



# Automation tools for Systematic Reviews

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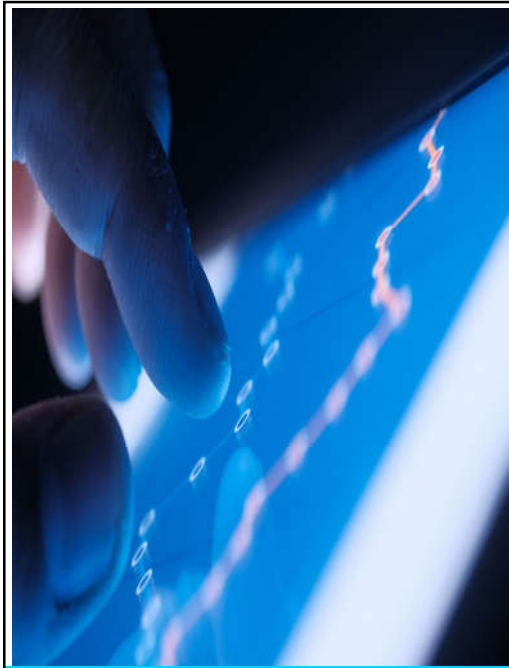
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## Introduction

- ❖ Systematic Review is a methodical and comprehensive approach to **synthesizing** research evidence.
- ❖ **Challenges in Traditional SRs:**
  - ✓ **Time-consuming**, **labor-intensive**, and prone to **human error**.
- ❖ **Role of Automation:**
  - ✓ **Tools to streamline the process, improve efficiency, and reduce bias.**

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## Introduction

❖ Some researchers have estimated that it takes on average around **11 months** to complete a systematic review

VS

❖ A full systematic review was completed in **2 weeks** using automation tools

➤ According to Clark J., et al. (2020)

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Journal of Clinical Epidemiology 121 (2020) 81–90

**ORIGINAL ARTICLE**

**A full systematic review was completed in 2 weeks using automation tools: a case study**

Justin Clark<sup>\*</sup>, Paul Glasziou, Chris Del Mar, Alexandra Bannach-Brown, Paulina Stehlik, Anna Mae Scott

*Institute for Evidence-Based Healthcare, Bond University, Gold Coast, Australia*  
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**Abstract**

**Background and Objectives:** Systematic reviews (SRs) are time and resource intensive, requiring approximately 1 year from protocol registration to submission for publication. Our aim was to describe the process, facilitators, and barriers to completing the first 2-week full SR.

**Study Design and Setting:** We systematically reviewed evidence of the impact of increased fluid intake, on urinary tract infection (UTI) recurrence, in individuals at risk for UTIs. The review was conducted by experienced systematic reviewers with complementary skills (two researcher clinicians, an information specialist, and an epidemiologist), using Systematic Review Automation tools, and blocked off time for the duration of the project. The outcomes were time to complete the SR, time to complete individual SR tasks, facilitators and barriers to progress, and peer reviewer feedback on the SR manuscript. Times to completion were analyzed quantitatively (minutes and calendar days); facilitators and barriers were mapped onto the Theoretical Domains Framework; and peer reviewer feedback was analyzed quantitatively and narratively.

**Results:** The SR was completed in 61 person-hours (9 workdays; 12 calendar days); accepted version of the manuscript required 71 person-hours. Individual SR tasks ranged from 16 person-minutes (deduplication of search results) to 461 person-minutes (data extraction). The least time-consuming SR tasks were obtaining full-texts, searches, citation analysis, data synthesis, and deduplication. The most time-consuming tasks were data extraction, write-up, abstract screening, full-text screening, and risk of bias. Facilitators and barriers mapped onto the following domains: knowledge; skills; memory, attention, and decision process; environmental context and resources; and technology and infrastructure. Two sets of peer reviewer feedback were received on the manuscript: the first included 34 comments requesting changes, 17 changes were made, requiring 173 person-minutes; the second requested 13 changes, and eight were made, requiring 121 person-minutes.

**Conclusion:** A small and experienced systematic reviewer team using Systematic Review Automation tools who have protected time to focus solely on the SR can complete a moderately sized SR in 2 weeks. © 2020 Elsevier Inc. All rights reserved.

**Keywords:** Systematic reviews; Automation; Methods improvement; 2 week systematic review; 2wSR; Systematic review accelerator; Barriers; Facilitators

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**1. Background**

Systematic reviews (SRs) synthesize evidence to answer a specific question, using methods that are transparent and reproducible. They are considered the highest-level of evidence to underpin clinical and policy decisions.

However, SRs are time and resource intensive, requiring a median of five researchers and 41 weeks to submit to a journal [personal communication, Kathryn Kaiser; [1]]. A median-sized SR search yields 1,781 references (range: 27–92,020) and requires a title/abstract screen of 1,286 references (range 14–77,910) and a full-text screen of 63 references (range: 0–4385). A median-sized SR includes 15 studies (range: 0–291) [1].

The International Collaboration for the Automation of

<sup>\*</sup>Funding: The systematic review described in the manuscript was conducted as part of the work of the Centre for Research Excellence in Minimising Antibiotic Resistance in the Community (CRE-MARC), funded by the National Health and Medical Research Council of Australia.

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## What are Automated Systematic Review Tools?

❖ Software or platforms that use AI, machine learning, or natural language processing to assist in various stages of systematic reviews.

❖ **Key Benefits:**

- Faster screening, data extraction, and synthesis
- Improved accuracy and reproducibility

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## Automated SR Tools



Automation of systematic reviews in order to **simplify the process** of producing reviews



The uptake of automation of systematic reviews has been **relatively slow**



A fully automated process is still **not providing an acceptable performance** compared with human reviewers

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## Automatic SR tools categories



### Visualization tools



### tools that use **active learning**

*combination of a Natural Language Processing (NLP), machine learning, and **human involvement***



### Automated tools

*employ an NLP and classifier but they use labelled documents and **no human interaction** during the learning process*



Most tools in this area are semi-automated and still require human intervention to train them, to achieve an acceptable performance

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## Automatic SR tools categories



### Screening Tools

*Example: Rayyan, Abstrackr*



### Data Extraction Tools

*Example: Covidence, SUMARI*



### Synthesis Tools

*Example: EPPI-Reviewer, RevMan, SUMARI*



### End-to-End Platforms

*Cover all stages of the systematic review process*

*Example: Covidence, DistillerSR, SysRev*

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Based on a scoping review (Khalil et al, 2022):

- Abstract screening has reached maturity
- Data extraction is still an active area

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	Covidence	Sumari	Rayyan	SR-Accelerator
Protocol Development	✗	✓	✗	✓
Search Improvement	✗	✗	✗	✓
Duplicate removal	✓	✓	✓	✓
Article Screening	✓	✓	✓	✓
Critical Appraisal	✓	✓	✗	✗
Synthesis	✗	✓	✗	✗
Assists with reporting	✓	✓	✗	✓
Cost	Subscription	Subscription	Free + (\$)	Free

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# Systematic Review Toolbox



- The Systematic Review Toolbox is an **online catalogue of tools that support various tasks** within the systematic review and wider evidence synthesis process
- Developers: **Dr Christopher Marshall** and **Anthea Sutton**
- Supported and hosted by the **NIHR Innovation Observatory**
- Link: <https://systematicreviewtools.com/>
- 2014

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# Systematic Review Toolbox



## Navigation

Go to

- Quick Search
- Advanced Search
- About

## Advanced Search

Tool Type

Software

Review Family

Systematic

Review Stage

Quality Assess

Search

Number of results: 32

### Name: CADIMA

Summary: CADIMA supports the conduct of systematic reviews and evidence/systematic maps by the provision of a freely available online tool that: 1. guides review authors through the evidence synthesis process, 2. facilitates the coordination of cooperating team members, 3. eases steps with considerable workload and 4. guarantees for its thorough documentation. The evidence synthesis tool was established and is further developed in a close collaboration between the Julius K ln-Institut and the Collaboration for Environmental Evidence.

URL: [Link](#)

Review Families: Systematic, Mapping

Review Stages: Search, Screen, Data Extract, Quality Assess, Synthesis, Report, Reference Management

### Name: Cientopolis Scolr

Summary: Cientopolis Scolr supports collaboration in the process of conducting open, literature reviews.

URL: [Link](#)

Review Families: Systematic, Rapid, Qualitative, Scoping, Mapping, Mixed Method, Other

Review Stages: Protocol, Search, Screen, Data Extract, Quality Assess, Synthesis, Report, Reference Management, Stakeholder Engagement

### Name: Covidence

Summary: A web-based software platform that streamlines the production of systematic reviews, including Cochrane Reviews. Citation screening, Full text review, Risk of Bias assessment, Extraction of study characteristics and other study data, Export of data into RevMan, Nonprofit

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# SRA tools

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## Systematic Review Accelerator

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The logo for the Systematic Review Accelerator, featuring a blue rectangular background with a white leaf icon on the left and the text "Systematic Review Accelerator" in white on the right. A small crest icon is positioned at the bottom right of the blue box.

- ❖ A free software
- ❖ developed at [Bond University](#)
- ❖ speed up translation of searches from PubMed/Ovid MEDLINE
- ❖ URL: <https://sr-accelerator.com/>
- ❖ **Review Families:** Systematic
- ❖ **Review Stages:** Protocol, Search, Screen, Reference Management

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Systematic Review Accelerator

**The Systematic Review Accelerator (SRA)**

Dear SRA users,

We have now released our brand new tools platform the Evidence Review Accelerator (TERA): <https://tera-tools.com/>

TERA includes upgraded versions of the existing tools and some brand new tools as well as project management, allowing you to store all your files in one place.

If you would like to provide feedback or share your user experience please feel free to contact us: [theteam@er-accelerator.com](mailto:theteam@er-accelerator.com)

[Video: TERA announcement \(2 minutes\)](#)

[Video: SRA workshop \(87 minutes\)](#)

Dashboard  
Login  
Methods Wizard  
WordFreq  
SearchRefinery  
Polyglot Search  
Deduplicator  
Screenatron  
Disputatron  
SpiderCite  
RevMan Replicant  
Help  
Recommended Tools  
Whats new  
About Us  
Citing us  
Contact Us  
Collapse

BOND UNIVERSITY  
INSTITUTE FOR Evidence Based Healthcare

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**Rayyan**

**rayyan**

- ❖ Web based, collaborative application to support undertaking systematic reviews
- ❖ Includes a mobile app for screening studies on the go
- ❖ URL: <https://www.rayyan.ai/>
- ❖ **Review Families:** Systematic, Rapid, Qualitative, Scoping, Mapping, Mixed Method, Other
- ❖ **Review Stages:** Screen

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## Sumari

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- ❖ A System for the Unified Management, Assessment and Review of Information
- ❖ containing a suite of tools to support various aspects of the systematic review process
- ❖ developed at the Joanna Briggs Institute (JBI)
- ❖ URL: <https://sumari.jbi.global/>
- ❖ **Review Families:** Systematic, Rapid, Qualitative, Scoping, Mapping, Mixed Method, Other
- ❖ **Review Stages:** Protocol, Screen, Data Extract, Quality Assess, Synthesis, Report, Reference Management

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JBI SUMARI

PRODUCT UPDATES PRICING SUPPORT LOGIN

## END TO END

Support for developing systematic reviews

JBI SUMARI facilitates the entire systematic review process from protocol to report, and includes team and contributor management for effective and efficient collaboration

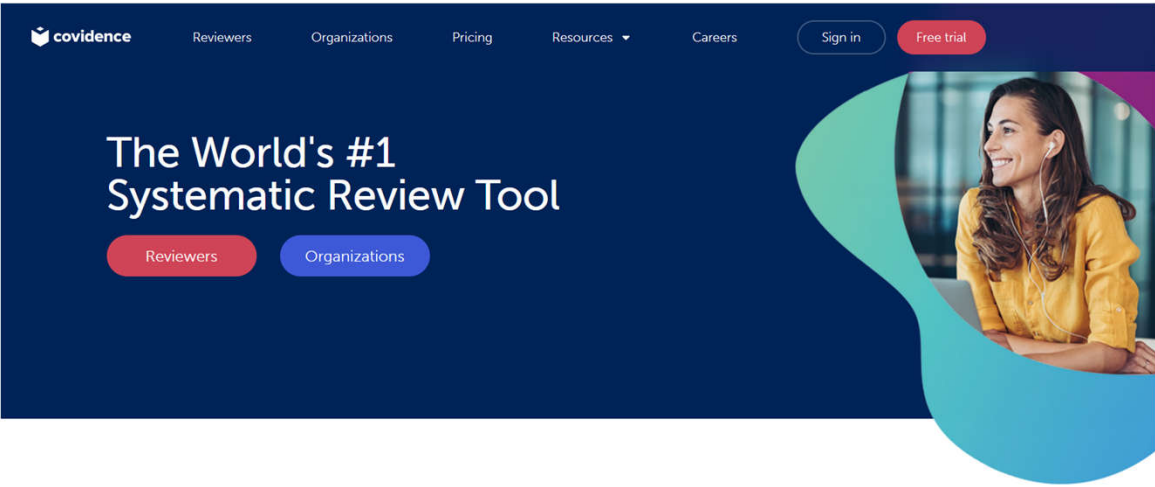
SUBSCRIBE FREE TRIAL

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# Covidence

- ❖ A web-based software
- ❖ Support [Cochrane Reviews](#)
- ❖ Nonprofit organization, open source software
- ❖ URL: <https://www.covidence.org/>
- ❖ **Review Families:** Systematic, Rapid, Mixed Method
- ❖ **Review Stages:** Screen, Data Extract, Quality Assess

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**covidence** Reviewers Organizations Pricing Resources Careers Sign in Free trial

# The World's #1 Systematic Review Tool

Reviewers Organizations

See your systematic reviews like never before

**Faster reviews**  
An average 35% reduction in time spent per review, saving an average of 71 hours per review.

**Expert, online support**  
Easy to learn and use, with 24/7 support from product experts who are also seasoned reviewers!

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# EPPI-Reviewer

EPPI Reviewer

- ❖ Web-based tool
- ❖ Match with **EPPI-Mapper**
- ❖ URL: <http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3396>
- ❖ **Review Families:** Systematic, Rapid, Scoping, Mapping, Other
- ❖ **Review Stages:** Screen, Data Extract, Synthesis

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**EPPI-Reviewer**  
Login

EPPI Centre home Contact Search...

HOME HELP EPPI-MAPPER RIS EXPORT ABOUT ACCOUNT MANAGER

About Features (ER4)

**Features (RE: ER4 / To be updated)**

**EPPI-Reviewer 4: software for research synthesis**  
EPPI-Reviewer 4 is the EPPI Centre's comprehensive online software tool for research synthesis. It is a web-based software program for managing and analysing data in literature review and has been developed for all types of systematic review such as meta-analysis, framework synthesis and thematic synthesis.

**Systematic review**  
EPPI-Reviewer 4 has the functionality to help manage your systematic review through all stages of the process from bibliographic management, screening, coding and right through to synthesis.  
It manages references, stores PDF files, facilitates qualitative and quantitative analyses and allows easy export of review data to enable use with other software programmes.  
The software allows multiple concurrent users to access the system and being web-based allows members of a review group to be located in different geographic locations.

**Searching and screening**  
*Bibliographic information*

**Characterising studies**  
*Organises and applies substantive codes (keywording)*

**Data extraction and quality/relevance assessment**  
*Substantive codes and textual detail (data extraction)*

**Numerical synthesis**  
*Meta-analysis functionality*

**Narrative 'empirical' synthesis**  
*Interrogation of codes and detail*

**Thematic / conceptual synthesis**  
*Line-by-line pdf coding*

EPPI-Reviewer 4 supports many different analytic functions for synthesis including meta-analysis, empirical synthesis and qualitative thematic synthesis. It allows you to present your data in summary diagrams and customisable reports. Recent additions to the software include text mining, data clustering, classification and term extraction which are leading to new possibilities in the field of systematic reviewing.

The only system requirements to run EPPI-Reviewer 4 are that you must be connected to the internet and your computer will need to have the free Microsoft Silverlight browser plug-in installed. This plug-in is available for both PCs and Macs and is available [here](#).

You can start using EPPI-Reviewer 4 today by signing up for a free one month trial [here!](#)

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# Abstrackr

- ❖ An online tool for the task of citation screening for systematic reviews
- ❖ URL: <http://abstrackr.cebm.brown.edu/account/login>
- ❖ **Review Families:** Systematic, Rapid, Scoping, Mapping, Mixed Method
- ❖ **Review Stages:** Screen

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home my account sign out help privacy policy citing abstractkr

**Important Notice:** We are actively working on improving Abstractkr's performance and responsiveness. Please note that we can provide only limited support. However, if you're looking for a more up-to-date abstract screening tool with machine learning assistance that is actively in development and receives full support, we recommend visiting <https://srdplus.ahrq.gov/>.



project name:

project description:

upload file (what can I import?):  No file selected.

screening mode (what?):

order abstracts by:

pilot round size (1uh7):

tag visibility (what?):

Before creating a review, you'll have to select a file to upload and make sure the project has a name.

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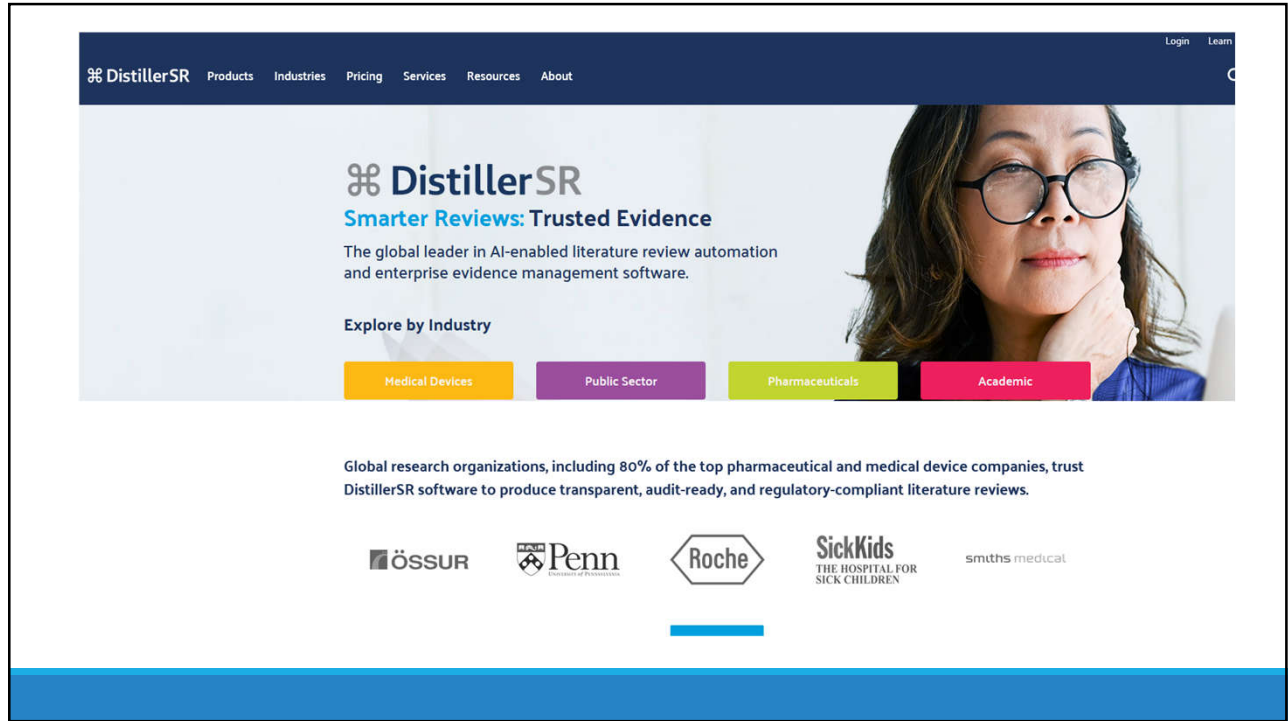
# DistillerSR

⌘ DistillerSR

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- ❖ Web-based tool
- ❖ AI-enabled literature review automation and enterprise evidence management software
- ❖ URL: <https://www.distillersr.com/>
- ❖ **Review Families:** Systematic, Rapid, Scoping, Mixed Method, Other
- ❖ **Review Stages:** Protocol, Screen, Data Extract, Quality Assess, Synthesis, Report, Reference Management

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The image shows a screenshot of the DistillerSR website. At the top, a dark blue navigation bar contains the DistillerSR logo and menu items: Products, Industries, Pricing, Services, Resources, and About. On the right side of the navigation bar, there are links for 'Login' and 'Learn'. The main content area features a large background image of a woman with glasses. The text on the page reads: 'DistillerSR Smarter Reviews: Trusted Evidence'. Below this, it states: 'The global leader in AI-enabled literature review automation and enterprise evidence management software.' A section titled 'Explore by Industry' includes four colored buttons: Medical Devices (orange), Public Sector (purple), Pharmaceuticals (green), and Academic (pink). A testimonial below reads: 'Global research organizations, including 80% of the top pharmaceutical and medical device companies, trust DistillerSR software to produce transparent, audit-ready, and regulatory-compliant literature reviews.' At the bottom, logos for ÖSSUR, Penn (University of Pennsylvania), Roche, SickKids (The Hospital for Sick Children), and smiths medical are displayed.

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