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Commentary: State of the Art, State of the Science?

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The science and practice of information retrieval has travelled a long distance over the last thirty years. This special issue of *Research Synthesis Methods* offers those interested in the identification of study reports for inclusion in research syntheses the collective opportunity to reflect on the origins of information retrieval research, to celebrate current outputs as showcased in the accompanying articles and to anticipate challenges that lie ahead. Forgive me if I illustrate this with a personal anecdote. In 1990 I published my first article – a serendipitous case study looking at what we could learn about MEDLINE indexing from a supplement that had been erroneously indexed twice.1 A year later my commentary in the same library practitioners' journal examined the utility of the US database CINAHL in a British context.2 I am by no means claiming a contribution for these articles (although at 8 and 1 Google Scholar citations respectively both need all the exposure they can muster!). Instead let us contrast these minuscule offerings with current practice. Both were solo-author unfunded projects completed after hours by a jobbing hospital librarian – essentially a cottage industry! At the time the articles were of potential interest only to fellow health librarians (based on the citation evidence barely even to them!) – and they revealed two preoccupations; coverage of sources and subject indexing. Against the (then non-existent) evidence pyramid they barely surfaced above the surrounding desert – a case study and an opinionated non-expert! Subsequently, I have keenly observed information retrieval science – primarily as a beneficiary whether trainer, user, mentor or appraiser.

Fast forward - only three years to November 1994 - to the beginning of "the modern age of evidence based information retrieval" and the *BMJ* article *Identifying relevant studies for systematic reviews*.3 Published by an international multi-author Cochrane group, including Carol Lefebvre as information specialist, this empirical study (with almost 2000 Google Scholar citations) demonstrated that contemporary indexing of MEDLINE would only retrieve 51% of known clinical trials. The accompanying narrative spoke to the critical issues of coverage of sources and indexing. On the back of this high-profile study, and an invited presentation to the National Library of Medicine,4 Carol stimulated the interest that led to the "MEDLINE retagging project" from which the Cochrane Library and, consequently, all systematic reviews of clinical trials have benefitted.

Of course, few information retrieval papers have subsequently featured in the "Big Five" medical journals, including the *BMJ*. Instead, *Research Synthesis Methods* offers a tailored forum for multidisciplinary papers, of interest to information specialists, systematic reviewers and methodologists alike, reporting collaborative research of potential value to ongoing and future reviews. Information retrieval methods are now a prevailing concern, not simply in this Special Issue but also throughout regular issues of this journal. Study identification features prominently at international conferences such as the Cochrane Colloquia, the Campbell Colloquia and Health Technology Assessment International (HTA-i). National and international information retrieval interest groups are active in continuing education and training, collaborative projects and multi-institution research projects. Academic review organisations, producing technical reviews for decision-makers such as NICE, increasingly legitimise involvement in information retrieval research for their information professionals

alongside, or integrated within, methodological work by health economists, statisticians, systematic reviewers and decision-modellers.

In 2003, the formation of a Cochrane Information Retrieval Methods Group was heralded thus:

> "information retrieval lies at the heart of an evidence-based healthcare movement that is committed to enabling patient care decisions to be well informed and based on up-to-date, reliable information and knowledge…it is essential that a broad and sensitive literature search is conducted to retrieve the maximum number of…relevant published and unpublished studies".5

Such a pronouncement seems as valid on the latest stage of this journey as it did fifteen years ago; although perhaps with a discernible shift towards "optimum" rather than "maximum" retrieval strategies.

Goodbye to cottage industries…

Previously, I have argued that building an evidence base is analogous to laying a floor.6 Unfortunately, deprived of a ready supply of large interlocking research studies, like laminated flooring, information retrieval research frequently has to resort to painstakingly piecing together a Roman mosaic of small-scale studies. Nevertheless, the direction of travel for this cross-section of information retrieval research is encouraging. While not yet at industrial levels of production, the papers in this Special Issue, dominated by multi-author and multidisciplinary work, attest to the demise of the information retrieval "cottage industry". Collaborations span institutions and the academic-commercial divide.7 Academic review organisations (e.g. ScHARR,8 PenTag,9 and YHEC10), health technology agencies (e.g. CADTH11 and networks (such as Cochrane10,12 and the Medical Library Association collaboration13) continue to play a critical part. Interest in sources8 and in indexing for retrieval9 persists through the decades. Although, understandably, a preoccupation with trial reports continues to drive the agenda, presaged by the 1994 *BMJ* article, this Special Issue reflects wider interests in trial protocols,8 unpublished data10 and qualitative studies.9 The latter addition is particularly welcomed by me, as a Cochrane Qualitative and Implementation Methods Group co-convenor, given that qualitative research remains a poor relation in terms of research outputs and research funding. Furthermore, we continue to witness the migration of systematic review methodology across new fields - both metaphorically and literally in the case of the narrative review from agriculture14 – offering the prospect of shared learning, adaptation and adoption together with further methodological innovation.

For me, however, much of the work collectively published in this Special Issue falls within a theme variously expressed as "how much searching is enough?"15 or "how far should you go?".16 However, my modest proposal is that we should "flip" this narrative to "how little searching is enough?" or "how close can you stay?". This accurately captures the prevailing zeitgeist for systematic review efficiency and rapid review methods. Efficiencies are claimed for search strategy construction7, randomised controlled trial (RCT) screening12 and for searching for protocols8 and all three authorial teams provide empirical evidence to support their claims. Such efficiencies must be accompanied by robust quality assurance procedures; for one of which, peer review of search strategies, we now have important supplemental evidence of benefit.11

A secondary theme is "working smarter", whether by sharpening the efficiency of search protocols8 or by harnessing the potential offered by technology.7,12 As the guide to machine learning illustrates, technologies may be harnessed in the screening of specific study types12 – initially, randomised controlled trials but ultimately a wider range of study types. In this connection it is particularly interesting to see the study by Langlois and colleagues17 which extends automated text classification to more elusive types of empirical study, thereby facilitating the rapidly expanding science of mixed studies reviews. Such technology offers significant advantages, and a tolerable margin of error, within the context of rapid reviews. Data mining or text mining can be used for relevance ranking, secondary screening or search strategy development and information specialists, together with the wider review team, should remain awake to the possibilities, and challenges, offered by these newer technologies.

Where to Next?

The science and practice of information retrieval still has far to travel. We can signpost future directions using the familiar Population Intervention Comparison Outcome Study type (PICOS) structure. Significant challenges remain as information specialists seek to extend the sources with which they are familiar, the types of evidence that they retrieve and the types of reviews that they support. Furthermore, they need to communicate effectively to fellow members of the review team, together with review commissioners and users (*Populations* and perspectives), the assumptions, implications and limitations that underpin the use of novel sources, technologies and strategies (*Interventions*). This imperative signals a significant research, education and training agenda.

Just under fifteen years ago, in an edited work on evidence-based information practice, I concluded that information access and retrieval represented one of the more densely populated domains of information practice.18 At that time isolated exemplars existed for systematic reviews, RCTs, and cohort studies but the chapter framed an exhortation for more comparative studies. We still need more plentiful and more robust evidence to compare between methods, approaches and sources, particularly when contrasting comprehensive, exhaustive searches with purposive, theoretical sampling and systematic reviews to rapid approaches *(Comparison)*. Considerable potential exists to learn from other methodologies and disciplines, emphasised by the illuminative comparison in this issue between systematic review methodologies and the science of tech mining from engineering and corporate research and development.13 At the same time technologies offer the prospect of accelerated research while review management data gathered along the way (such as Included/Excluded studies, yield from specific sources and PRISMA statistics) open up opportunities for secondary data analysis (*Study types*).

Previously, I have argued that evaluation of information retrieval methods should shift from the technical measures of sensitivity and specificity, precision and recall, to the more meaningful metric of impact (*Outcomes*).15 How do different retrieval methods perform in relation to actually included studies and, then, do the studies missed hold the potential to overturn the bottom line results of a review? Preliminary evidence suggests that a more thorough search within the PubMed database can identify more included studies than the diminishing yield from additional subject databases.19 This has led me to assert (in oral presentations but never in print!) that searching multiple databases may primarily offer searchers a compensatory strategy for their own inadequate searching or for deficient

indexing of the principal databases of choice. However, as with any methodological shortcuts for potential use in rapid reviews, we need more empirical evidence on implications of limited database searching for the quality of the final review product.

Finally, we should acknowledge that, together with the contributing authors, the two co-editors themselves model roles that attest to the evolution of information retrieval science. In addition to publishing multiple articles on information retrieval Suzy Paisley secured a research fellowship from the U.K. National Institute for Health Research; further legitimisation for the science of study identification. Together with health economics, modelling and systematic review colleagues she is challenging existing conceptions of information retrieval for decision analytic models. Margaret J Foster has extended her own role as Systematic Review Co-ordinator at the Medical Sciences Library of Texas A&M University by co-authoring the book *Assembling the Pieces of a Systematic Review*,20 unique among the systematic review books that populate my shelves in targeting information specialists. Judging from the quality of the contributions and the editorial input into this Special Issue the science and practice of information retrieval, in seeking to "systematize …provision of expertise, advice and support, conduct research and facilitate information exchange",5 rests in very safe hands. **[1740 Words excluding References]**

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