rowley dropped IR from her book’s subtitle). Any term including “bibliographic” is likely to be deemed too library-oriented, while “information access” also has a much broader meaning, encompassing physical and digital access. The term “representation” has often been used in association with indexing and IO, but its concept is even more abstract than that of “organization”. “Information resource description” has been used by Hider [155] as, perhaps, a somewhat more intelligible rendering of what IO is and does, but may be rather long for the name of a field, while “document description” would not work so well in the museum context, “arrangement and description” is more a specifically archival term, and “information description” has hardly ever been used.

The ambiguity around KO suggests that IO might presently be the field’s name of choice. There is, however, a practical argument for the other term: KO has its own international scholarly society, and a dedicated scholarly journal, whereas IO has neither. This argument might well become compelling if ISKO were to confirm that its scope does indeed cover all approaches to KO and IO, with “knowledge” including, and indeed ultimately focusing on, recorded knowledge. This would not exclude, by any means, the study of ontologies and domains, and knowledge in the abstract sense, because such study supports the subject approach to providing access to recorded knowledge. On the other hand, the study of “knowledge” for its own sake, might be regarded as anthropological or philosophical, and less of a focus for the Society, if it is to retain a distinct raison d’être. As the
Society for the scholarship of KO/IO, in the broader KO sense, ISKO could provide the home for KO/IO scholars of all stripes, who may otherwise find themselves somewhat isolated within their respective iSchools.

8. Conclusion

Both “information organization” and “knowledge organization” are fairly common terms in contemporary LIS. While they can be regarded as synonyms, and used as such, they can also represent different, though related, things, with “information organization” standing for a broader field of study, and “knowledge organization” focusing, in its narrower definition, on the representation of the subjects of information resources.

The broader field of IO has, however, only become established in the professional curriculum in the past two or three decades, mirroring LIS programs’ move toward a focus on “information”, due to economic and reputational pressures. This shift can be seen as the latest of four overlapping phases toward an increasingly integrated syllabus covering the foundations of IO practice. First, in the Library Science curriculum from its beginnings until the mid-twentieth century, cataloguing and classification were taught and conceived of as the primary, and distinct, fields of IO; second, from around the 1930s until late in the twentieth century, “cat and class” tended to be taught together as the single, core IO field; and, third, from the 1960s until the 90s, while “cat and class” still tended to dominate IO offerings, there was a growing interest in, and coverage of, the other activities of “bibliographic control”, as Library Science gave way to Library and Information Science. The vanguard of this third phase was the “subject approach” to IO, which covered indexing and the newer processes involved in “information retrieval”, as well as elements of traditional “cat and class”. However, the field of “information retrieval” ended up, during this period, going its own way, emphasizing the automated approach. Instead, the IO syllabus that emerged in the late twentieth century, and that is still with us today, continued to prioritize the input and judgement of the information professional, given the ongoing reality of many library, archival and museum collections, with content that is not yet fully indexed by discovery systems.
While IO as a field of study makes sense in the context of the new Information curriculum, IO as a field of practice is not yet readily apparent. Further, its prospects may be challenged by technology: the value of traditional IO practices, particularly cataloguing and classification, has been questioned for many years, and this questioning is only likely to increase as more and more content is indexed by discovery systems, and as relational databases struggle to cope with “big data”. Nevertheless, there appear to be two ways in which the IO field, with its emphasis on solutions involving professionals, may hold firm in the face of these challenges, and the threat of complete displacement by Computer Science. It may be that Computer Science ends up partnering IO to produce the long-awaited Semantic Web. And it may be that the IO field will, in any case, start paying closer attention to the “exploitative” control of information resources, supporting their selection in ways that are more intellectually and culturally nuanced, and domain specific, than that of search engine rankings. Thus the tradition of bibliography might be added as another layer to the IO field, transforming it, once again, into something larger.
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