A guide to

Systematic Literature Reviews

and 5 reasons why we want them

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What is a Systematic Literature Review?

*"…a means of evaluating and interpreting **all** available research relevant to a particular **research question**, **topic area**, or **phenomenon** of interest.*
*Systematic reviews aim to present a fair evaluation of a research topic by using a **trustworthy**, **rigorous**, and **auditable** methodology."* (Keele Staff, 2007)

— I'm using the acronym SLR in the rest of the slides —

Where do SLRs come from?

Systematic research synthesis in **medicine** (in 1972)

Research synthesis to aid **evidence-based** medicine

*'the conscientious, explicit, judicious use of current best evidence in **making decisions** about the care of individual patients.' (Sackett et al. 1996)*

5 reasons SLRs are a good thing

Researchers get an **overview** of their area of interest

Highlight areas for **further work**

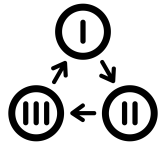Knowledge **organization**

Service to the research community

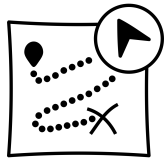They are (usually) **well-cited**

Typology of literature reviews

Narrative literature review

Situates a study within the relevant literature, non-systematic

Systematic literature review

Provides a comprehensive summary of literature

Systematic **mapping** review

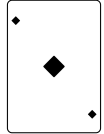*Characterizes quantity and themes of research in an area*
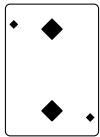
Systematic **scoping** review

Similar to mapping, but considered preliminary
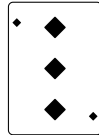
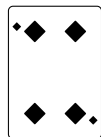For even more types: http://bit.ly/2h2IVqE
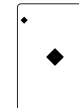
SLRs: Step-by-step guide

{ Define questions
Define keyword string
Select databases
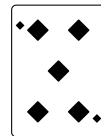Define inclusion/exclusion criteria
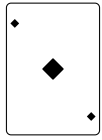
Perform initial search

{ Apply criteria to papers from
List of included papers }

Read full text

{ Data extraction
Create annotated bibliography
Data processing }

⬦ : **Set up**

? The **questions** will guide the rest of the choices
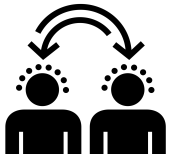
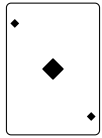🔑 Keyword string needs to capture **main elements** of the area

"Same concept, different name" issue

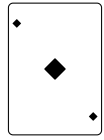🏆 Most **representative** publishers in the discipline

👥 Inclusion/Exclusion criteria need to be **precise**

⬦ : Set up

*open source **OR** FLOSS **OR** (Libre **AND** software **OR** project) **OR** (Free **AND** software **OR** project) **AND** (certification **OR** certify)*

⬦ : Set up

1. Abstract and/or title **contain the keywords** as defined in the search string

2. Papers are published in **journals**, **conference proceedings**, or are **book chapters**.

3. Software certification refers to OSS and is the **main theme of the paper** (certification mentioned in more than one third of the pages of the publication).

4. Publications are in **English**.

5. The full paper content is **available** in the collection (not just its abstract).

What to watch out for
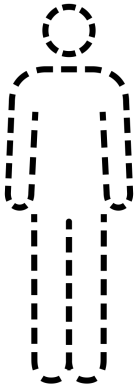
Not scoping keywords enough

Choose your words wisely

What to watch out for

What to watch out for

8 - Bounty Programs in Free/Libre/Open Source Software
The Economics of Open Source Software Development, 2006, Pages 165-183
Sandeep Krishnamurthy, Arvind K. Tripathi
▶ Abstract

Web-based oral health promotion program for older adults: Development and preliminary evaluation Original Research Article
International Journal of Medical Informatics, Volume 91, July 2016, Pages e9-e15
Rodrigo J. Mariño, Parul Marwaha, Su-yan Barrow
▶ Abstract | 📕 PDF (422 K)

An insight into license tools for open source software systems Original Research Article
Journal of Systems and Software, Volume 102, April 2015, Pages 72-87
Georgia M. Kapitsaki, Nikolaos D. Tselikas, Ioannis E. Foukarakis
▶ Abstract | ▶ Research highlights | 📕 PDF (2375 K)

On the use of developers' context for automatic refactoring of software anti-patterns Original Research Article
Journal of Systems and Software, In Press, Corrected Proof, Available online 28 May 2016
Rodrigo Morales, Zéphyrin Soh, Foutse Khomh, Giuliano Antoniol, Francisco Chicano
▶ Abstract | ▶ Research highlights | 📕 PDF (2073 K)

Mental floss: polish up your brain Original Research Article
New Scientist, Volume 208, Issue 2780, 2 October 2010, Pages 28-33
Helen Thomson
▶ Abstract
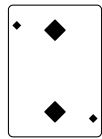
: Initial search

👍 Publishers usually support search in a number of text fields

👎 Sciences, disciplines, sub-disciplines etc, are **not** standardized across publishers

| All | Journals | Books | Reference Works | Images |

Advanced search | Expert search

? Search tips

Search for

[   ] in ✓ All Fields
        Abstract, Title, Keywords
[AND ▾]   Authors
        Specific Author
[   ] in Source Title
        Title
Refine your search   Keywords
        Abstract
☑ Journals   ☑ All   References
☑ Books   ☐ My Favorites   ISSN
        ☐ Subscribed publications   ISBN
        ☐ Open Access articles   Affiliation

👎 Hold down the Ctrl key (or Apple Key) to select multiple entries.

- All Sciences -
Agricultural and Biological Sciences
Arts and Humanities
Biochemistry, Genetics and Molecular Biology

◉ All Years   ◯ [2007 ▾] to: [Present ▾]
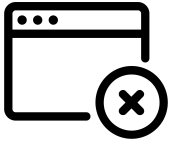
[Search]

What to watch out for
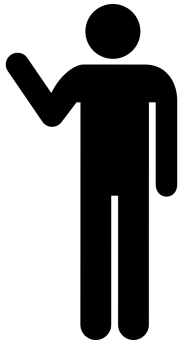
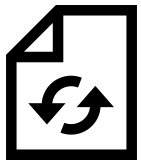Say hello to a flood of papers

But don't despair yet
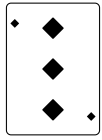
: Selection

Apply the inclusion/exclusion **criteria** you defined
Most often this is done on the title and abstract

If in doubt, **document** your decisions

Update the selection criteria if you need to
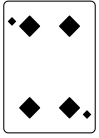
You can **iterate** on the selection step
This step will drastically reduce the number of papers

What to watch out for
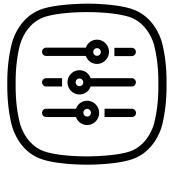
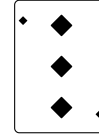It is easy to get overwhelmed

Stick with your questions

: Review full text

This **applies** to the papers you kept in

You may make final **adjustments** to your criteria

You **parse** for the data you want to extract

== the data that is relevant to your question(s)

⬖ : Set up

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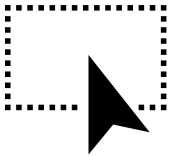
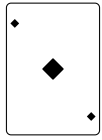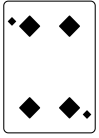# : Review full text

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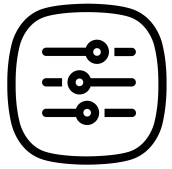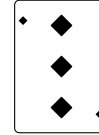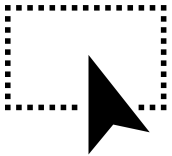
== the data that is relevant to your question(s)

What to watch out for
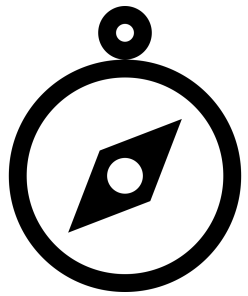
It is easy to get lost in details

Stick with your questions

Optional step: snowball search
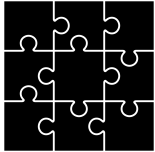
The aim is to support the **completeness** of the search
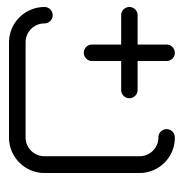
This is an additional search based on some of the **reviewed** papers in
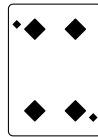
Backward snowball: papers that paper X cites

Apply the existing selection criteria

Forward snowball: papers that cite paper X

Apply the existing selection criteria
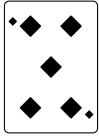
🎴 : The real work

Probably the most **labor-intensive** step

Extract the data and create an **annotated bibliography**

http://guides.library.cornell.edu/annotatedbibliography
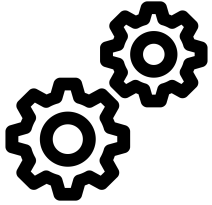
Data **processing** can take many forms

qualitative coding, quantitative analysis, etc

What to watch out for

Thinking you are done

You need to tell people

Reporting a SLR

Usually includes research **demographics** for the area
number and frequency of publications, affiliations, etc
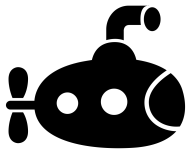
In-depth presentation of the review findings
themes, summary of sub-areas, tables, etc
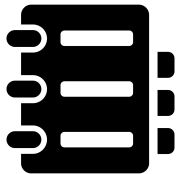
Usually concludes with a **research agenda**

Guidelines for SLRs in Software Engineering

Guidelines for performing Systematic Literature Reviews in Software Engineering

Version 2.3

EBSE Technical Report

Software Engineering Group
School of Computer Science and Mathematics
Keele University
Keele, Staffs
ST5 5BG, UK

and

Department of Computer Science
University of Durham
Durham,
UK

Things to remember

The methodology behind SLRs is meant to lessen **bias**

Bias in the primary studies can still exist though

The SLR reporting should support **replication**

Present your review protocol clearly

You may forget **tacit** details

Document everything
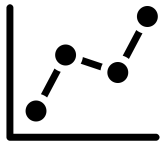
SLRs may detect **effects** that individual studies cannot

This applies more when assessing quality

Yes, there is such a thing as a **SLR of SLRs**

It's called a "tertiary review"

Thank you

Good luck with your SLR!

References

Cochrane AL (1972) Effectiveness and efficiency: random reflections on health services. London: Royal Society of Medicine Press.

Sackett DL et al (1996) Evidence based medicine: what it is and what it isn't. British Medical Journal 312: 71-2.

Keele Staff. (2007). Guidelines for performing systematic literature reviews in software engineering. In Technical report, Ver. 2.3 EBSE Technical Report. EBSE. sn.
Chicago (link)

Britten, N., Campbell, R., Pope, C., Donovan, J., Morgan, M., & Pill, R. (2002). Using meta ethnography to synthesise qualitative research: a worked example. Journal of health services research & policy, 7(4), 209-215.

Jalali, S., & Wohlin, C. (2012, September). Systematic literature studies: database searches vs. backward snowballing. In Proceedings of the ACM-IEEE international symposium on Empirical software engineering and measurement (pp. 29-38). ACM.

Good examples of SLRs in SE

Kitchenham, B., Brereton, O. P., Budgen, D., Turner, M., Bailey, J., & Linkman, S. (2009). Systematic literature reviews in software engineering–a systematic literature review. Information and software technology, 51(1), 7-15.

Beecham, S., Baddoo, N., Hall, T., Robinson, H., & Sharp, H. (2008). Motivation in Software Engineering: A systematic literature review. Information and software technology, 50(9), 860-878.

Hossain, E., Babar, M. A., & Paik, H. Y. (2009, July). Using scrum in global software development: a systematic literature review. In Global Software Engineering, 2009. ICGSE 2009. Fourth IEEE International Conference on (pp. 175-184). Ieee.

Dybå, T., & Dingsøyr, T. (2008). Empirical studies of agile software development: A systematic review. Information and software technology, 50(9), 833-859. Chicago

Šmite, D., Wohlin, C., Gorschek, T., & Feldt, R. (2010). Empirical evidence in global software engineering: a systematic review. Empirical software engineering, 15(1), 91-118.