



REVIEW ARTICLE

Living systematic reviews: 2. Combining human and machine effort

James Thomas^{a,*}, Anna Noel-Storr^b, Iain Marshall^c, Byron Wallace^d, Steven McDonald^e,
Chris Mavergames^f, Paul Glasziou^g, Ian Shemilt^a, Anneliese Synnot^{e,h}, Tari Turner^e,
Julian Elliott^{e,i}, on behalf of the Living Systematic Review Network

^aEPPI-Centre, Department of Social Science, University College London, 18 Woburn Square, London, WC1H 0NR, UK

^bRadcliffe Department of Medicine, University of Oxford, Level 4, Academic Block, John Radcliffe Hospital, Headington, Oxford OX3 9DU, UK

^cPrimary Care & Public Health Sciences, Kings College, Capital House, 42 Weston Street, London, UK

^dCollege of Computer and Information Science, Northeastern University, 360 Huntington Ave, Boston, MA 02115, USA

^eCochrane Australia, School of Public Health and Preventive Medicine, Monash University, 99 Commercial Road, Melbourne VIC 3004, Australia

^fCochrane, St Albans House, 57-59 Haymarket, London SW1Y 4QX, UK

^gCentre for Research on Evidence Based Practice, Bond University, 14 University Drive (Off Cottesloe Drive), Robina, QLD 4226, Australia

^hCentre for Health Communication and Participation, School of Psychology and Public Health, La Trobe University, Melbourne, Australia

ⁱDepartment of Infectious Diseases, Monash University and Alfred Hospital, 55 Commercial Rd, Melbourne VIC 3004, Australia

Accepted 17 August 2017; Published online xxxx

Abstract

New approaches to evidence synthesis, which use human effort and machine automation in mutually reinforcing ways, can enhance the feasibility and sustainability of living systematic reviews. Human effort is a scarce and valuable resource, required when automation is impossible or undesirable, and includes contributions from online communities (“crowds”) as well as more conventional contributions from review authors and information specialists. Automation can assist with some systematic review tasks, including searching, eligibility assessment, identification and retrieval of full-text reports, extraction of data, and risk of bias assessment. Workflows can be developed in which human effort and machine automation can each enable the other to operate in more effective and efficient ways, offering substantial enhancement to the productivity of systematic reviews. This paper describes and discusses the potential—and limitations—of new ways of undertaking specific tasks in living systematic reviews, identifying areas where these human/machine “technologies” are already in use, and where further research and development is needed. While the context is living systematic reviews, many of these enabling technologies apply equally to standard approaches to systematic reviewing. © 2017 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Keywords: Systematic review; Automation; Crowdsourcing; Citizen science; Machine learning; Text mining

1. Introduction

This is the second paper in a series of papers discussing the emerging field of living systematic reviews (Box 1). In this paper, we specifically focus on the ways

in which the use of new human and machine “technologies” can make the standard systematic review process more efficient.

Systematic reviews are a type of literature review, which adopt principles of scientific method to the task of finding and summarizing research. They aim to answer prespecified research questions using all relevant empirical evidence, using explicit and replicable methods and minimizing bias. They thus aim to provide trustworthy findings on which policy and practice decisions can be made [1]. A living systematic review is a systematic review which is continually updated in the light of new evidence as it becomes available (Box 2) [2]. Living systematic reviews represent an opportunity to rethink conventional review processes and take advantage of emerging approaches to reviewing which promise to increase efficiency [3]. In this paper, we describe how new “technologies” (which encompass both

Conflicts of interest: none.

Funding: The Living Systematic Review Network is supported by funding from Cochrane and the Australian National Health and Medical Research Council (Partnership Project grant APP1114605). J.T., A.N.-S., I.S., T.T., and J.E. receive funding from Cochrane (“Transform Project”) and Australian NHMRC (“Evidence Innovation Transforming the efficiency of systematic review”). J.T. is supported by the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care (CLAHRC) North Thames at Bart’s Health NHS Trust. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR, or the Department of Health.

* Corresponding author. Tel.: +44 207 612 6844; fax: +44 207 612 6400.

E-mail address: james.thomas@ucl.ac.uk (J. Thomas).

<http://dx.doi.org/10.1016/j.jclinepi.2017.08.011>

0895-4356/© 2017 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

What is new?

- The need to maintain an up-to-date, dynamic system for evidence synthesis can be facilitated using new technologies which comprise both human and machine effort.
- As well as standard review teams, systematic review activities can be broken down into “micro-tasks” and distributed across a wider group of people—including the involvement of citizen scientists through crowdsourcing.
- Machine automation can assist with some systematic review tasks, including routine searching, eligibility assessment, identification and retrieval of full-text reports, extraction of data, and risk of bias assessment.
- While the context is living systematic reviews, many of these enabling technologies apply equally to standard approaches to systematic reviewing.

computer technology and more efficient models of human contribution) can increase the efficiency and sustainability of the systematic review enterprise. We argue that human effort is a scarce and valuable resource which should be expended only where automation is impossible, impractical, or undesirable. Furthermore, for many of the repetitive and labor-intensive tasks of evidence synthesis, automation is increasingly preferable and viable [4–10]. Human effort can contribute in two ways: either by undertaking tasks in a specific review or by providing examples that can be used to “train” machines which can then automate (or semi-automate) the activity in question—sometimes across many reviews. We consider how human effort can be considered not simply in terms of traditional author teams, but in terms of communities—and “crowds”—of people who come together to curate knowledge in a given area. Rather than organize the paper in terms of the two families of

Box 1 Series of papers on living systematic reviews

- Living systematic reviews: 1. Introduction—the why, what, when, and how
- Living systematic reviews: 2. Combining human and machine effort
- Living systematic reviews: 3. Statistical methods for updating meta-analyses
- Living systematic reviews: 4. Living guideline recommendations

Box 2 Living systematic reviews

- A systematic review which is continually updated, incorporating relevant new evidence as it becomes available
- An approach to review updating, not a formal review methodology
- Can be applied to any type of review
- Use standard systematic review methods
- Explicit and a priori commitment to a predetermined frequency of search and review updating

technologies—human and machine—we consider each stage of the systematic review process and discuss ways in which these two technologies interact and operate in mutually supportive ways.

2. Opportunities for a different workflow

Systematic reviews are conventionally undertaken by a small team of trained researchers working in a highly labor-intensive—but time-limited—way. New ways of working aim to replace this with a less labor-intensive model in which the ongoing workflow is conducted by a wider community of individuals. The changes to review production we describe here are not required for living systematic reviews to be conducted, but are situated within a wider set of innovations in evidence synthesis from which living systematic reviews can draw to improve feasibility. For example, it is possible that systematic review production will evolve away from an individual, isolated endeavor, toward a dynamic and continuous research curation system in which communities of people work together to maintain an up-to-date evidence base in their areas of interest. By breaking work into micro-tasks, living systematic reviews may be conducted more efficiently among a wider range of people. Microtasks are discrete, small units of work, which can be done independently from one another. We describe key living systematic review microtasks alongside examples of new technologies and innovative ways of working to help accomplish them in [Table 1](#). Breaking up the living systematic review workload in this way allows the authorship team to take advantage of emerging automation systems to reduce the workload. It also makes more efficient use of the skill sets and time availability of contributors necessary for undertaking review tasks. The formation of review teams can be assisted using task-sharing platforms, such as Cochrane’s “Task Exchange” (taskexchange.cochrane.org/).

As Elliott et al. described [2], the work of a living systematic review begins with a traditional systematic review (which can also benefit, of course, from many of the efficiencies described here). We take the existence of the initial systematic review as our starting point and outline below

Download English Version:

<https://daneshyari.com/en/article/7519288>

Download Persian Version:

<https://daneshyari.com/article/7519288>

[Daneshyari.com](https://daneshyari.com)