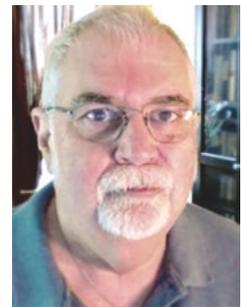


# ISKO 15's Bookshelf: Dispersion in a Digital Age— An Editorial

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**Abstract:** The Fifteenth International ISKO Conference (ISKO 15) took place in Porto, Portugal in early July 2018 at the Faculty of Arts and Humanities of the University of Porto, Department of Communication and Information Sciences. The main theme was "challenges and opportunities for knowledge organization in the digital age;" three sub-themes were: foundations and methods, interoperability and societal challenges. A feature of the conference was a special session devoted to the memory of ISKO founder Ingetraut Dahlberg. The proceedings contain 105 formal research papers as well as abstracts for fourteen posters and two workshops. Informetric analyses produce a characteristic picture for an international ISKO conference, with core concepts of KO and KOSs embracing digital age concepts of social media and the semantic web alongside new library conceptual data models. On ISKO 15's bookshelf were articles by Hjørland, Dahlberg, Tennis and Beghtol, and books by Ranganathan and Szostak, Gnoli and López-Huertas. But also books by Adler, García Gutiérrez, Holland and Verborgh and *FRBR/LRM* were present as were articles by Adler, Kleinberg and Gruber. Core ISKO is joined on this bookshelf by new articles from the ISKO Encyclopedia, by works pointing toward ethical approaches to KO, and by works pointing toward KO for a semantic web—challenges and opportunities for KO, as the conference theme indicated.

Keywords: ISKO international conference, knowledge organization, citations, references

## 1.0 The Fifteenth International ISKO Conference, Porto, Portugal

Sandwiched between summer holidays, the Fifteenth International ISKO Conference (ISKO 15) took place in Porto, Portugal in early July 2018. Scholars gathered in the subtropical paradise of the Faculty of Arts and Humanities of the University of Porto, guests of the Department of Communication and Information Sciences. Lunches and breaks took place on a terrace with breathtaking views of the Douro River (Figure 1).

The conference was organized around the main theme (which is also the title proper of the proceedings) "challenges and opportunities for knowledge organization in the digital age." Three sub-themes were used to organize the sessions: foundations and methods, interoperability and societal challenges. Research papers were presented at twenty-two panel sessions. The keynote presentation by David Bawden of City, University of London was ti-

tled "Supporting Truth and Promoting Understanding: Knowledge Organization and the Curation of the Infosphere." For the first time an "ISKO Publications Forum" featured presentations by the editors of *Knowledge Organization* and the ISKO Encyclopedia of Knowledge Organization about how to write for, publish in and referee for those two hallowed ISKO endeavors. A feature of the conference was a special session devoted to honoring the memory of ISKO (and knowledge organization (KO) as a science) founder Ingetraut Dahlberg, who passed away in October 2017 (cf., *Knowledge Organization* 2017). In fact, the entire conference was permeated by memories of Dahlberg, who had carefully nurtured her complex creation of a scholarly domain by mentoring many participants, and whose prolific writings are clearly at the core of the domain.

In 2008, inspired both by the Tenth International ISKO Conference in Montréal and by White's idea of authors as citers over time (White 2003), I began what has



Figure 1. Porto and the Douro River from the terrace of the Faculty of Arts and Humanities.

become a series of informetric analyses of ISKO conference proceedings under the moniker “ISKO’s bookshelf” (Smiraglia 2008, 2011, 2013, 2014, 2016). My idea was to use these analyses to record the shifting intension and extension of the domain of knowledge organization (KO), to track the international growth of the domain, and also to make a stab at discovering the influential discourses that were motivating ISKO scholars. The metaphor of the bookshelf calls to mind the traditional resources of the toiling scholar, but also serves to point toward the influences that shape the multiple discourses that shape the shifting extension and intension of KO. Research questions remain:

- How international is participation in ISKO’s international conferences and where are global centers of innovation located?;
- What epistemic stances of ISKO scholars are visible in the citation indicators at each international conference?;
- What is the shape of the research front as represented by each international conference?; and,
- How are the shifting extension and intension of the KO domain reflected in each international conference?

The proceedings (Ribeiro and Cerveira 2018) were published in digital form for all participants, and are available to all ISKO members through Ergon Verlag’s ISKO por-

tal ([https://www.ergon-verlag.de/isko\\_ko/](https://www.ergon-verlag.de/isko_ko/)). They also were published in a very dense paperback volume (993 pages) that is available for purchase from the publisher. The proceedings contain 105 formal research papers including the keynote, as well as abstracts for fourteen posters and two workshops. The number of collaborative papers was remarkable; 68.6% or more than two-thirds of the papers were proffered by collaborative teams. The collaborative teams ranged in size from two to six authors; the majority (54.2%) were by two authors but 37.3% were by three or four authors. Thematically, most papers (47.1%) were in the foundations stream, 22.3% in the interoperability stream and 16.5% in the societal challenges stream.

The present analysis was conducted manually after recording the table of contents, abstracts and all references in an Excel spreadsheet (this basic data source is available on my blog (<http://lazykoblog.wordpress.com/>)). Basic analysis was conducted using Excel and IBM-SPSS Statistics®. As before, but to a greater extent, there was no consistent referencing style among the papers, although several traditional formats were recognizable. As I have reported before (see for example Smiraglia 2016, 3), such inconsistency makes automatic indexing of the references quite difficult, which might be one reason these proceedings continue not to be indexed in the Clarivate Web of Science. It also is possible that manual errors in conversion of undelimited data might have led to errors in compilation of this analysis, which is one limitation of

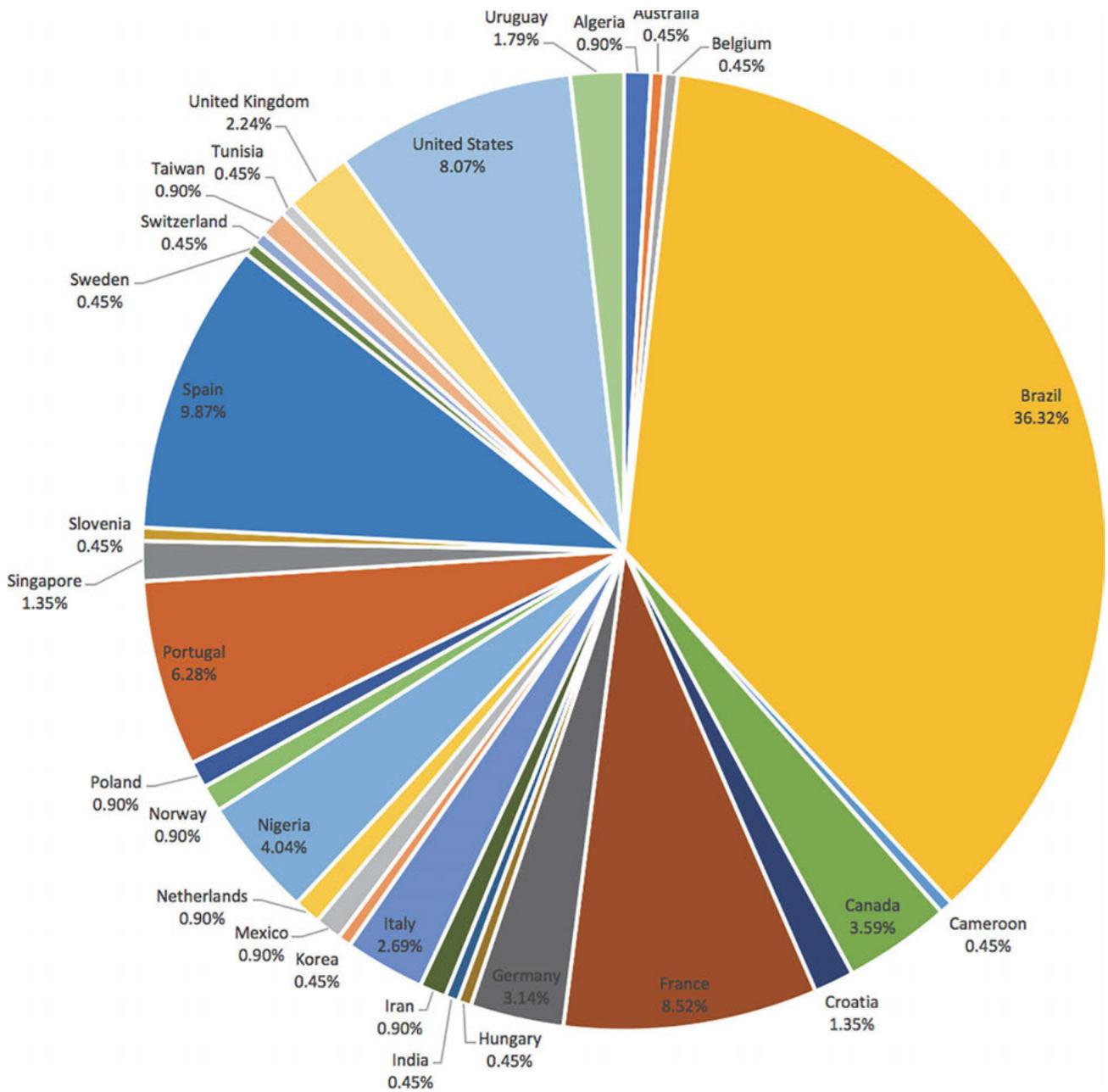


Figure 2. Countries of affiliation of conference authors.

the research reported here. Throughout this editorial I have used the term “identifiable” to indicate uncertainty in analysis of citation data.

**2.0 KO is Global, International and Growing**

The term “international” as applied to ISKO biennial conferences is clearly entirely appropriate, as an analysis of author institutional affiliations attests. Understanding that affiliation is not the same as nationality, but with the comprehension that institutional affiliations reflect both influence and discourse in KO, the countries associated

with all author affiliations were recorded from the proceedings. The list of all countries of affiliation shows the global breadth of the KO domain at this time (Figure 2).

A continuing trend is the preponderance of authors affiliated with Brazilian institutions, over 36%. Spain (9.8%), United States (8.07%), France (8.5%) and Portugal (6.28%) constitute the next proximate third of the contributions. Thirty countries are represented altogether, meaning the remaining twenty-five countries constitute the final portion, slightly less than a third. New to the distribution in 2018 are Algeria, Cameroon, Croatia and Tunisia. Note that Nigeria contributed more at 4% than tra-

ditional mainstay contributing regions such as Italy, Germany, Canada or the United Kingdom. The breadth of the global input to this conference can be contrasted with the fifteen national affiliations of authors in 2016, twenty in 2014, and seventeen in 2012, thirteen in 2010. Country of affiliation was cross-tabulated with the three conference themes and this is shown in Table 1.

On the left we see the five countries whose authors contributed the largest number of presentations to ISKO 15 and the distribution of themes by country. From this we can see that presentations in the foundation track were the largest groups for Brazil and the United States, and that there were no presentations on interoperability from the Portuguese affiliated authors. On the right we

Country	Theme	Freq.	Theme	Country	Freq.
<b>Brazil</b>	Foundations	24	<b>Societal challenges</b>	Brazil	8
	Interoperability	8		France	3
	Societal challenges	8		Portugal	2
	no theme	5		Algeria	1
				Canada	1
				Italy	1
<b>France</b>	Foundations	3		Nigeria	1
	Interoperability	1		Spain	1
	Societal challenges	3		Sweden	1
	no theme	2		United States	1
<b>Portugal</b>	Foundations	4	<b>Interoperability</b>	Brazil	8
	Societal challenges	2		United States	4
				Canada	2
				Germany	2
<b>Spain</b>	Foundations	3		Italy	2
	Interoperability	2		Spain	2
	Societal challenges	2		France	1
	no theme	3		Mexico	1
				Nigeria	1
				Norway	1
<b>United States</b>	Foundations	10		Poland	1
	Interoperability	4		Taiwan	1
	Societal challenges	1			
	no theme	1	<b>Foundations</b>	Brazil	24
				United States	10
				Canada	5
				Portugal	4
				Singapore	3
				Spain	3
				France	2
				Germany	2
				Australia	1
				Iran	1
				Italy	1
				Poland	1
				Uruguay	1

Table 1. Country of affiliation by conference theme.

see that Brazil and the United States contributed the most in every theme, and that Canada, which was not among the five, ranked third in both interoperability and foundations. No pattern of influence was observed when comparing country of affiliation with the presence of collaboration.

### 3.0 Citing behavior of ISKO 15 authors

There were 1,841 references to works cited by authors of the 121 presentations represented in the proceedings. The mean number of references was fifteen, as were the median and the mode; the range was 0 to 39. This suggests an overall social scientific orientation among the conference papers, continuing a trend from the Fourteenth International ISKO Conference in 2016 (ISKO 14). The mean number of references per paper was 16.5, per poster was 6.7, and per workshop was 2.5. The mean number of references per theme was 16.9 for the foundations track, 14.7 for the interoperability track, and 18.2 for the societal challenges track. The mean number of references in presentations by country of affiliation was calculated and those for the five countries contributing the largest number of presentations appear in Table 2.

Age of work cited was calculated ranging from 0 to 348 years; the mean age of work cited was 14.8 years (the median was 9 years, the mode was 1 year). While the mean is slightly lower, the median and mode are comparable to ISKO 14 and therefore also consistent with the long-term stream of ISKO international conferences, continuously pointing to a social scientific epistemology. The extreme age of the oldest work cited points to the typical presence of historical narrative, a common theme in ISKO domain analyses (Smiraglia 2015). The mean age of work cited by authors from each country of affiliation was calculated and some differences were observed. For example, the means for each of the five countries from which the largest number of the presentations originated are shown in Table 3.

Although this analysis is not complex enough to discover causality, it is perhaps apparent that the differences observed can be related to the epistemological points of view of the authors; that is, where we see more historical narrative we also see higher mean ages of work cited. The mean age of work cited by conference theme and by collaborating authors also was calculated and these appear in Table 4.

One interpretation is that there is little difference in mean age of work cited by the collaborative teams, and that this mean is consistent with a social science orientation. The highest mean age of work cited thematically occurs in the foundations track, where more historical narrative likely also occurred. The lowest mean is in the

interoperability track where little historical narrative was present. Finally, a regression plot of the mean age of cited work by mean number of references was created using IBM-SPSS Statistics® (Figure 3).

The plot shows a positive correlation between the mean age of cited work and the number of references such that the larger the number of references the higher the mean age of cited work. This is consistent with prior observations concerning the typical presence of historical narrative among the conference presentations, often roughly equal to that of empirical research reporting. As noted above, most of that historical narrative seems to come from the foundations track.

Journal articles and conference papers are usually the most cited sources in KO although there often is a rough equivalence between those two combined and monographic sources. This conference conformed to that expectation, more or less, as shown in Table 5.

On this occasion there were slightly more citations to monographs and theses (649) than to journal articles and conference papers (586), which is another pointer to the presence of historical narrative among the conference presentations. Among the cited works, thirty were dissertations or theses; none of these was cited more than once. The dissertations and theses were relatively recent, dated from 1986 to 2017, with a mean age of 8 years. Another 159 were web resources of various kinds. Twelve were identifiable as blog posts and one as a PowerPoint presentation. Only two were repeatedly cited—a Berners-Lee post on linked data design issues (<https://www.w3.org/DesignIssues/LinkedData.html>), and schema.org. Monographs, anthologies or technical reports accounted for 619 identifiable cited works. Those cited more than once, which give a clue to the underlying discourse among conference authors, are shown in Table 6.

Works by Olson, Bowker and Star and Berman carry over from ISKO 14 with lower frequencies. The most frequently cited works are Ranganathan, indicating discourse about facets, and the work by Szostak Gnoli and López-Huertas about interdisciplinarity. Cutter's rules and FRBR are new to this list, indicating the greater presence of presentations about FRBR or the new Library Reference Model. Among notable works new to the list are Adler's *Cruising the Library*, works by Svenonius, Cabre and Tognoli, and works about linked data, structured vocabularies and action research. It is interesting to note that Eco's *Semiotics and the Philosophy of Language* is cited twice, both times in Portuguese translation.

Conference proceedings provide venues for KO scholars to try out new ideas and present research in progress. This function is clear from the list of the most frequently cited conference series, which appears in Table 7.

Country	Mean number of references
Brazil	16
France	11.75
Portugal	18.33
Spain	9.44
United States	14.62

Table 2. Mean number of references by authors from five countries of affiliation.

Country	Mean age of work cited
Brazil	15.7056451
France	9.50272818
Portugal	16.8399351
Spain	7.43227745
United States	11.4808843

Table 3. Mean age of work cited by authors from five countries of affiliation.

	Collaborative team	Mean age of cited work
<b>Foundations</b>		18.13
<b>Interoperability</b>		8.15
<b>Societal challenges</b>		10.46
<b>no collaboration</b>		12.92
<b>collaboration</b>		13.08
	2 authors	13.75
	3 authors	10.51
	4 authors	14.65
	5 or 6	11.88

Table 4. Mean age of work cited by size of collaborative team.

Venue	Freq.
Journal articles	422
Conference papers	164
Monographs etc.	619
Dissertations and theses	30
Web resources	159

Table 5. Publication venues.

Authors	Dates	Title	Freq.
Ranganathan	1957-67	<i>Prolegomena to Library Classification</i>	5
Szostak Gnoli and López-Huertas	2016	<i>Interdisciplinary Knowledge Organization</i>	5
Cutter	1876-1904	<i>Rules for a Printed Dictionary Catalog</i>	4
IFLA	1998	<i>Functional Requirements for Bibliographic Records</i>	4
Olson	2002	<i>The Power to Name</i>	4
Berman	1971-93	<i>Prejudices and Antipathies</i>	3
Bowker and Star	1999-2000	<i>Sorting Things Out</i>	3
Smiraglia	2014	<i>The Elements of Knowledge Organization</i>	3
Adler	2017	<i>Cruising the Library</i>	2
Bliss	1929	<i>The Organization of Knowledge and the System of the Sciences</i>	2
Broughton	2015	<i>Essential Classification</i>	2
BSI Group	2005-2007	<i>Structured Vocabularies for Information Retrieval</i>	2
Cabré	1993-99	<i>La Terminologia</i>	2
Eco	1984-2001	<i>Semiótica e Filosofia da Linguagem</i>	2
Foskett	1969-77	<i>Subject Approach to Information</i>	2
García Gutiérrez	2011	<i>Epistemología de la Documentación</i>	2
Bean and Green	2001	<i>Relationships in the Organization of Knowledge</i>	2
Hooland and Verborgh	2014	<i>Linked Data for Libraries, Archives and Museums</i>	2
Kemmis McTaggart and Nixon	2014	<i>The Action Research Planner</i>	2
Kuhn	1962-70	<i>The Structure of Scientific Revolutions</i>	2
Rayward	1975	<i>The Universe of Information</i>	2
Rousseau and Couture	1998	<i>Os fundamentos da disciplina arquivística</i>	2
Svenonius	2000	<i>The Intellectual Foundation of Information Organization</i>	2
Tesauro	1670	<i>Il canocchiale Aristotelico</i>	2
Tognoli	2014	<i>A construção teórica da diplomática</i>	2
Wilson	1968	<i>Two Kinds of Power</i>	2

Table 6. Monographs, anthologies and reports cited two or more times.

Conference	Freq.
ISKO International	20
NASKO	10
ISMIR	10
ENANCIB	7
IFLA	7
ISKO-UK	4
UDC Seminar	4
ISKO Brazil	3
SIG/CR	3
ISKO Spain/Portugal	2
DCMI	2
CAIS	2
ISSI	2
ISKO France	1

Table 7. Most cited conference series.

### Normal P-P Plot of Regression Standardized Residual

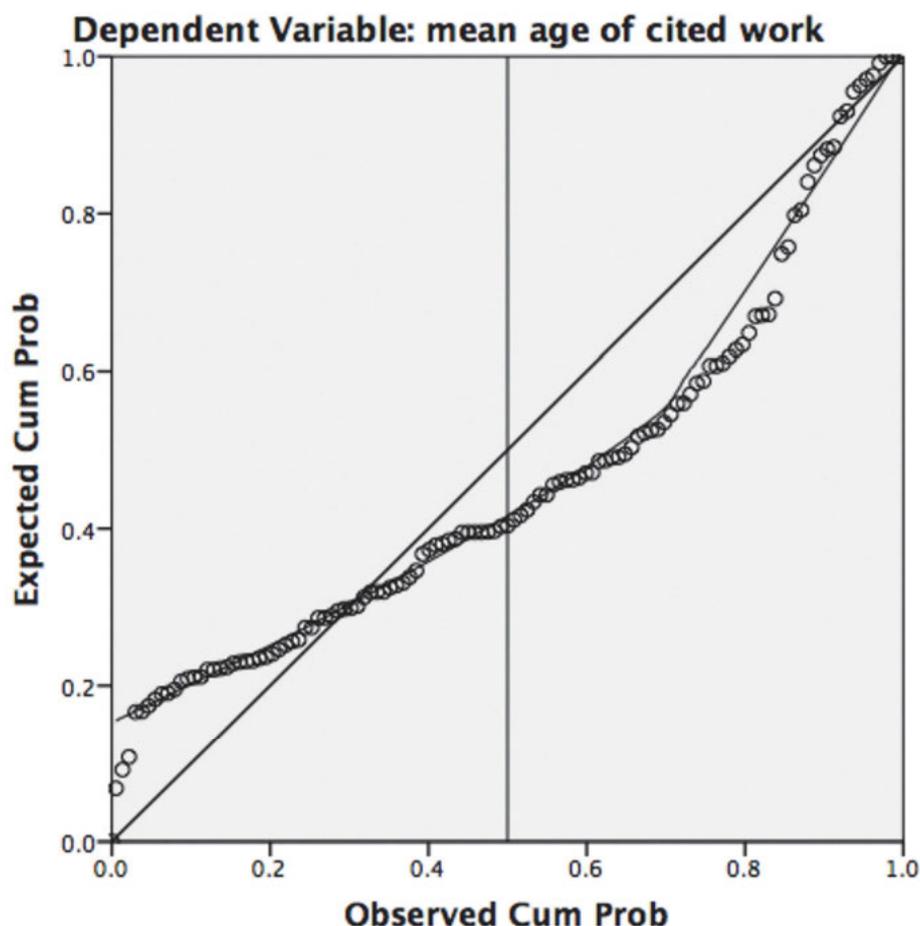


Figure 3. Regression plot of mean age of cited work by number of references ( $R^2 = .055$ ; sig. = .005)

ISKO international conferences are most cited, but ISKO regional conferences (NASKO for Canada/United States, UK, Brazil, Spain/Portugal, and France) account for the same number of citations.

Journals cited four times or more are shown in Table 8. The list is much the same as in prior ISKO international conferences. *Journal of Library Metadata* is new to the top tier of cited journals, as are *New Media & Society*, *Revista da Escola da Biblioteconomia da UFMG*, and *Sociological Perspectives*. Twenty-seven individual journal articles were cited more than once giving another clue to the discourse informing conference authors; these are shown in Table 9.

Out of necessity only partial citations are given; full citations appear in the proceedings, of course. Although the table is arranged in order of descending frequency of citation, we can easily see that Hjørland (18) and Dahlberg (14) are the most heavily cited; Tennis is next (6) and then Beghtol (4). A number of articles from the new ISKO Encyclopedia are included on this list, as well as several classical articles by traditional authors. Relative new-

comers, whose presence indicates recent influence in the discourse, are Fox and Adler, pointing toward ethical approaches to the representation of human condition, and Boyd and Crawford pointing to the big data movement.

### 3.0 The research front

Identifying the authors most cited in a domain is one way of revealing the domain's research front, or the group of scholars who are most influential in the development and evolution of theoretical points of view in the domain. Although a fair bit of citation is what is referred to as "classical" or "ritual" (e.g., citation of Cutter or Ranganathan in Table 6, and arguably some citation of Hjørland and Dahlberg in Table 9), much of the remainder clearly identifies the scholars whose work has been most influential in the shaping of the presentations in ISKO 15. Of the 1,841 references to cited works list, 1,678 were entered under 1207 identifiable personal names. About half, or 662 citations were made to 182 personal names

Journal	Freq.
<i>Knowledge Organization</i>	79
<i>Journal of the American Society for Information Science</i>	40
<i>Journal of Documentation</i>	27
<i>Cataloging &amp; Classification Quarterly</i>	18
<i>Library Trends</i>	17
<i>Ciência da Informação</i>	11
<i>Information Processing &amp; Management</i>	11
<i>Journal of Information Science</i>	11
<i>International Classification</i>	7
<i>Information Research</i>	5
<i>Journal of Library Metadata</i>	5
<i>Library Quarterly</i>	5
<i>Perspectivas em Ciência da Informação</i>	5
<i>Scientometrics</i>	5
<i>TransInformação</i>	5
<i>Archivaria</i>	4
<i>D-Lib Magazine</i>	4
<i>Evidence Based Library &amp; Information Practice</i>	4
<i>Informação &amp; Informação</i>	4
<i>Library Resources &amp; Technical Services</i>	4
<i>New Media &amp; Society</i>	4
<i>Revista da Escola de Biblioteconomia da UFMG</i>	4
<i>Scire</i>	4
<i>Sociological Perspectives</i>	4
<i>Axiomathes</i>	4

Table 8. Most cited journals.

that were cited two or more times. The 28 names cited five or more times are shown in Table 10.

The authors in Table 10 can be said to provide the core of the theoretical discourse used by conference authors and therefore to constitute the leading edge of the research front. The list is very similar to that from ISKO 14 at the top. Ranganathan is cited more heavily in this conference than in past, perhaps because of increasing emphasis on concepts related to faceted classification. Names new to the list are Bawden, Broughton, Capurro, Floridi, Svenonius, Baca, Guarino, and Hudon. Floridi, Svenonius, Bawden and perhaps Capurro point perhaps to a closer alliance with information science than in the recent past. Baca's presence on the list is related to cultural heritage KOSs and Guarino is a sign of greater focus on ontologies as semantic web tools.

Author co-citation analysis can provide a visualization of the theoretical poles represented by this research front among the perceptions of the citing authors. An author

co-citation matrix was compiled using the twenty-seven names in Table 10 to seek co-citation among the conference presentations. As it happened, there was very little co-citation, suggesting there was less theoretical coherence across the conference. Empty cells result when there is no co-citation of pairs of authors, which foils attempts at multi-dimensional scaling (MDS) for visualization. For example, Floridi and Capurro were co-cited with Hjørland but with nobody else in the matrix; Campos was co-cited with Dahlberg but no others, etc. Authors with little or no co-citation were removed to produce a useful MDS plot. IBM-SPSS Statistics® was used to create an MDS plot of author co-citation among conference presentations; two interpretations of this plot are shown in Figure 4.

Essentially the plot is a flat line with little dimensionality, a reflection of the low co-citation counts across the set of author names, which we might recall were those of the twenty-seven most cited authors in the conference. In Figure 4 on the left we see two clusters revealed by the

Authors	Date	Title	Freq.
Hjørland	2008	What is Knowledge Organization?	6
Dahlberg	1978	A Referent-oriented Analytical Concept Theory of Interconcept.	4
Hjørland	2002	Domain Analysis in Information Science: Eleven Approaches-Traditional as well as Innovative	4
Hjørland	2016	Knowledge Organization	4
Dahlberg	1993	Knowledge Organization: Its Scope and Possibilities	3
Dahlberg	2006	Knowledge Organization: A New Science?	3
Fox	2016	Subjects in Doubt: The Ontogeny of Intersex in the <i>Dewey Decimal Classification</i>	3
Zeng and Chan	2004	Trends and Issues in Establishing Interoperability among Knowledge Organization Systems	3
Adler	2016	The Case for Taxonomic Reparations	2
Almeida and Bax	2003	Uma visão geral sobre ontologias: pesquisa sobre definições, tipos, aplicações, métodos de avaliação e de construção	2
Almeida and Crippa	2009	De Bacon à internet: considerações sobre a organização do conhecimento e a constituição da ciência da informação	2
Beghtol	2002	A Proposed Ethical Warrant for Global Knowledge Representation and organization Systems	2
Beghtol	2005	Ethical Decision-Making for Knowledge Representation and Organization Systems for Global Use	2
Borko	1968	Information Science: What is it?	2
Boyd and Crawford	2012	Critical Questions for Big Data: Provocations for a Cultural, Technological, and Scholarly Phenomenon	2
Dahlberg	1978	Teoria do conceito	2
Dahlberg	1981	Conceptual Definitions for Interconcept	2
Gruber	1995	Toward Principles for the Design of Ontologies used for Knowledge Sharing?	2
Hjørland	2003	Fundamentals of Knowledge Organization	2
Hjørland	2017	Domain Analysis	2
Hulme	1911	Principles of Book Classification	2
Kleineberg	2017	Integrative Levels	2
Mai	2010	Classification in a Social World, bias and trust	2
Olson	1999	Exclusivity, Teleology and Hierarchy: Our Aristotelian Legacy	2
San Segundo	2002	A New Concept of Knowledge	2
Santos	2013	Catologação, formas de representação e construções mentais	2
Tennis	2008	Epistemology, Theory, and Methodology in Knowledge Organization: Toward a Classification, Metatheory, and Research Framework	2
Tennis	2012	The Strange Case of Eugenics: a Subject's Ontogeny in a Long-lived Classification Scheme and the Question of Collocative Integrity	2
Tennis	2016	Methodological Challenges in Scheme Versioning and Subject Ontogeny Research	2

Table 9. Journal articles cited two or more times.

dendrogram (which is not shown here); on the lower left anchored by Dahlberg are essential aspects of KO mostly associated with concepts in various contexts. On the upper right, anchored by Hjørland are domain analytical aspects of KOSs. But the plot on the right uses dotted lines to show the essential flat line surrounding most of the authors reflecting the typical theoretical poles within KO, but one strongly-correlated cluster containing Gnoli, Svenoni-

us and Guimarães. Potentially this cluster represents the presentations from authors that are new to ISKO international conferences, and are relying on information organization and domain analytical approaches to KO. Another way to visualize the co-citation is with a network plot, created by VosViewer, which is shown in Figure 5.

Here we see the centrality of theoretical points of view from Hjørland. The red network to the left repre-

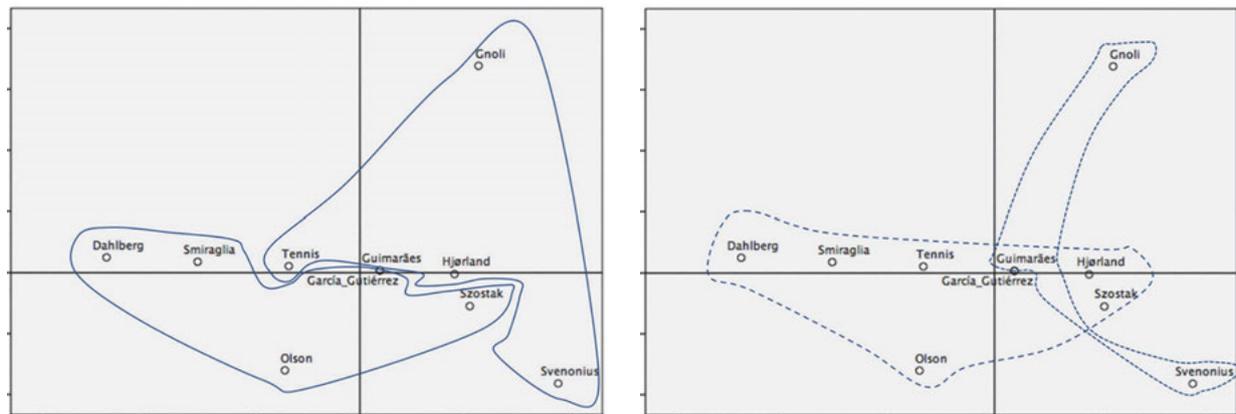


Figure 4. MDS plots of author co-citation among conference presentations (stress = .00 R<sup>2</sup> = 1.0).

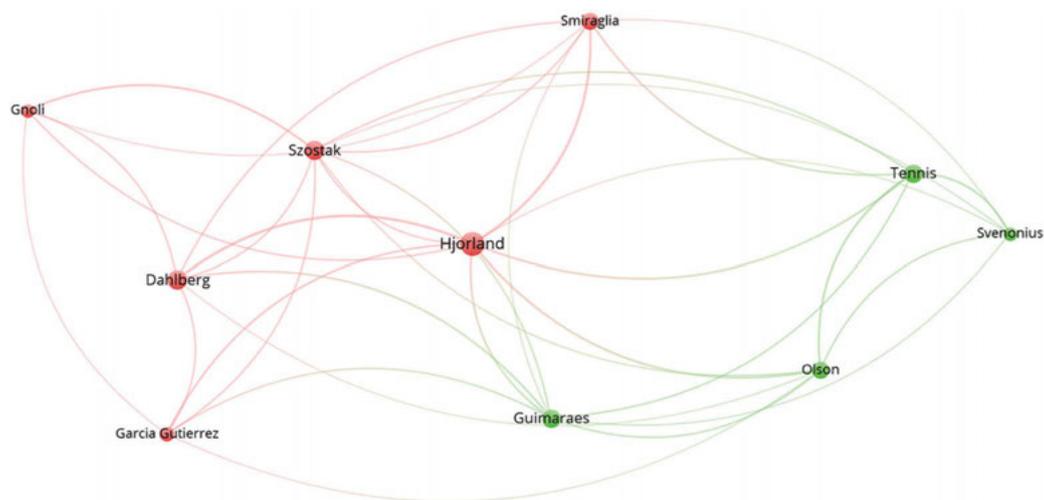


Figure 5. VosViewer 1.6.5 network diagram of author co-citation among conference presentations.

sents epistemological points of view and aspects of concept theory. The green network to the right represents a bridge between domain-analytical approaches to KO and ethical and cultural considerations. The heaviest line is that running between Hjørland and Dahlberg, the theoretical anchors of KO and of this conference.

#### 4.0 Explicit themes of ISKO 15

Co-word analysis is a means of extracting terms for a corpus of meaningful text to discover both frequency of occurrence and frequency and proximity of co-occurrence of terms. It is a form of semantic analysis that helps to visualize the explicit thematic content of a domain. It also is a very useful form of methodological triangulation. One expects, or hopes, to see thematic clusters arise from co-word analysis that match or at least are compatible with those that arose from author co-citation analysis. To that end, all titles and abstracts of conference presentations were entered into the Provalis ProSuite™ software via the SimStat

module. In addition, and as yet another form of methodological and data triangulation, the titles of all works cited by conference authors can be analyzed thematically using the same tools. This provides further clues to the discourse governing the conference presentations. There were 1,720 identifiable titles in the works cited by conference presentations. The titles and abstracts contained 2,489 keywords of which 121 were unique; they also contained 10,810 two-to-five-word phrases of which nineteen occurred eight times or more.

But among the cited works 390 titles were not in English. In order to make the best use of the co-word analysis software these titles were translated using Google Translate. Table 11 shows the languages and frequencies among these translated titles.

An interesting research question then arose: is there any discernible pattern among the various language materials being cited? Each cluster of translated titles was entered individually into the ProSuite for analysis. Results were that the Portuguese titles contained 2,213 keywords of which

Author	Freq.
Hjørland	31
Dahlberg	24
Smiraglia	19
Szostak	17
Tennis	16
Ranganathan	12
Guimarães	10
Beghtol	9
Olson	9
Adler	8
García Gutiérrez	8
Gnoli	8
Silva	8
Fujita	7
Mai	7
Bawden	6
Broughton	6
Campos	6
Capurro	6
Floridi	6
Svenonius	6
Zeng	6
Baca	5
Bowker	5
Guarino	5
Hudon	5
Ritzer	5

Table 10. Most cited authors.

Language	Freq.
Portuguese	233
French	75
Spanish	50
Italian	13
German	9
Polish	4
Hungarian	1

Table 11. Cited work titles translated.

565 were unique; the Spanish contained 351 keywords of which fifty were unique, and the French contained 260 keywords of which seventy-five were unique. Numbers for the other languages were essentially inconsequential. Analysis showed no major difference among the keywords or phrases occurring most frequently in the translated titles for any language group, except that the term “information

ecology” occurred frequently among the cited titles in Portuguese and Polish, and “sixteenth century art writing” and “Aristotelian telescope” occurred among those in Italian.

The WordStat module produces keyword frequency distributions; an MDS plot for the most frequently occurring phrases among the translated titles appears in Figure 6.

We see a dichotomous usage of “organization of knowledge” and “organization of information” alongside a cluster focused on university library policy and “thematic treatment of information.” Thanks to an anonymous referee we can point out that “thematic treatment of information” is a mis-translation from Spanish and Portuguese of “subject representation, which, of course, links naturally to “indexing policy.” The MDS plot for the entire body of cited works appears in Figure 7.

Interestingly we see a cluster encompassing “churn prediction” alongside “data-mining” and big data, indicating a business orientation not otherwise visible in prior international ISKO conferences. We also see a small cluster embracing “university libraries” and “verbal protocol” suggesting a locus for a form of content research.

Finally, we can compare these visualizations of cited-work titles with the visualization of phrases from the conference papers and abstracts, which appears in Figure 8.

Here we see a more characteristic picture for an international ISKO conference, with core concepts of KO and KOSs embracing digital age concepts of social media and the semantic web. We see also the emphasis at this conference on new library conceptual data models, which is another aspect of KO in a digital age.

## 5.0 ISKO 15's Bookshelf

We might begin by asking “what, then, is on ISKO 15's bookshelf?” The answer might be, for the first time, surprising. There were several surprises in this conference for ISKO. First, the domain's most cited and most prolific author—Birger Hjørland—for the second time attended but did not present a paper. Second was that there was no clear coherence among the disparate groups attending the conference, and this was reflected in the over abundant proceedings. We are accustomed to local participation as ISKO moves around the world, but the impact is not usually felt in the intension of the domain in the way that seems to have happened in this conference. That is, there were more Portuguese speakers than usual, more of the references cited were in Portuguese (including, frequently, translations of classical texts), and there was decidedly more of a library-oriented bent to this conference than is usually the case. There were too many papers accepted to fit into the conference comfortably; yet, to have not accepted submissions would have been to have put

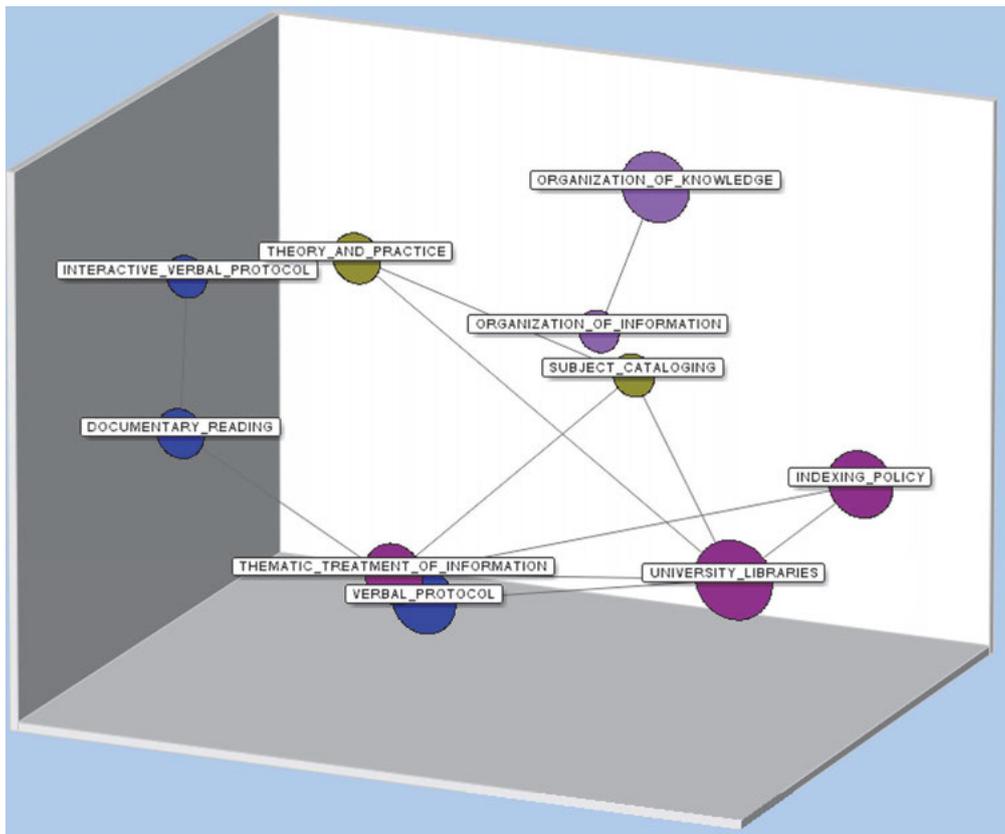


Figure 6. MDS plot of phrase co-occurrence among translated titles of cited works (stress = .19  $R^2 = .96$ ).

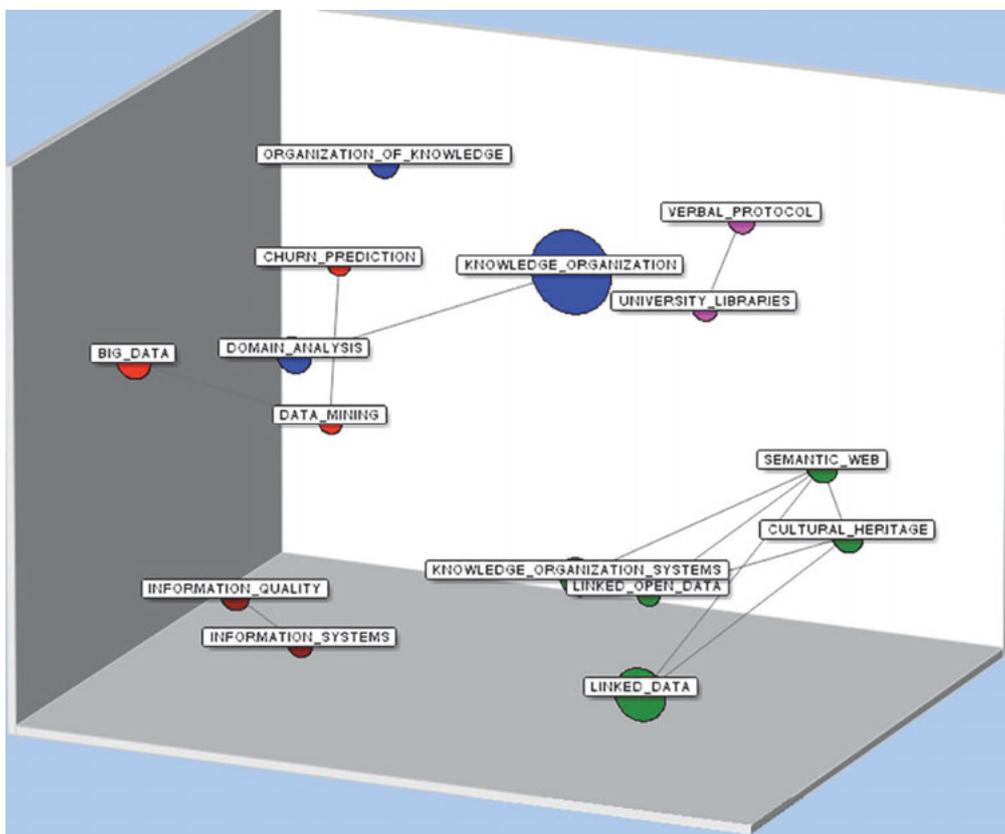


Figure 7. MDS plot of phrase co-occurrence among titles of cited works (stress = .24  $R^2 = .81$ ).

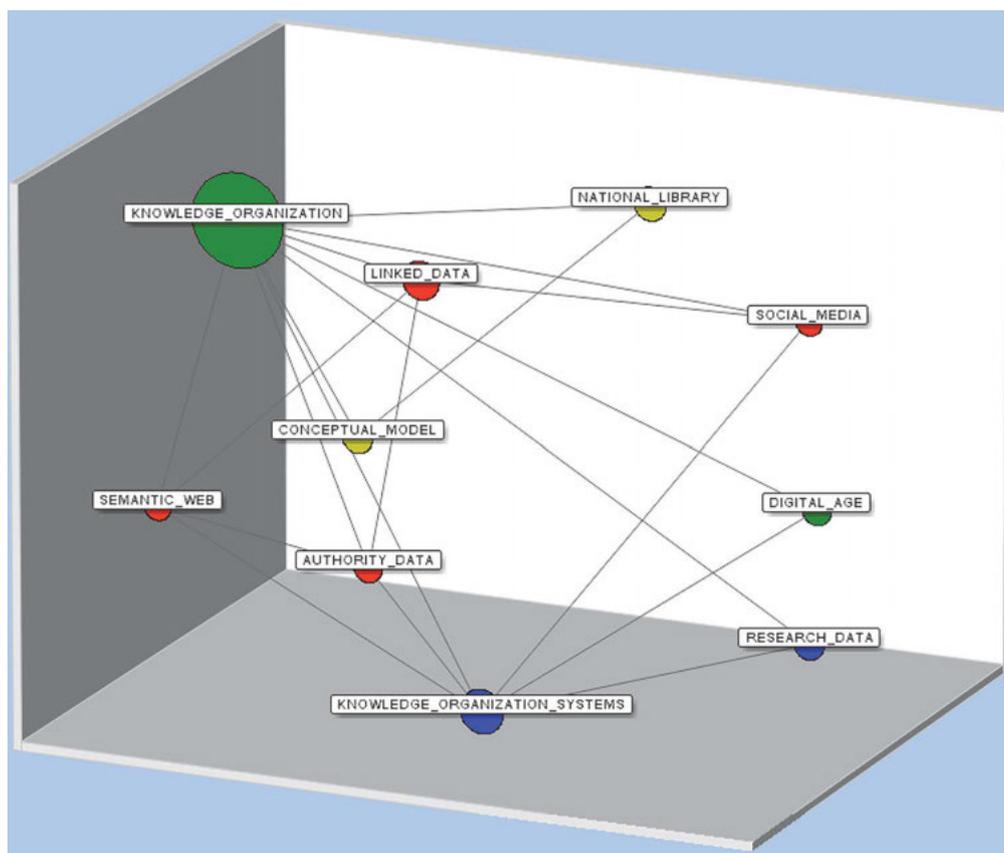


Figure 8. MDS plot of phrase co-occurrence among conference paper titles and abstracts (stress = .21  $R^2 = .92$ ).

erect boundaries around original thought. This remains an ongoing problem for ISKO. But to answer the question directly, on ISKO 15's bookshelf were articles by Hjørland, Dahlberg, Tennis and Beghtol, and books by Ranganathan and Szostak, Gnoli and López-Huertas. But also books by Adler, García Gutiérrez, Holland and Verborgh and *FRBR/LRM* were present as were articles by Adler, Kleineberg and Gruber. Core ISKO is joined on this bookshelf by new articles from the ISKO Encyclopedia, by works pointing toward ethical approaches to KO, and by works pointing toward KO for a semantic web—challenges and opportunities for KO, as the conference theme indicated.

KO is a global domain devoted to the discovery and application of heuristics for the conceptual order of knowledge. This is often at odds with the gathering functions required by librarianship. It has been an error always to equate the dream of Ingetraut Dahlberg and the designs of forward-thinking classificationists from Richardson to Otlet to Bliss to Ranganathan to Szostak with the moribund and essentially culturo-political classifications used in North American libraries. Although the now nearly decade old preoccupation with epistemology was still apparent in this conference, it has been extended into a new and demanding corner of the intension focused on

the ethical ordering, use and implementation of KO, especially in social milieu. It is long past time in my opinion for ISKO to take up the science of social and occupational classifications, which are serious instruments of social control, over and against the moribund problem of shelving library materials.

The extension of KO as represented in this conference seems secure, and that is good, because it allows the domain to embrace new directions, of which, at the moment, semantic web applications seem to be taking a slight lead. We might remember, however, that it was not so long ago that we were overwhelmed with social tagging, a fad that has taken its place now as a simple technology, and that has been demonstrated as an aid but not a replacement for true concept-ordered KOSs.

This conference coincides with the revision of conceptual models for library bibliographic control, replacing the originally flawed *FRBR* with a new *LRM* (*Library Reference Model*) based on the object-oriented *FRBRoo*, and incorporating aspects of other cultural heritage conceptual models. These are conceptual systems, although they are rarely explained as such either in the KO community or in the library or cultural heritage community. ISKO's embrace of these models should serve as a catalyst for the authors and librarians behind this movement to begin

to articulate how their conceptual models (see the keyword “conceptual”) embrace concept theory, and thus can conform to the science of KO.

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