Reviews of Concepts in Knowledge Organization

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Library and Information Science (LIS), Part 2†

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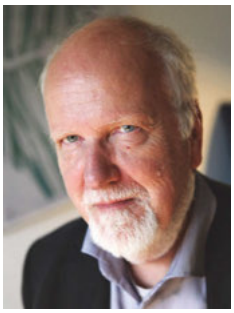

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Abstract: This article outlines the history of library and information science (LIS), from its roots in library science, information science and documentation. It considers various conceptions or "paradigms" in the field and discusses the topical content of LIS as well as the relationships between LIS and other disciplines. The main argument of the article is that answers to all such questions concerning LIS are related to conceptions of LIS. It is argued that an updated version of social epistemology (SE), which was founded by Egan and Shera in 1952, may in hindsight provide the most fruitful theoretical frame for LIS. SE is related to the domain-analytic approach, which was suggested by Hjørland and Albrechtsen in 1995.

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3.4 The cognitive view

To say that information processes and processors are cognitive in nature is a triviality that cannot be used to distinguish these from other approaches. Dahlberg (1992) is an editorial about the cognitive view in knowledge organization. She declared the term cognitive approaches a tautology, since all approaches to KO must, in one way or another, be concerned with conceptual and cognitive issues; according to Dahlberg, the term is thus not specifying anything new in knowledge organization. Since the cognitive view is often presented as one of several positions, its theoretical assumptions relative to other perspectives must be further examined. As Slife and Williams (1995, 71) wrote:

> to truly evaluate and understand the ideas behind other ideas, we must have a point of comparison. We must have some contrast with implicit ideas or they will not look like ideas. They will look like common sense or truth of axiom rather than the points of view that they really are.

The cognitive view came to information science from an interdisciplinary movement known as cognitive science or the cognitive revolution, which again was influenced by Shannon's information theory. For example, human information processing (Lindsay and Norman 1977) influenced LIS and was in some places used as a text in information science around 1990.

Gärdenfors (1999) wrote about the origin of cognitive science:

> There are good reasons for saying that cognitive science was born in 1956. That year a number of events in various disciplines marked the beginning of a new era. A conference where the concept of Artificial Intelligence (AI) was used for the first time was held at Dartmouth College. At this conference, Alan Newell and Herbert Simon demonstrated the first computer programme that could construct logical proofs from a given set of premises. They called the programme the Logical Theorist. This event has been interpreted as the first example of a machine that performed a cognitive task.
> Then in linguistics, later the same year, Noam Chomsky presented his new views on transformational grammar, which were to be published in his book Syntactic Structures in 1957. This book caused a revolution in linguistics and Chomsky's views on language are still dominant in large parts of the academic world. What is less known is that Chomsky in his doctoral thesis from 1956 worked out a mapping between various kinds of rule-based languages and different types of automata …
> Also in 1956, the psychologist George Miller published an article with the title The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information that has become a classic within cognitive science. Miller argued that there are clear limits to our cognitive capacities: we can actively process only about seven units of information. This article is noteworthy in two ways. First, it directly applies Shannon's information theory to human thinking. Second, it explicitly talks about cognitive processes, something which had been considered to be very bad manners in the wards of the behaviourists that were sterile of anything but stimuli and responses. However, with the advent of computers and information theory, Miller now had a mechanism that could be put in the black box of the brain: computers have a limited processing memory and so do humans …. Another key event in psychology in 1956 was the publication of the book A Study of Thinking, written by Jerome Bruner, Jacqueline Goodnow and George Austin, who had studied how people group examples into categories. They reported a series of experiments where the subjects' task was to determine which of a set of cards with different geometrical forms belong to a particular category … Bruner, Goodnow and Austin focused on logical combinations of primitive concepts, again following the underlying tradition that human thinking is based on logical rules.

One of the main figures in the cognitive view in information science is Nicholas Belkin, who claimed (1990, 11):

> It is shown, by example, that considering problems of information science from this point of view has led to significant advances in a variety of areas of information science, including bibliometrics,[53] user studies, the reference interview and information retrieval. This variety of applications suggests that the cognitive viewpoint may be a powerful framework for the general theoretical and practical development of information science.

Such a broad influence is what should be expected from a paradigm or framework theory in information science. Belkin's view has been questioned, and one of the aims of the present article is to explore its claim further.[54]

The cognitive view in information science, at least in its original form (as connected with Lindsay and Norman 1977), was based on the view that the study of how humans search and index/classify information is based on universal rules inherent in the human mind (and connected to human neurobiology). In other words, the principles of information science can be uncovered by the study of the human mental system, considered to be universal (as opposed to a culturally and socially shaped mind).

Ørom (2000, 16) characterized the cognitive view in the following way:

> During the last three decades [i.e., the 1970s to 2000] the cognitive school or approach has developed and increasingly dominated the study of information behaviour. Even though it is not generally accepted, it has most impact [Vakkari 1996, 204–218]. The development of the cognitive perspective has meant a broadening of both the scope and spectrum of foci of information science. It is a broadening of the scope in the sense that all kinds of information are included in the concept, and it is a broadening of the focus in the way that it includes human information (retrieval) behavior in general, and in relation to information retrieval and IR systems. The approach concentrates on the qualitative aspects of information retrieval interaction. The cognitive viewpoint [Ingwersen 1992] is based on a relativistic model of knowledge, which means that knowledge is relative in that it is altered by cognitive (and social) processes.

However, one may ask whether Ørom's description is correct. For example, is it correct that the cognitive view is

based on a relativistic model of knowledge, altered by cognitive and social processes? Brasseur (2003, 1), for example, wrote that "cognitive-based theory … privileges the idea of a universal viewer, whose needs can best be met by designing technical visuals that respond well to the innate perceptual abilities of readers." Gärdenfors (1999) also described cognitive science as being based on the rationalist view that there are underlying universal mechanisms in human cognition that can be uncovered by cognitive scientists. The relativist and social view of knowledge associated with, for example social constructivism, pragmatism and critical theory (including Ørom's own view) is very different from cognitive science and the cognitive view in information science. Sampson (1981) argued that cognitivism, by virtue of the primacy it gives to the individual knower,[55] to subjective determinants of behavior, and to formal cognitive operations, represents a set of values and interests that reproduce and reaffirm the existing nature of the social order, and thus must be understood as an ideology.

For example, in information science, Frohmann (1990) criticized the cognitive understanding of indexing. Based on the philosophy of the late Wittgenstein, Frohmann argued that principles of indexing cannot be rules inherent in a universal mind. If information specialists are going to index a text, we may assume that the principles of this indexing have been learned, for example during their education in LIS. Such principles may have been discussed in the literature and developed historically (based on research which is informed by epistemological theories, which themselves are developed historically). In other words, LIS is supposed to develop sound principles of indexing, rather than to uncover them by studying abstract minds. The minds of the indexers are supposed to reflect what they have learned (and thus are socially/culturally formed). Because of this simple reasoning, basic assumptions in the cognitive view are based on what has been called "the psychologist's fallacy."[56]

Another important example is provided by Kwon (2016, ii):

> If "information" is a central concept for library and information science, then "questions" are fundamental, for information "informs" relative to the question. But research focusing on questions as a central theoretical concept has been stymied by the paradox of the question, which observes that in order to ask one must know enough to know what one does not know (Flammer, 1981). This dissertation proposes that this paradox results from the limitations of the cognitive approach to questions as indications of individual information need, and that the paradox can be resolved by reframing questions as social epistemological tools of inquiry within knowledge domains.

Talja (1997) wrote:

> It is widely recognized that both individual information needs and institutional information access are socially conditioned. However, conducting information seeking research on a macro-sociological level has turned out to be difficult within the cognitive viewpoint, since it is basically a theory of how individuals process information. The cognitive viewpoint offers no concrete and obvious solutions to the question of how to conceptualize and study the socio-cultural context of information processes.

There have been "turns" in the development of the cognitive view in information science. Ingwersen (1992, 18) differentiates cognitivism from the cognitive view, and Ingwersen and Järvelin (2005, 29) term their new view the holistic cognitive view, claiming that it has accommodated the socially oriented criticism.[57]

Talja et al. (2005, 81) claim that the cognitive view is a misnomer:

> In IS [information science], constructivist ideas are commonly labelled under "the cognitive viewpoint." The cognitive viewpoint in IS, as initially formulated by Brookes (1980), Belkin and colleagues (Belkin 1984; 1990; Belkin et al. 1982) and Ingwersen (1982; 1992), does not represent cognitivism, however. Cognitivism is an approach that significantly informed artificial intelligence in drawing straightforward analogies between human information processing and computing (Ingwersen 1992, 19-25, 227). The cognitive viewpoint in IS differs from cognitivism by laying major emphasis on the way in which knowledge is actively built up by the cognising subject, that is, by the individual mind to serve the organisation of internal and external reality.

Talja et al.'s point of view may be more correct in some cases than in others. We should remember the connection between the cognitive view in information science and that of Lindsay and Norman (1977), which indicates that the cognitive view in information science is related to cognitive science. It may be, however, that the authors in the cognitive tradition are not themselves loyal to their metatheoretical commitments. Konrad (2007, 23) found that "the 'cognitive viewpoint' literature [in information science] is sparse in its use of, and even reference to, any of these [cognitive science postulates], preferring to originate its own postulates in these areas."

Ellis (1992, 53) found that it is "difficult to identify … that there is any concrete scientific achievement which can be said to serve as the exemplar for the cognitive approach, and which would qualify as a paradigm for that approach … unlike the physical paradigm there may be no equivalent of the Cranfield tests to serve as a paradigm for those adopting the cognitive approach in this field."[58] The clearest characteristic of the cognitive view is the aim of modeling and representing the user's cognitive structures and processes. However, for those researchers who consider knowledge and information as fundamentally social in nature, this task seems condemned from the beginning.[59]

As we saw above, Warner (2010, 4-5) found that the cognitive and the physical paradigms shared a set of problematic assumptions and therefore should be considered as "a single heterogeneous paradigm, linked but not united." In his view, the cognitive tradition is also based on the query transformation assumption rather than on the idea of selection power.

Despite the unclarified issues in the cognitive approach and the serious arguments that have been raised against it, there is a today a large body of interdisciplinary literature informed by that view.[60] Cognitive science has also developed new perspectives and approaches that are much more fruitful than the classicist/cognitivist research program, including:

- embodied cognition (cognition as actively constructed from select environmental features)
- enculturated cognition (the co-evolution of cognition and culture)
- distributed cognition (cognition stretching across systems of humans and artifacts)
- situated cognition (cognition located in and arising from interactions within situations)
- the cognitive-historical approach (reconstructing conceptual changes in the history of science; see Nersessian 2008; Andersen, Barker and Chen 2006)

In this way, cognitive science may come closer to the views introduced in section 3.6. The cognitive-historical approach, in particular, seems fruitful for knowledge organization (cf., Hjørland 2017a section 4.1, 103-5).

3.5 Floridi's philosophy of information

Philosopher Luciano Floridi (born 1964) has developed a philosophy of information that he labels the philosophy of information (PI) or the philosophy of computing and information (PCI). In Floridi (2002), he explicitly considers PI's relation to LIS and to social epistemology (SE) as a foundation for LIS. Floridi argues that SE cannot serve as a proper foundation for LIS, but should be considered a sibling, and that both siblings (LIS and SE) must be founded in PI. In other words, Floridi claims that LIS must be understood as applied PI. He rightly points out (Floridi 2002, 39) that:

> The library is a place where educational and communication needs and values are implemented, defended and fostered, where contents are assessed and selected for the public, and where practices like cataloguing, for example, are far from being neutral, evaluation-free activities [note omitted]. This normative stance makes LIS lean towards ESK [Epistemology of Social Knowledge].[61]

However, Floridi then argues that "SE and LIS do not make a happy marriage because LIS works at a more fundamental level than epistemology. Its object is not knowledge itself but the information sources that make it possible, even if only indirectly."[62] This argumentation is somewhat confusing;[63] an example can be considered as follows.

Information specialists index documents in databases such as MEDLINE in order to make it possible to produce systematic reviews reflecting which medical treatments have the best effects in relation to a certain disease. Here, documents are primarily indexed serving information retrieval, or rather document retrieval. What is considered proper information is here the same as what is considered proper knowledge. Documents have different epistemic status, and in evidence-based medicine, the highest status is given to documents reporting randomized controlled trials (RCTs). Therefore, there are epistemic norms governing which documents should be retrieved. Such norms are not developed within LIS, but LIS must be aware of them in order to do its job properly. Such norms are never decided once and for all and should not be considered too mechanically. In all domains, there tend to be different views connected to different epistemological norms, and information professionals are therefore involved in epistemic problems whether they like it or not. Floridi's sentence: "This normative stance makes LIS lean towards ESK [Epistemology of Social Knowledge]" therefore seems correct, and his attempt to replace it with his PI is unconvincing.

Floridi's theory was discussed in a special issue of *Library Trends* in 2004. Here, Cornelius (2004, 386) provided his evaluation and concluded:

> In summary, I want to say that Floridi's PI, as it stands, is innocent of the social character of a field like LIS and the way it constructs itself. His view of information needs some easing away from a simple message transfer system, and the unexamined con-

> cerns expressed about the position of the informee in OPPI [Open Problems in the Philosophy of Information, Floridi 2004b] (Proposition 16) need to be accommodated within the understanding of information. Finally, his PI would be more widely applicable in LIS if it could take into account individual information behavior.

In the afterword to the same issue, Floridi (2004a, 658) stated:

> Library information science (LIS) should develop its foundation in terms of a philosophy of information (PI). This seems a rather harmless suggestion. Where else could information science look for its conceptual foundations if not in PI?

Although this statement may seem obvious, it is problematic. It should be remembered that the name of the discipline (LIS) is itself an issue and that theoreticians have problematized it. Furner's contribution in the same issue was "Information Studies without Information" (2004, 443), in which he stated:

> We have now seen, through an analysis of the categories to which the term "information" is variously applied in IS, how those categories are well understood in fields such as philosophy of language, communication studies, and semiotics, and how labels other than "information" have been used to effectively distinguish among those categories in those fields.

Frohmann's (2004b, 387) article in the same issue claimed:

> A philosophy of information is grounded in a philosophy of documentation … [and] the informativeness of a document depends on certain kinds of practices with it, and because information emerges as an effect of such practices, documentary practices are ontologically primary to information. The informativeness of documents therefore refers us to the properties of documentary practices.[64]

Mai (2013, 677-9) also provides a discussion of Floridi's view. He finds that Floridi (2010, 22) constitutes information as "meaningful independent of an informee" and as such establishes a notion of information that does not rely on a knowing subject. Floridi's view is in this respect similar to the view of the information scientist Bertram C. Brookes (1910-1991) and philosopher Fred Dretske (1932–2013), although it is opposed to the views put forward by David C. Blair, Jonathan Furner, Birger Hjørland, Lars Qvortrup and Jens-Erik Mai himself, who wrote (2013, 679):

> These scholars view information as a vehicle used in the production and exchange of meaning. They base their understanding of information and communication in the semiotics school, and as such establish foundations for both the philosophy of information and information studies that focus on the interpretive nature of the production, organization, retrieval, and use of information.

Therefore, Floridi's statement that "library information science (LIS) should develop its foundation in terms of a philosophy of information (PI)" is not a harmless suggestion, but a highly problematic one, and it is somewhat frustrating when philosophers make claims about other fields in this way. Biologists, for example, do not need philosophers to construct a philosophy of life in order to develop biology (although a certain cooperation between philosophers and domain experts is desirable). In information science, many theoretical arguments have been put forward and considered, and we cannot expect philosophy to provide a basis for LIS as far as these arguments have not been addressed by the philosophers. However, a recent, positive and relatively developed evaluation of Floridi's PI is Bawden and Robinson (2018).

3.6 Socially, culturally and content-informed views

In the 1970s and 1980s, two paradigms dominated in the theoretical discourses on LIS: the physical approach and the cognitive view. Around 1990, other voices began to be influential (and in the 2000s, as we saw, Floridi's PI, among other views). In other words, information science became more pluralistic. The new approaches were often related to social, cultural, and philosophical perspectives. Examples from the international scene were Frohmann (1990) and Blair (1990), along with views that had been formerly expressed, such as those of Wilson (1983) and Winograd and Flores (1987).[65] In Scandinavia, such socially oriented views were also put forward. Ørom (2000, 18) wrote:

> In the nineties a number of alternative theories, perspectives or proposals for metatheories have been introduced, discussed or developed. In a Nordic context Hjørland [1996; 1997], Albrechtsen and Hjørland [1997], Wikgren [1998], Ginman [1995] and Brier [1996; 1997] are among the most prolific. Others could be added. Though there is no common denominator of these researchers they do have, to a certain degree, some similarities in their perspectives. One is that they study, analyse or conceptualise information

> processes and communication of knowledge at a macro level, i.e. in a socio-cultural context. Their theoretical viewpoints do have affinities as well, but not much more than that. They understand the subject area of information science from a sociology of science, hermeneutic, semiotic or discourse analytic point of view.

As stated in section 3, socially oriented perspectives on LIS also existed at an earlier time. We focus here on Egan and Shera's social epistemology, which in hindsight (and with methodological updates) may represent the most important perspective for LIS. Firstly, Shera's social epistemology represents a sociological approach[66] (Shera 1970; 1971). A sociological approach means that the focus is on knowledge/information/document production, mediation and utilization, understood through social and cultural perspectives. This perspective includes the analysis of the roles of all actors, institutions, systems, media and documents. It also means that explanations for empirically observed phenomena are sought in social conditions rather than in universal cognitive processes. Secondly, Shera's social epistemology implies the importance of subject knowledge for LIS, and therefore also a perspective of the theory of knowledge (epistemology). Shera's (1951, 82) relating classification with the prevailing epistemology and the denial of a "fundamental order of nature" is an important theoretical position. Since Shera (1951) and Egan and Shera (1952) introduced the term social epistemology, there has been much interdisciplinary controversy about epistemological issues. Kuhn (1962) introduced the influential concepts of paradigm and the paradigm shift just as social constructivism, post-modernism, etc., became trends along with other currents. One understanding presented by, among others, Hjørland (2017b) is that different paradigms[67] related to different interests always compete in all fields of knowledge. Different information systems and knowledge organization systems are influenced by certain paradigms and tend to support certain tasks and interests at the expense of other interests. Ørom (2003) offers a model by demonstrating how different library classification systems reflect different views on art. This example also illuminates the content-oriented view: that the mediation of information, knowledge, and documents cannot escape issues concerning the content of what is mediated.

The shift in perspective from the cognitive to the social is very clearly expressed by Gärdenfors (1999), and is exemplified in linguistics:

> The role of culture and society in cognition was marginalised in early cognitive science. These were regarded as problem areas to be addressed when an understanding of individual cognition had been achieved. This neglect shows up especially clearly in the treatment of language within cognitive science. For Chomsky and his followers, individuals are Turing machines that process syntactic structures according to some, partly innate, recursive system of grammatical rules. Questions concerning the meaning of the words, let alone problems related to the use of language in communication, were seen as not properly belonging to a cognitive theory of linguistics.
>
> However, when the focus of cognitive theories shifted away from symbolic representations, semantic and pragmatic research reappeared on the agenda. Broadly speaking, one can find two conflicting views on the role of pragmatics in the study of language. On the one hand, in mainstream contemporary linguistics (dominated by the Chomskian school), syntax is viewed as the primary study object of linguistics; semantics is added when grammar is not enough; and pragmatics is what is left over (context, deixis, etc.).
>
> On the other hand, a second tradition turns the study programme upside-down: actions are seen as the most basic entities; pragmatics consists of the rules for linguistic actions; semantics is conventionalised pragmatics; and finally, syntax adds grammatical markers to help disambiguate when the context does not suffice to do so. This tradition connects with several other research areas like anthropology, psychology, and situated cognition.

The shift from a cognitive, individual perspective to a social and cultural perspective is important for LIS, and, as we saw above, for epistemology and linguistics.

4.0 Content and structure of LIS

There are many studies of the content and structure of LIS. Some approaches towards studying this have been:

1. To study the educational programs at schools of library and information science (SLIS).
   1.1 To study LIS-textbooks.
2. To study the disciplinary composition of researchers and teachers at SLIS.
3. To carry out a content analysis of a representative set of publications from LIS.
4. To carry out bibliometric studies of publications in LIS or in other disciplines.
5. To create facet-analytic classifications of LIS.
6. To carry out domain-analytic studies of LIS.

4.1 Educational programs in SLIS

Borup Larsen (2005) contains a study of the curricula at SLIS in Europe and finds the following distribution of core subject areas taught:

Library management and promotion	81%
Knowledge organization	66%
Information seeking and information retrieval	100%
Knowledge management	49%
Information literacy and learning	45%
The information society: barriers to free access to information	45%
Library and society in a historical perspective	38%
Cultural heritage and digitalization of cultural heritage	19%
The library in the multi-cultural information society: international and intercultural communication	13%
Mediation of culture in a specific European context	6%

Table 2. LIS themes ranked as core subject areas in LIS school curricula (from Borup Larsen 2005, 235).

We shall not consider methodological problems in this study; however, we will point out that the labels used for content areas often cover very different content, and that the assumptions behind the content may reflect very different views of what kind of knowledge is needed in the future. The literature about SLIS education is rather extensive and includes Davis (1994), Bonnici et al. (2009) and Varlejs (2010).

4.1.1 Textbooks on LIS

Most studies of LIS focus on the research literature (cf., section 4.3 "Content analysis of LIS publications"). Although this is a very popular research field, there is almost no research on LIS textbooks, one exception being a Russian study reviewed by Foskett (1975). In a way, this is understandable, since studies of the scholarly literature of LIS represent firsthand knowledge whereas studies of textbooks present the field through the interpretation of their authors, and therefore represent second-hand knowledge about the content and structure of LIS. However, textbooks (and related genres such as readings, handbooks and bibliographic guides[68]) provide the kinds of syntheses that may provide additional relevant perspectives.

We do not have much knowledge of which texts are generally used in LIS education. It is likely that specialized texts on, for example, knowledge organization (e.g., Rowley and Farrow 2016; Taylor and Joudrey 2009 or Glushko 2013), information seeking (e.g., Case and Given 2016), or bibliometrics (e.g., De Bellis 2009) are much used, whereas general texts on LIS are less often used, since these are more difficult to integrate into educational programs consisting of various subdisciplines.[69]

In terms of texts on LIS as a whole, Stock and Stock (2013) stands out as the most ambitious work, entitled *Handbook of Information Science* and containing 901 pages. Handbooks are normally anthologies written by experts in the different topics; however, here we have the view of two researchers of the field. The main structure of the book is as follows:

A. Introduction to Information Science
   Information Retrieval
B. Propaedeutics of Information Retrieval
C. Natural Language Processing
D. Boolean Retrieval Systems
E. Classical Retrieval Models
F. Web Information Retrieval
G. Special Problems of Information Retrieval
H. Empirical Investigations on Information Retrieval
   Knowledge Representation
J. Metadata
K. Folksonomies
L. Knowledge Organization Systems
M. Text-Oriented Knowledge Organization Methods
N. Indexing
O. Summarization
P. Empirical Investigations on Knowledge Representation

Davis and Shaw (2011) is a textbook that was written by a team of authors; this started as a Wiki-project and, therefore, has a somewhat mingled perspective. It contains the following chapters:

1 Our World of Information
2 Foundations of Information Science and Technology
3 Information Needs, Seeking, and Use
4 Representation of Information
5 Organization of Information
6 Computers and Networks
7 Structured Information Systems
8 Information System Applications
9 Evaluation of Information Systems
10 Information Management
11 Publication and Information Technologies
12 Information Policy
13 The Information Professions
14 Information Theory

Rubin (2016) is a well-received text, which includes coverage of:

– the history and mission of libraries, from past to present;
– digital devices, social networking and other technologies;
– the impact of digital publishing on the publishing industry and the effects of eBooks on libraries
– the values and ethics of the profession;
– how library services have evolved in the areas of virtual reference, embedded librarianship, digital access and repositories, digital preservation and civic engagement;
– new and ongoing efforts to organize knowledge, such as FRBR, RDA (Resource Description And Access), BIBFRAME, the Semantic Web, and the Next Generation Catalog (Catalog 2.0);
– the significance of the digital divide and policy issues related to broadband access and network neutrality;
– the concept of intellectual freedom, and how it plays out in the real world;
– legal developments such as new interpretations of copyright related to the mass digitization of books (Google Books) and scholarly articles;
– the continuing tensions in LIS education between information science and library science; and
– initiatives to integrate libraries, archives, and museums (LAMs).

However, one might say that this is not quite what the title promises in terms of *Foundations of Library and Information Science*. Again (cf., section 2.0), it conflates the content area of LIS and the science of LIS. For example, it contains a chapter about the history of libraries; however, this is not an introduction to the historiography of libraries, nor is it about the science or study of libraries, nor theory or research, but is simply some information about the history of libraries (Connaway and Radford 2017, in contrast, is about the methodology of LIS).

Bawden and Robinson (2012) contains the following chapters:

1. What is information science? Disciplines and professions
2. History of information: the story of documents
3. Philosophies and paradigms of information science
4. Basic concepts of information science
5. Domain analysis
6. Information organization
7. Information technologies: creation, dissemination and retrieval
8. Informetrics
9. Information behaviour
10. Communicating information: changing contexts
11. Information society
12. Information management and policy
13. Digital literacy
14. Information science research: what and how?
15. The future of the information sciences

Among the fine qualities of this book are its coverage of the philosophies and paradigms in LIS and the fact that it is written by well-known authors in the field. Perhaps, however, the book is more eclectic than it is based on a certain theoretical outlook. Many persons (including one of the reviewers of the present article) do not agree on the necessity of the emphasis on different paradigms.[70] However, it is a basic premise of this article that there is no such thing as LIS per se, and that one cannot write about it from "the view of nowhere" (Nagel 1986). The most important problem in LIS is related to theoretical and conceptual clarifications, and it is difficult to find textbooks based on a well-considered standpoint

Examples of two very different theoretical perspectives are Luenberger (2006), which applies a technology-oriented perspective (it was the winner of the 2006 Award for Best Professional/Scholarly Book in Computer and Information Science), and Buckland (2017, 181), which argues for also "insisting that the study of information be rooted in the process of informing, of becoming informed, of human knowing."

4.2 Faculty composition of SLIS departments

Another way of studying LIS is to focus on the teaching and research staff, their educational backgrounds and their research. One way to select SLIS in America is to focus on LIS schools accredited by the American Library Association (ALA). Studies of the research output of these schools show a much broader picture than the studies presented in sections 4.3 and 4.4, which focus on LIS journals. Meho and Spurgin (2005), for example, found that no database provides comprehensive coverage of the literature produced by researchers employed in SLIS; researchers must therefore rely on a wide range of disciplinary and multidisciplinary databases for ranking and other research purposes. The explanation is probably that many professors at SLIS institutions do not (or do not primarily) publish in LIS journals but in journals devoted to other fields.

Wiggins and Sawyer (2012) found that there are great variations in the intellectual composition of different iSchools; this seems to be related to local logics that, over time, have guided hiring to meet the needs of individual schools. From this, the authors infer that these local arrangements are more important to hiring decisions than is any sense of shared community identity. In other words, iSchools (and with them SLIS) seem less to be an international (or just regional) community in which researchers

compete for positions and are more influenced by local priorities (see also Golub et al. 2017).

4.3. Content analysis of LIS publications

Järvelin and Vakkari (1990; 1993) and Tuomaala et al. (2014) are a series of content-analytic investigations of LIS. In the first of these studies, a relatively detailed topic classification system was developed (reprinted in Tuomaala et al. 2014, 1461). The authors admit (1449) that this classification system is somewhat outdated, although it was also used in the latest study to be able to compare former periods. Its overall structure is:

010: The professions in library and information-service (LI) services
020: Library history
030: Publishing (including book history)
100: Education in LIS
200: Methodology
300: Analysis of LIS
400: Library and information-service (L&I) activities
500: Information storage and retrieval (ISR)
600: Information seeking
700: Scientific and professional communication
800: Other aspects of LIS

Tuomaala et al. (2014) found that the largest areas of LIS research in that year were, in decreasing order of prevalence:

– information storage and retrieval (ISR)
– scientific communication
– library and information-service activities
– information seeking

By considering changes over time, this series of studies were also able to illuminate trends; for example, between 1965 and 2005, a decreasing interest in library and information-service activities and the growth of research into information seeking and scientific communication was shown.

Among the methodological problems in this series of studies is that they cannot specify, for example, which studies of ISR should be considered computer science studies and which should be considered LIS studies. This is due to several factors: the migration of information retrieval from information science to computer science; the interdisciplinary nature of LIS journals (cf. Chua and Yang 2008); and finally the classical epistemological problem: to select something, you must already know what that something is. Since LIS is ill-defined, any empirical analysis of LIS depends of the researchers' preunderstanding of LIS.

4.4 Bibliometric studies of LIS

There have been many bibliometric studies of the intellectual structure of LIS.[71] Liu et al. (2015, 758) wrote about these studies:

> Over the past 20 years, many researchers (Milojević et al. 2011; Åström 2007; Moya-Anégon et al. 2006; Janssens et al. 2006; White and McCain 1998; Zhao and Strotmann 2008)[72] have examined the intellectual structure of LIS. However, the results attained by the researchers are different from each other, and the number of the main themes range from 3 to 16. It is probably due to several factors, e.g., the data collected for analysis covered different core LIS journals, different time period, or the methods frequently used have relatively strong subjective judgments.

We may therefore concur with Parrochia (2018), who wrote about empirical classifications: "However, all these classifications remain, for technical and epistemological reasons … very unstable ones."

4.4.1: Import and export studies

Import-export studies are investigations based on citation analysis to describe the exchange of ideas between disciplines or scholarly communities. This economic metaphor was introduced in the seminal work by Cronin and Pearson (1990). An import study for a field (e.g., LIS) demonstrates from which disciplines references in LIS-publications have been imported. Export studies, on the other hand demonstrates which disciplines a given discipline is cited by, representing a kind of reception studies. It is a common premise in science studies that interdisciplinarity is a positive thing and that isolated disciplines (disciplines not cited in other disciplines) is an indicator of a crisis[73] (although some disciplines such as mathematics are exceptions from this rule).

4.4.1.1 Import studies

Import studies of LIS may reveal from which fields of knowledge LIS has mostly drawn, and to which it is, therefore, most closely related. There have been several empirical examinations of the relationship between LIS and other fields, and selected studies only are mentioned here. Small (1981, 49) examined the relationship of information science to the social sciences. He found that information science, as represented by his data from the Social Sciences Citation Index 1975–77, "appears poised somewhere between psychology and sociology, with a very strong link to

sociology via the sociology of science, and a more tenuous link to psychology through a cluster called 'creativity and achievement'. At the same time, information science, at least in the context of the social and behavioral sciences, appears somewhat isolated. It certainly is not the central discipline, with strong linkages to many diverse fields, that many would like it to be."

Warner (1991) examined the impact of linguistic theory on information science and showed that the examined portion of the information science literature cited linguistic theory very seldom. Further data analysis showed that a small number of citing and cited authors accounted for most of the activity, and that syntax and semantics gained more attention from information scientists than other branches of linguistic theory.

Borgman and Rice (1992) examined the relationship between information science and communication studies; Ellis et al. (1999) studied the relationship between information science and information systems research. However, all such empirical studies can only identify which in the past have been the most related cognate fields (based on which paradigms have been dominant).

Huang and Chang (2011) investigated the interdisciplinary changes in information sciences over the period 1978 to 2007 and found that information science researchers have most frequently cited publications in LIS. The co-authors of information science articles are also primarily from the discipline of LIS, although the percentage of LIS references is much higher. This indicates that information science researchers mainly rely on publications in LIS, and that they often produce scientific papers with researchers from LIS. The degree of interdisciplinarity in information science has shown growth, particularly in terms of co-authoring.

In LIS, many theoretical points of view are imported from other fields. Almost all well-known theorists from, for example, the social sciences have been used in LIS. Leckie et al. (2010), for example, present twenty-six critical theorists for LIS; this is only a small sample of the total number of theorists cited in LIS. However, such theorists are seldom used to establish a broad theoretical frame for issues in LIS, such as bibliometrics, classification, information retrieval, information seeking, etc.

4.4.1.2 Export studies

There are many export studies in LIS, and a few are briefly introduced here. Cronin and Pearson (1990) discussed the journals citing the work of six leading LIS researchers: Bertram Brookes, Cyril Cleverdon, Robert Fairthorne, Jason Farradane, Maurice Line, and Brian Vickery. They found that the discipline, as represented by the work of these six grandees, exported little to other disciplines. Tang (2004) studied citations of 150 LIS publications drawn randomly from six years in the period 1975 and 2000 and showed that LIS involves a wide spectrum of interests from across the sciences, social sciences, arts, and humanities. Cronin and Meho (2008) is a large-scale study that found that LIS exported significantly to computer science, engineering, and management during the years 1977-2006 (and also imported much from the same disciplines). Odell and Gabbard (2008) is a follow-up of the study by Meyer and Spencer (1996); these authors also found large increases in LIS exports to computer science, business, and management. Hessey and Willett (2013) is a methodologically important study that questions some of the former results concerning LIS exports. Using the subject categories in the Web of Science™ is popular in such studies; however, some journals are classified in more than one subject field, and this may provide a highly over-optimistic view of the extent to which LIS knowledge is being exported to the wider academic community. Among the findings in this study was that LIS research published in non-LIS journals has a much larger interdisciplinary influence compared to LIS research published in LIS journals. Another interesting finding was that just eleven distinct articles from the Sheffield Chemoinformatics Group absolutely dominated the export from LIS. The authors wrote: "In view of this degree of specificity, it could be argued that the best export performance for the discipline as a whole is exemplified by journals that draw more widely on LIS research." One strength of the study was that it considered the relative value of different kinds of exports.

Import-export studies concerning LIS are relevant to the relationship between LIS and other disciplines, as discussed in section 5 below.

4.5. Facet-analytical classifications of LIS

The classification of subject fields is one of the classical activities of LIS professionals and researchers. Among the influential approaches to classification is facet analysis (see Hjørland 2013a). One of the major researchers in facet analytical classification was Jack Mills, who contributed to a classification of LIS (Daniel and Mills 1975). A newer knowledge organization system for LIS is the *ASIS&T Thesaurus of Information Science, Technology, and Librarianship* (Redmond-Neal and Hlava 2005).

It seems worthwhile to evaluate the facet analytic classification method in relation to the classification of LIS compared with other approaches, although this has never been done, and is outside the scope of this article. It should be said, however, that the logical structuring of the concepts of a field is a valuable, if not indispensable, activity. However, such a logical structuring cannot replace a concern with the theoretical issues in the field classified and cannot provide a neutral classification.

4.6. Domain-analytical studies of LIS

Domain analysis is different from content analysis, bibliometric studies, and facet analytical classification in its emphasis of the necessity of the historical and philosophical analysis of knowledge domains. This article is an attempt to provide background knowledge about LIS in order to illuminate the importance of different conceptualizations of the field.

4.7 Conclusions of section 4

The main conclusion is that there is today no consensus on what constitute the most important subfields of LIS. Empirical studies reveal a confusing picture, and passing fads (such as the H-index) may distort the picture; on the other hand, the picture may be influenced by researchers who routinely do the same kinds of studies, although these may be of limited value. Milojevic et al. (2011, 1933) found:

> Conceptually, our analysis reveals that LIS consists of three main branches: the traditionally recognized library-related and information-related branches, plus an equally distinct bibliometrics/scientometrics branch. The three branches focus on: libraries, information, and science, respectively. In addition, our study identifies substructures within each branch. We also tentatively identify 'information seeking behavior' as a branch that is establishing itself separate from the three main branches.

However, the subfields identified in this study seem not to be theoretically coherent fields. In order to discuss the nature of LIS and its subfields, it is necessary to ask, as did Buckland (2012): "What Kind of Science Can Information Science Be?"

If the role of LIS is to facilitate users' access to information, documents and knowledge, and if criteria for what counts as information and knowledge and thereby as valuable documents are established outside of LIS itself, then it follows that LIS must engage in such epistemological studies. Secondly, knowledge is not solely organized by knowledge organization systems (KOS) developed within LIS, but is primarily organized using social and intellectual structures (such as disciplines, social networks, theories, and conceptual structures) developed outside LIS. It follows that LIS must study those external KOSs in order to be able to construe its internal KOS and help users navigate the information ecology.

The main subfields of LIS may therefore be the study of concepts, conceptual systems, genres and genre systems, where genres are understood as "typified rhetorical actions based in recurrent situations" (Miller 1984, 157). LIS institutions, systems, and processes can be understood as second-order genres depending on a critical analysis and mediation of first-order genres. For example, in evidence-based medicine, the systematic review is a genre based on certain epistemological assumptions. LIS is about providing databases and search techniques for mediating medical knowledge, including support for the researchers writing systematic reviews. The criteria for what counts as evidence are not developed within LIS but must be known by LIS professionals working in this domain.

5.0 Relationships between LIS and other disciplines

Bradford (1948, 110; 1953, 148) wrote under the heading "The Scattering of Articles on a Given Subject:"

> It is, therefore, necessary to examine the extent to which articles on a given subject actually occur in periodicals devoted to quite other subjects: as, for instance, a paper on the mechanism of the heart, contributed to the Proceedings of Physical Society, or one on genetics, occurring in an agricultural magazine. Investigation shows that this distribution follows a certain law, which can be deduced both theoretically from the principle of the unity of science and practically from examination of the references. According to this principle every scientific subject is related, more or less remotely, to every other scientific subject.

If Bradford was right, it follows that any subject, including LIS, is more or less remotely connected to every other subject. But what determines which subjects are closely related and which subjects are only peripherally related?

A rationalist philosophy may see the world as having a given structure and science as a representation of this given structure; it may expect a fixed relationship between disciplines. However, it seems obvious that the relationship, for example, between LIS and other disciplines is relative to the underlying conception of LIS. If LIS is considered from a logical perspective (as in facet analysis), LIS must be closely related to logic. If LIS is considered from a cognitive perspective, LIS should be closely related to the cognitive sciences,[74] and so on; each theoretical position in LIS (as in other fields) has implications for the relationship between LIS and other fields, that is, for which subjects are closely related and which subjects are only peripherally related. In other words, it cannot be decided which fields are closely related to LIS until we have made up our minds on which theoretical position in LIS we consider the most fruitful.

As shown in section 4.4.1, import-export studies are investigations based on citation analysis that describe the ex-

change of ideas between disciplines or scholarly communities and thus contribute to describing the relationships between LIS and other disciplines. However, such empirical studies simply reveal the relationship between disciplines based on what in the past have been the most influential paradigms.

According to the domain-analytic view (e.g., Hjørland 2017b), LIS concerns the optimization of information infrastructures and knowledge utilizations in different domains, between domains and from these domains to the public. By implication, LIS must be understood as a metascience (cf., Hjørland 2016).[75] Therefore, LIS is first and foremost related to the specific fields of scholarship, for example, chemistry, biology, art studies, or literature studies. To create a classification or a thesaurus of, say, birds, primarily requires an up-to-date knowledge of ornithology. Mediation of medical knowledge requires knowledge about the medical criteria of evidence and the way evidence is provided in systematic reviews and presented in medical databases. In Scandinavian SLIS, cultural studies is an important part of the curriculum. In a way, culture (including literature, history, music, the arts, etc.) can be seen as a domain considered from specific LIS perspectives (as in Ørom 2003), although this perspective is not always shared or made explicit (and cultural theory is also relevant in other ways).

Among the metascientific perspectives, the philosophical and the sociological are most important (cf., section 3.6). Therefore, next to the specific disciplines, the philosophy and sociology of knowledge/science are the most important cognate disciplines.

6.0 Relationships between LIS, libraries, and mediating practices

LIS has generally been greatly influenced by the institutional purposes of SLIS, which traditionally have been dominated by the education of librarians, mostly for public libraries. In marked contrast to computer science, which developed from mathematical, scientific, and technological research and shaped its own market, LIS, to a much larger degree, has taken shape from the need to educate people for already existing institutions, systems, and processes. Central questions are therefore:

1) What are the perspectives on the future of physical libraries?
2) Should we count on the future of physical libraries, or should we concentrate our efforts on developing information systems and services that are independent of physical libraries (i.e., should we count on a future for LIS professionals, which is independent of physical institutions)?

Concerning (1), there are many statistics and studies regarding trends in the use of libraries; the details are not communicated here. A valuable but generally neglected study is Huymans and Hillebrink (2008). Central tendencies in the use of libraries seem to be:

- Libraries operate in a society that has changed from a limited supply of and access to information to an abundant supply and wide access;
- There are tendencies towards a decline in support for public libraries and research libraries;
- Loans of physical books in public libraries are decreasing. Loans of e-books are increasing, but their future is dependent on negotiations with the publishers, who want to have their own commercial market for e-books;
- Loans of music and film in public libraries are dramatically reduced, and other services such as Spotify, HBO, Netflix and other streaming services have increased;
- Library reference services seem challenged (Shachaf 2009);
- The use of library catalogs as finding aids seems to have increased, although this is not the user's first choice (Gardner and Inger 2016);
- Public libraries are increasingly used as physical places and are increasingly being integrated with other kinds of cultural institutions; they are thereby undergoing a relative loss of identity as libraries;
- The electronic downloading of electronic resources from research libraries is markedly increasing.
- There is an increasing market for information specialists within bibliometrics and research evaluation.

Traditionally, the physical delivery of documents has been overwhelmingly the most important function for libraries. An important question is whether the library can develop new services that are more concerned with the intellectual communication of documents, information, knowledge, and culture. As pointed out by Huymans and Hillebrink (2008, 163), it should also be considered that the use of cultural activities, such as exhibitions, probably

> depends greatly on developments in other areas which, to use a modern term, "generate traffic." Many visits to cultural activities probably result from the fact that someone goes to the library for a fiction or non-fiction book and takes in the cultural activity present "en passant."

Regarding (2), in section 2.1 we saw this definition: "Library science: The professional knowledge and skill with which recorded information is selected, acquired, organized, stored, maintained, retrieved, and disseminated to meet the needs of a specific clientele," This definition

mentions skills and qualifications that may not depend on physical libraries. At the same time, it is characteristic of the definition that the listed functions almost all depend on domain knowledge, and that high-quality information services therefore demand specialized subject knowledge, e.g., in the cultural domain. LIS-educated persons are meeting with increasing competition from people educated in other domains. It is probably not a good idea for LIS to neglect its own core and instead to focus too much on knowledge from other disciplines, thereby becoming "a rather shapeless assemblage of chunks picked from a variety of disciplines." It seems strategically important to develop respected courses in information literacy, which is strongly related to and dependent on document retrieval and knowledge organization.

It is important to understand that the development of practice should be led by research, and not vice versa. LIS professionals depend on their knowledge base, and that knowledge base is closely related to LIS research.

7.0 Conclusion

One way of understanding of LIS was formulated by Andersen (2011):[76]

> Library and information science (LIS) is the study of knowledge production as it is materialized in documents, and of through which channels this knowledge is communicated and how one can make access to this knowledge in terms of organization and representation of documents. In this way, the study of knowledge organization plays a crucial role in LIS. The study of knowledge organization has a long tradition in LIS. However, this tradition has been characterized by searching for techniques for knowledge organization rather than having arrived at a profound understanding of the nature and function of knowledge organization in society. Therefore, it is important to connect the study of knowledge organization and its problems with analyses of society's production of knowledge. In order to arrive at an understanding [of] the production of knowledge in society, philosophical, historical, sociology of science and knowledge, cultural, literary, and social aspects of knowledge production need to be recognized. Knowledge should not be conceived of as scientific knowledge only, but also as artistic, technical, and 'everyday life' knowledge; that is a basic pragmatic view on knowledge. A practical consequence of this conception must be to contribute to an understanding of why it is important to "keep the valuable from oblivion" (Wilson 1968, 1).

Perhaps this quotation underestimated LIS's traditional concerns for techniques for information searching and knowledge organization. What seems important is that such techniques are evaluated by criteria that presuppose the kind of knowledge derived from studies of "society's production of knowledge in society, philosophical, historical, sociology of science and knowledge, cultural, literary, and social aspects of knowledge production."

Notes

53. In spite of the mentioning of bibliometrics in the quote, bibliometrics was not further presented by Belkin (1990).
54. The opposite claim seems true: the cognitive view did not lead to significant advances in a variety of areas of information science, and the present article argues that other views, in particular social epistemology, are in hindsight the most fruitful theoretical framework for LIS.
55. The cognitive approach is often said to be about the individual knower. In 1977, de Mey proposed a cognitive view for information science based on the view "that any processing of information, whether perceptual or symbolic, is mediated by a system of categories or concepts which, for the information processing device, are a model of his world" (xvi–xvii). This has often been quoted in information science but in a confusing way. Semiotic theories, among other theories, are about how cognition is mediated by signs and how different interpreters associate different objects with different sciences. However, this is not the way the cognitive view works. If cognitive science is about the individual, one might expect biographical studies of individuals; however, such studies are again very different from the cognitive view.
56. Cultural psychologist Carl Ratner (2002, 3) wrote about the psychological fallacy: "In 1910 Dewey wrote a statement that expresses a central tenet of cultural psychology. He said that the processes that animate and form consciousness lie outside it in social life. Therefore, the objective for psychologists is to use mental phenomena (e.g., perception, emotions) as clues for comprehending the life processes that they represent … 'The supposition that these states [of consciousness] are somehow existent by themselves and in this existence provide the psychologist with ready-made material is just the supreme case of the 'psychological fallacy.'"
57. Although Peter Ingwersen is one of the leading representatives of the cognitive view of information science, much of his own research seems not to be cognitive. Serrano-López et al. (2017), for example, is a

fine study of Wikipedia, but is not related to cognitive theory or the holistic cognitive view. As Andersen (2004, 139-44) wrote about cognitive theory: "It is, however, difficult to see what a cognitive approach to indexing offers and, if it offers something, what is cognitive about it." In the same way, Serrano-López et al. (2017), does offer valuable knowledge, but it is difficult to see what is cognitive about it.

58 .Hjørland (2013b, 16-18) suggests that Annelise Mark Pejtersen's Book House probably is the best example of a system developed from the cognitive point of view.

59. Cognitivism was the theme of the 1989 Sociology of the Sciences Yearbook conference, in which was argued (Fuller et al. 1989, xiii-xiv):

> Steve Woolgar and Thomas Nickles offer contrasting views of the prospects for integrating cognitive psychology and the sociology of science … not only is there a problem of linking the cognitive processes of scientists to the knowledge products of science, but even of determining the sense in which scientists 'have' certain cognitive processes. Woolgar observes that sociologists have been traditionally suspicious of the cognitivist approaches to science pursued by philosophers and psychologists, not so much because these approaches impute too much rationality to scientists, but more fundamentally because they portray scientific rationality as an inherent property of individual scientists (specifically, an emergent feature of their brains), rather than as a property socially attributed to individuals whenever they act in the relevant way in a relevant setting. Woolgar then argues that cognitivist and sociological approaches are irreconcilable precisely because the cognitivist requires that we take for granted an assumption about inherent personal properties that the sociologist aims to deconstruct.

60. In literary studies, there is a now comprehensive literature, including Zunshine's (2015*) The Oxford Handbook of Cognitive Literary Studies*. In film studies, Nannicelli and Taberham's (2014) Cognitive Media Theory is an example.

61. Floridi (2002, 39) defines (emphasis original) "the *Epistemology* of Social Knowledge (ESK), that is the critical and conceptual study of the social (multiagents) dimensions of knowledge." Floridi does not, by the way, argue as to why only social knowledge is considered. As Wilson (1983, 202) wrote: "Epistemological questions are social questions, and social epistemology is the only epistemology. This view can be expected to be found unattractive by professional philosophers but very attractive by those of us interested in the social study of knowledge."

62. Floridi's idea that information science is more fundamental than (social) epistemology, because information is more fundamental than knowledge, is an expression of the much criticized DIK hierarchy (see Fricke 2009).

63. Angere (2012) in his review of Floridi (2011) wrote: "Unfortunately, this kind of too-brief treatment of complex or deep problems appears again and again in the book." This feeling is shared by the present author, and not just in relation to that particular book, but also for other texts by Floridi, including the 2002 article.

64. It is remarkable that Floridi (2004a) did not in the afterword to the issue consider the arguments raised in the issue, including the arguments provided by Cornelius (2004) and Frohmann (2004b). A corresponding neglect can be observed in his book *The Philosophy of Information* (Floridi 2011), which, for example, omits the authors discussed by Mai (2013): David C. Blair, Jonathan Furner, Birger Hjørland, Lars Qvortrup, and Jens-Erik Mai himself.

65. Winograd and Flores (1986, 30) wrote: "What we understand is based on what we know, and what we already know comes from being able to understand."

66. Wersig (1973) represents an early contribution to the sociological perspective of information science but was not influential, and even the author himself seems to have later related more to the cognitive view. Cronin (2008) is a recent recognition of the sociological perspective.

67. The concept of the paradigm is used differently from Kuhn (1962). By Kuhn, for example, there were no simultaneously competing paradigms.

68. Bemis (2014) is an example of a bibliographic guide to LIS.

69. The subfield "information retrieval" is more difficult to describe. Although this is undoubtedly a very important field within LIS, much research has migrated to computer science, and the most often used texts, such as Baeza-Yates and Ribeiro-Neto (2011) and Manning et al. (2008) are probably much less used in LIS compared to computer science. LIS has its special foci, including online searching and human oriented views in information retrieval, but today it is difficult to identify the central textbooks covering these aspects.

70. The referee wrote: "In my opinion, the text is a bit uneven in content, as it puts much emphasis on different paradigms and less emphasis on LIS itself."

71. The Web of Science™ category (WC) termed "Information Science & Library Science" may be taken as a

point of departure. This is however, a very heterogenous class, which is not limited to LIS as a discipline (or inter-discipline) (see also Leydesdorff and Bornmann 2016). Firstly, a single publication, *Library Journal*, dominates quantitatively. In a search carried out on June 10, 2017, 12,979 papers were assigned as WC=Information Science & Library Science; of these, 4,928 were from *Library Journal* (=38 %). Overall, this not a journal reporting research in LIS, but more like a general culturally oriented journal published by the American Library Association. Also, WC=Information Science & Library Science contains source titles from many other communities. It is of course difficult to say where one discipline or community starts and ends, but as Ellis et al. (1999) found, are, for example, information science and information systems "conjunct subjects but disjunct disciplines." The same is the case with many other source titles (although again, it is not easy to define a discipline, although a combination of educational institutions, scholarly conferences and journals will often reveal some separate disciplines).

72. Other bibliometric studies of LIS include Åström (2002); Chang et al. (2015); Figuerola et al. (2017); Lariviere et al. (2012); Sugimoto et al. (2010); Taylor and Willett 2017; Yang et al. (2016); Yang and Wang (2015); and Zhao and Srotmann (2008a; 2014).
73. Intra-disciplinary citations are also important as they indicate disciplinary independence and coherence. In this connection, uncitedness is an interesting indicator. Schwartz (1997), for example, found that 72% of articles in LIS journals did not receive a single citation within five years of publication. Although articles may serve other purposes, for example educational purposes, such a figure seems problematic.
74. However, we have seen above that the cognitive view in LIS seems not to be well informed by developments in cognitive science.
75. Ingetraut Dahlberg and Marcia Bates have also expressed the view that KO/LIS is part of the metasciences. Dahlberg (cited from Dodebei 2014) said: "I consider Knowledge Organization as a subdiscipline of Science of Science with application fields not only in the Information Sciences but also for all subject fields (domains) needing Taxonomies (classification systems of objects) and other fields like Statistics, Commodities, Utilities, Weapons, Patents, Museology etc. According to Science Theory, every domain has its own area of objects and of methods and processes, next to other relationships."

    The idea of Information science as metascience was also put forward by Bates (1999, 1044). "It is first of all important to recognize that information science, like education and journalism, among others, is a field that cuts across, or is orthogonal to, the conventional academic disciplines. All three of the above-named fields deal with distinct parts of the transmission of human knowledge—information science with the storage and retrieval of it in recorded form, education with the teaching and learning of it, and journalism with the discovery and transmission of news. Under these circumstances, such fields cut across all of what we might call 'content' disciplines. Art historians focus on the study of art; information scientists, on the other hand, take art information as but one slice of the full range of information content with which we deal. Likewise, art education is but one part of education, etc."
76. Andersen's definition of LIS resembles Egan and Shera's (1952, 133-134) definition of social epistemology: "Thus the focus of attention for the new area of study here described as social epistemology is the analysis of the production, distribution, and utilization of intellectual products in much the same fashion as that in which the production, distribution, and utilization of material products have long been investigated. Graphic communication provides objective evidence of the process."

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