



Systematic Literature Review & Mapping

Juan Cruz-Benito

GRIAL Research Group, Department of Computers and Automatics
University of Salamanca, Salamanca, Spain.

juancb@usal.es

@_juancb

Education in the Knowledge Society PhD programme.
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Outline

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- Goals
- Planning the SLR & Mapping
- Methodology
- SLR & Mapping, step by step
- Where to publish a Literature Review
- Conclusions
- Acknowledgments
- References



Introduction

What is a SLR & Mapping?



Introduction. What is a SLR & Mapping

The SLR is a type of literature review that collects and critically analyzes multiple research studies or papers through a systematic process.

The purpose of a SLR is to provide an exhaustive summary of the available literature relevant to a research question.



Introduction. What is a SLR & Mapping

The SLR born in the field of Medicine and Health studies to get expertise in a topic.

In Healthcare, exists the Cochrane Collaboration group composed by more than 31000 members that work reviewing systematically research related to prevention, treatments, rehabilitation and health systems intervention.

This group publish their reviews in the Cochrane Database of Systematic Reviews which has an impact factor of 6.103 and is ranked 12th in the “Medicine, General & Internal” in JCR (top 7%).



Introduction. What is a SLR & Mapping

The SLR is not currently restricted to Healthcare. There are many researchers and organization involved in making SLR in other knowledge fields.

I.E. the Campbell Collaboration is a sister initiative of Cochrane Collaboration that deals with SLR in Social Sciences.

Also in other fields like Computer Sciences there is a strong community that works with SLR and tries to standardize it and spread its techniques and results in the knowledge area.



Introduction. What is a SLR & Mapping

The Mapping in Literature Reviews (*a.k.a.* Literature Mapping) techniques are useful at the very beginning of the literature review as a brainstorming and scoping tool¹.

The literature mapping is broadly used to complement the SLR

¹ https://as.exeter.ac.uk/media/universityofexeter/academicservices/educationenhancement/cascade/Mapping_in_literature_reviews.pdf



Introduction. What is a SLR & Mapping

The Mapping Literature techniques/outcomes are very different depending on the purpose:

- To write down words, phrases and sub-topics related to the main topic in a white paper to gather key concepts and issues
- Summarize key findings from journal, books and working papers to create concept maps
- Present a summary of the journals, conferences, publication years, most important authors, etc. found in the SLR
- Etc.



Introduction. What is a SLR & Mapping

Systematic Literature Review

≠

Mapping in Literature Reviews



Introduction. What is a SLR & Mapping

Systematic Literature Review

+

Mapping in Literature Reviews

=

Better results



Goals



Goals

- Deeper knowledge in your knowledge field
- Get insight about the current trends and future challenges
- Identify the most important authors
- Identify the most important journals & conferences
- Get a (several?) good publication(s)
- Get citations



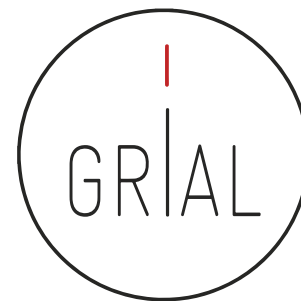
Planning the SLR & Mapping



Planning the SLR & Mapping

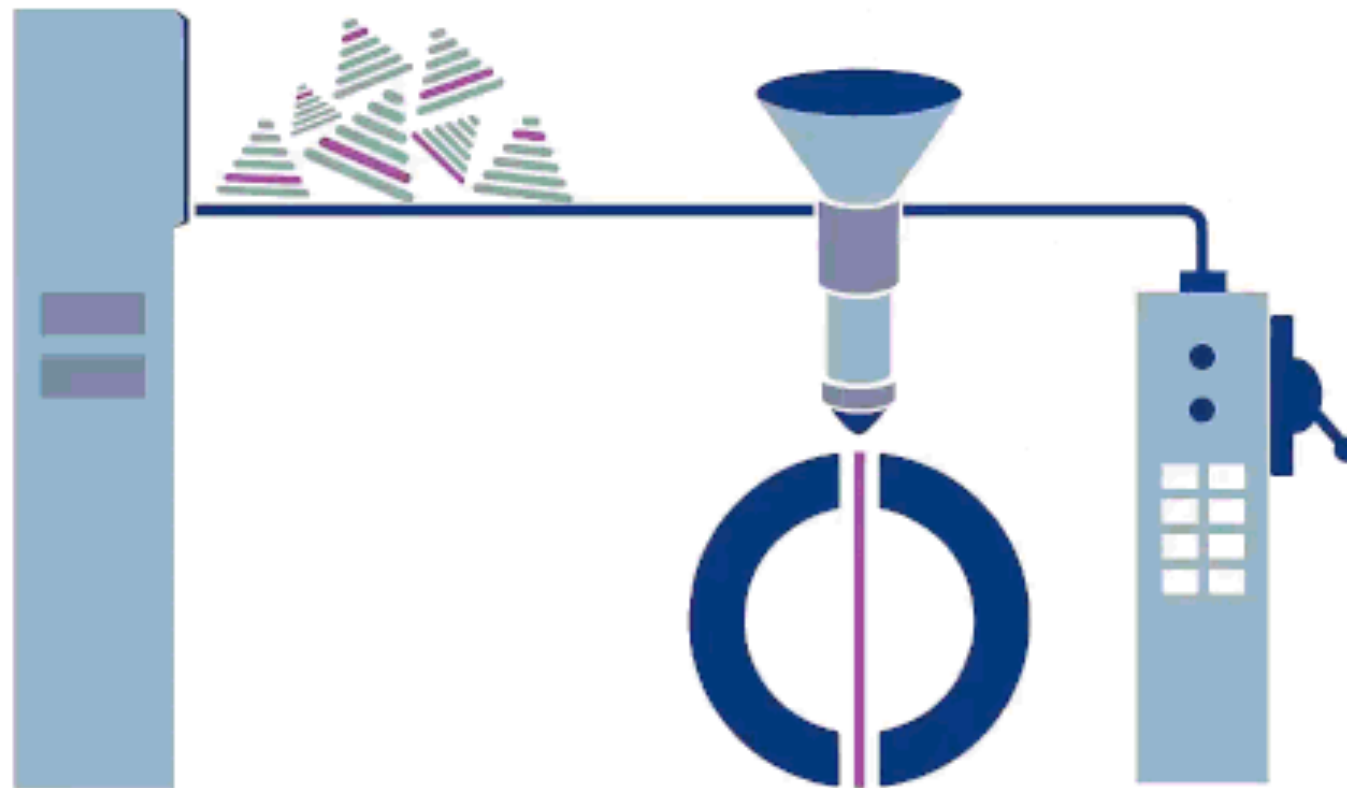
Several aspects to keep in mind:

- Scope
- Time
- Planned *revenue*
- Where to publish



Methodology

Methodology



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Methodology

- Define research questions (and goals)
- Define inclusion criteria for your SLR
- Define exclusion criteria for your SLR
- Search in scientific databases and extract relevant contents/data (iterating the process in several stages).
- Assess the quality of these results
- Gather the most outstanding results in order to analyze, discuss and learn from them.



SLR & Mapping, step by step



SLR & Mapping, step by step

1. RQs
2. ICs
3. ECs
4. PICOC
5. Databases
6. Queries
7. Review phases
8. Quality assessment
9. Traceability
10. Write results



Research Questions

SLR & Mapping, step by step

Research questions: Mapping

MQ1: How many studies were published over the years?

MQ2: Who are the most active authors in the area?

MQ3: Which publication vehicles are the main targets for research production in the area?

MQ4: In which domains has pragmatic interoperability been applied? (e.g. Bioinformatics, Telemedicine, Business)

MQ5: Which type of computational support has pragmatic interoperability techniques provided (e.g. framework, software architecture, etc.)?

MQ6: Which definitions of pragmatic interoperability have been used?



SLR & Mapping, step by step

Research questions: SLR

RQ1: Which solutions have been used to enhance pragmatic interoperability?

RQ2: How did the proposed solutions address pragmatic interoperability?



SLR & Mapping, step by step

PICOC



SLR & Mapping, step by step

PICOC: defining the SRL scope. This scope helps in the papers analysis to answer the research questions

- Population (P)
- Intervention (I)
- Comparison (C)
- Outcomes (O)
- Context (C)



SLR & Mapping, step by step

PICOC

Population (P): Solutions that implement interoperability.

Intervention (I): Pragmatic interoperability solution.

Comparison (C): No comparison intervention.

Outcomes (O): Solution.

Context(C): Computational solutions.



SLR & Mapping, step by step

Inclusion Criteria



SLR & Mapping, step by step

Inclusion Criteria

- IC1: The papers proposed a pragmatic interoperability solution (method, technique, model, tool, framework) AND
- IC2: The proposed solution are applied on software OR system OR application OR service OR infrastructure AND
- IC3: The proposed solution supports machine to machine pragmatic interoperability AND
- IC4: The papers are written in English language AND
- IC5: The papers are reported in peer reviewed Workshop or Conference or Journal or Technical Reports.



SLR & Mapping, step by step

Exclusion Criteria



SLR & Mapping, step by step

Exclusion Criteria

- EC1: The papers do not propose a pragmatic interoperability solution OR
- EC2: The proposed solution are not applied on software OR system OR application OR service OR infrastructure OR
- EC3: The proposed solution does not support machine to machine pragmatic interoperability OR
- EC4: The papers are not described in English OR
- EC4: The papers are not published in a peer reviewed conference or journal



SLR & Mapping, step by step

Databases



SLR & Mapping, step by step

Databases:

WoS, Scopus, Google Scholar, IEEEExplore, ACM, Springer, ERIC,
Pubmed, ScienceDirect, Compendex, etc.

**Not limited only to major databases.



SLR & Mapping, step by step

Queries



SLR & Mapping, step by step

The queries between the different database where the researcher search for results should be the same or equivalent

(if not, the results gathered would not be comparable)



SLR & Mapping, step by step

Review phases

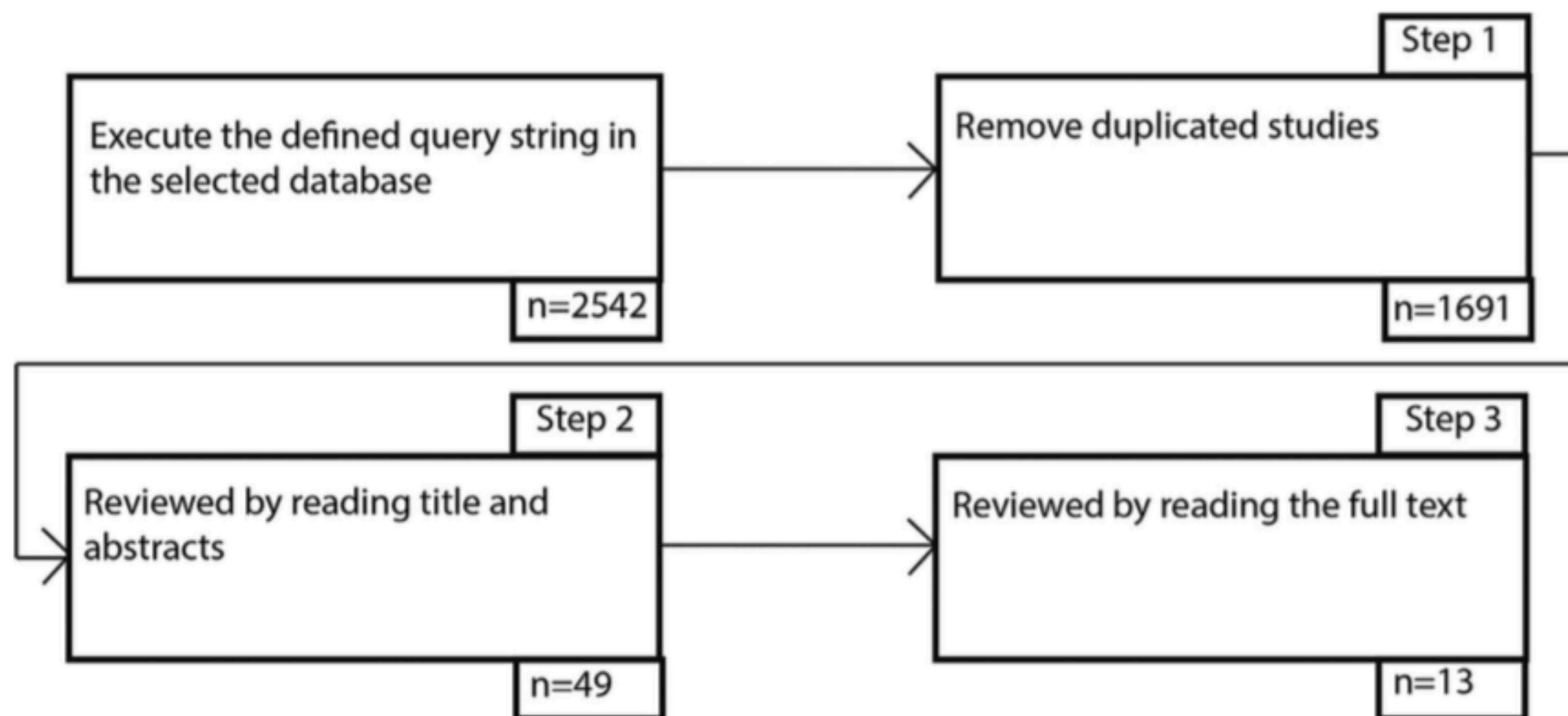
SLR & Mapping, step by step

Review phases. Typical steps:

1. Execute query
2. Remove duplicates
3. Review by regarding titles and abstracts (applying IC, EC)
4. Review the full text & assess quality (applying also IC, EC)
5. Include (if necessary) papers cited in your results and repeat

SLR & Mapping, step by step

Review phases





SLR & Mapping, step by step

Quality assessment

SLR & Mapping, step by step

Quality assessment: checklist

- The researcher would assess quality using a checklist to evaluate the aspects relevant for the SLR in each paper
- Depending on the evaluation score, each paper would be included or excluded in the final phase. The researcher will fix the cutoff point.

SLR & Mapping, step by step

Quality assessment: checklist

Question	Score
1. Are the research aims clearly specified?	Y/N/partial
2. Was the study designed to achieve these aims?	Y/N/partial
3. Are the used techniques clearly described and their selection justified?	Y/N/partial
4. Are the variables considered by the study suitably measured?	Y/N/partial
5. Are the data collection methods adequately described?	Y/N/partial
6. Is the data collected adequately described?	Y/N/partial
7. Is the purpose of the data analysis clear?	Y/N/partial
8. Are statistical techniques used to analyse data adequately described and their use justified?	Y/N/partial
9. Are negative results (if any) presented?	Y/N/partial
10. Do the researchers discuss any problems with the validity/reliability of their results?	Y/N/partial
11. Are all research questions answered adequately?	Y/N/partial
12. How clear are the links between data, interpretation and conclusions?	Y/N/partial
13. Are the findings based on multiple projects?	Y/N/partial



Traceability

SLR & Mapping, step by step

Traceability

- You must provide full explanations on how was carried the process
- You should include the papers reviewed in each phase. Depending the review phase you will required to specify the IC, EC used to select or reject the paper in the SLR.
- If you do not provide these explanations, the reviewer/thesis supervisor will not be able to trust your research (and you).



SLR & Mapping, step by step

Traceability

- Most of these information cannot be included in a journal/conference paper.
- Too much extension / visual fatigue (in the case of huge tables)



SLR & Mapping, step by step

Traceability

- One solution: use Google Spreadsheets
- <https://docs.google.com/spreadsheets/d/169RCtU7Q4Qqleryq1d6c1XnMzDEhgypTYqZh1C8eaYA/edit#gid=0>
- Other solutions: use Websites
- <https://sites.google.com/site/francilaneiva/research/pragmatic-interopability-a-systematic-mapping>



SLR & Mapping, step by step

Write results

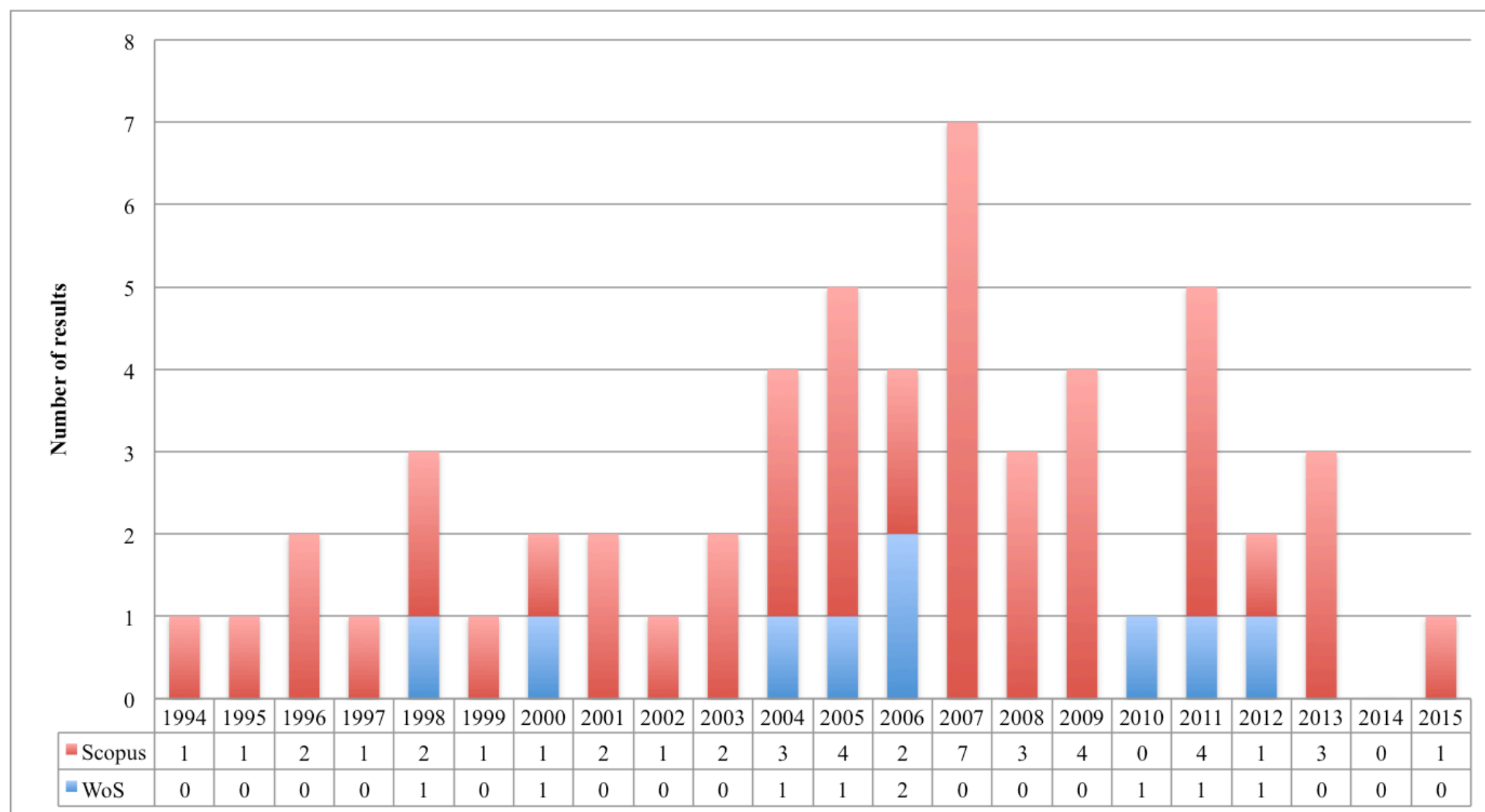
SLR & Mapping, step by step

Write results:

- Usually the resultant paper will have one section for the mapping report and other for the systematic
- Each one should respond the research questions and provide insights about the paper and contents selected for that.
- Use charts, tables and visual explanations

SLR & Mapping, step by step

Write results.



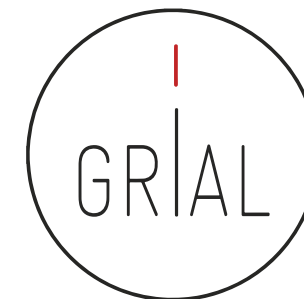


SLR & Mapping, step by step

Write results.

Authors' names and number of publications.

Name	Total
Kecheng Liu	3
James Geller, Yugyung Lee, Lea Kutvonen	2
Zhongfu Wu, Borianana Rukanova, Lin Liang, Pieter De Leenheer, Goran D. Putnik, Gan Mingxin, Min Gao, Wenge Rong, Zlata Putnik, Robert A. Stegwee, Andreas Tolk, Soon Ae Chun, Jejung Lee, Lus Ferreira, Electra Tamani, Saikou Y. Diallo, Sanket Shah, Janne Metso, Chintan Patel, Kecheng Liu, Kees van Slooten, Paraskevas Evripidou, Toni Ruokolainen, Stijn Christiaens, Maria Manuela Cruz-Cunha, Charles D. Turnitsa, Weizi Li,	
Shixiong Liu	1



SLR & Mapping, step by step

Write results.

Publication channel.

Reference	Channel name	<i>h</i> -index
[22]	ACM Symposium on Applied Computing (SAC)	61
[23]	International Conference on Advanced Language Processing and Web Information Technology (ALPIT)	7
[19]	IEEE Enterprise Distributed Object Computing Conference Workshops (EDOCW)	13
[24]	International Conference on e-Business Engineering (ICEBE)	20
[25]	International Conference on Enterprise Information Systems (ICEIS)	24
[26, 27]	International Conference on the Pragmatic Web (ICPW) IEEE International Conference on Web Services (ICWS)	–
[28]	International Journal of Enterprise Information Systems (IJEIS)	58
[29]	Information Resources Management Journal (IRMJ)	11
[30]	IEEE International Conference on Service Operations and Logistics and Informatics (SOLI) World Multi-conference on Systemics, Cybernetics and Informatics (WMSCI)	22
[31]	IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid)	–
[18]	ACM Symposium on Applied Computing (SAC)	5
[32]	International Conference on Advanced Language Processing and Web Information Technology (ALPIT)	60

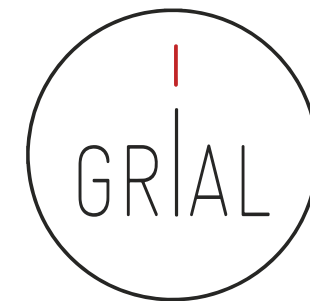


SLR & Mapping, step by step

Write results.

RQ1—solutions to promote pragmatic interoperability.

Reference	Service discovery, composition and/or selection	Ontology	Software agents	Pragmatic web services	Pragmatic grid	Meta model
[30]	X	X				
[24]		X				
[23]	X	X	X	X		
[29]	X	X				X
[18]	X	X				
[31]	X		X		X	
[25]						X
[27]	X					
[22]	X	X				
[26]		X				
[19]	X	X				X
[28]	X	X	X	X		X
[32]						X



SLR & Mapping, step by step

Write results.

Categories	Physical context / devices						Software Engineering specifications					Human-Computer Interaction specifications							Learning					
	Personal Computers	Wearables	Mobile/ smartphones	Servers	Domotics	Robots	Components' communication	Information collectors	Architecture diagrams (ADL, UML, etc.)	Design details (patterns, use cases, etc.)	Technologies, languages	Standards	Measurement process description	React to users' interaction	Centered on usability	HCI - software elements	HCI - hardware elements	Laboratory experiment	Field study	Standards	Purpose of analysis	Standards	Potential users	Mobile learning
An Information System Prototype for Analysis of Astronaut/Computer Interaction During Simulated EVA	I	E	U	I	U	U	E	I	U	U	E	U	E	U	I	I	E	E	I	U	U	U	U	U
Experiences with Software Architecture Analysis of Usability	E	U	E	E	U	U	I	I	E	E	I	I	E	I	E	E	U	I	I	U	U	U	U	U
Exploring the benefits of the combination of a software architecture analysis and a usability evaluation of a mobile application	E	U	E	I	U	U	I	I	E	E	U	I	E	I	E	E	I	E	E	U	U	U	U	U
Bridging patterns: An approach to bridge gaps between SE and HCI	E	U	I	U	U	U	I	I	E	E	I	I	E	I	I	E	I	U	I	U	U	U	U	U
A unified architecture to develop interactive knowledge based systems	E	U	U	U	U	U	I	I	E	E	E	U	E	U	U	E	U	U	U	U	U	U	U	U
Mockup-based Navigational Diagram for the Development of Interactive Web Applications	E	U	U	U	U	U	E	E	E	E	E	I	E	I	U	E	U	I	U	U	U	U	U	U
An Integration Framework for Motion and Visually Impaired Virtual Humans in Interactive Immersive Environments	U	U	U	I	E	U	E	E	E	E	E	I	E	I	I	E	I	U	U	U	U	U	U	U
Towards improving user interfaces: a proposal for integrating functionality and usability since early phases	I	U	U	U	U	U	I	I	E	E	U	E	E	I	E	E	U	E	U	E	U	U	U	U
A case study of post-deployment user feedback triage	I	U	U	I	U	U	U	I	U	U	E	U	I	U	U	E	U	U	U	U	U	U	U	U
Context-aware mobile augmented reality architecture for lifelong learning	I	E	E	I	U	U	I	I	E	E	E	U	I	I	I	E	E	I	U	U	E	U	E	E
Development of a communication robot (fbot)	U	U	U	U	U	E	U	E	E	U	I	U	E	E	U	U	E	E	I	U	U	U	I	U
Autonomous Behavior Control Architecture of Entertainment Humanoid Robot SDR-4X	E	U	U	I	U	E	U	I	E	I	U	U	I	E	U	U	E	E	I	U	U	U	U	U
Usability and software architecture	U	U	U	U	U	U	I	I	E	E	U	I	I	E	I	E	U	E	I	U	U	U	U	U
An architecture for automatic gesture analysis	I	U	U	I	U	E	U	I	U	U	U	U	E	I	U	U	E	E	U	U	U	U	U	U
Inconsistency Management for Multiple-View Software Development Environments	E	U	U	U	U	U	U	U	I	E	E	U	U	U	U	E	U	E	U	U	U	U	U	U
Linking usability to software architecture patterns through general scenarios	I	U	U	I	U	U	U	I	E	E	U	U	I	E	E	E	U	E	I	U	U	U	U	U



Where to publish a Literature Review & Mapping



Where to publish a Literature Review & Mapping

- Conferences
- Journals
- Books



Where to publish a Literature Review & Mapping: examples



Where to publish a Literature Review & Mapping

- TEEM Conference
- Other conferences (HCI International, Interacción, SIIE, AIDIPE?)
- PLOS ONE
- Education in the Knowledge Society (EKS)
- International Journal of Knowledge Management (IJKM).
- Health Education



Where to publish a Literature Review & Mapping

- International Journal of Law and Management
- International Journal of Productivity and Performance Management
- Computers in Human Behavior
- Information and Software Technology
- IEEE Transactions on Software Engineering
- Computers & Education
- ...



Conclusions

Conclusions

- Strengths
 - This kind of reviews are regarded as the strongest in many knowledge areas
 - Many organizations fund SLR processes for develop research
 - A good SLR in a journal that accepts this kind of research, has real choices to be published

Conclusions

- Weaknesses
 - Publisher bias
 - If the review takes too much time, you will need to re-do some parts after a while
 - Should be extended usually to other databases apart of the main ones. This will help the SLR effectiveness
 - Depending the publisher, you will need to cut some parts of your SLR (regarding papers extension)

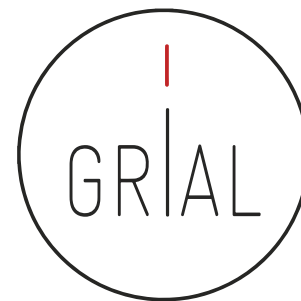


Conclusions

- To publish your SLR & Mapping:
 - Find what journals/conference use to publish them and the latest SLR papers published
 - Prepare your paper version of the SLR based on these latest papers published previously to your submission
 - If you will make a huge SLR, only part of it would be published by a journal/conference. The other part of the content/results could be available in your full Thesis volume



Do a SLR!



Acknowledgments



Acknowledgments

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References



References

- Fink, A. (1998). *Conducting literature research reviews: from paper to the internet*. Thousand Oaks, CA: Sage
- Neiva, F. W., David, J. M. N., Braga, R., & Campos, F. (2016). Towards pragmatic interoperability to support collaboration: A systematic review and mapping of the literature. *Information and Software Technology*, 72, 137-150.
- Kitchenham, B. A., Budgen, D., & Brereton, O. P. (2011). Using mapping studies as the basis for further research—a participant-observer case study. *Information and Software Technology*, 53(6), 638-651.
- Kitchenham, B. (2004). Procedures for performing systematic reviews. *Keele, UK, Keele University*, 33(2004), 1-26.
- B.A. Kitchenham, S. Charters, Guidelines For Performing Systematic Literature Reviews in Software Engineering, EBSE Technical Report EBSE-2007-01, 2007. URL <http://www.rbsv.eu/courses/rmtw/mtrl/SLR.pdf>.
- Petticrew, M., & Roberts, H. (2008). *Systematic reviews in the social sciences: A practical guide*. John Wiley & Sons.



References

- Cruz-Benito, J., Therón, R., & García-Peñalvo, F. J. (2016, July). Software architectures supporting human-computer interaction analysis: A literature review. In *International Conference on Learning and Collaboration Technologies* (pp. 125-136). Springer International Publishing.
- Neiva, F. W., David, J. M. N., Braga, R., & Campos, F. (2016). Towards pragmatic interoperability to support collaboration: A systematic review and mapping of the literature. *Information and Software Technology*, 72, 137-150.
- Radant, O., Colomo-Palacios, R., & Stantchev, V. (2014). Analysis of Reasons, Implications and Consequences of Demographic Change for IT Departments in Times of Scarcity of Talent: A Systematic Review. *International Journal of Knowledge Management (IJKM)*, 10(4), 1-15.
- Chilton, R., Pearson, M., & Anderson, R. (2015). Health promotion in schools: a scoping review of systematic reviews. *Health Education*, 115(3/4), 357-376.
- Sepúlveda, S., Cravero, A., & Cachero, C. (2016). Requirements modeling languages for software product lines: A systematic literature review. *Information and Software Technology*, 69, 16-36.
- Chei-Chang Chiou (2009) Effects of concept mapping strategy on learning performance in business and economics statistics. *Teaching in Higher Education*. Feb2009, Vol. 14 Issue 1, p55-69.



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Juan Cruz-Benito

GRIAL Research Group, Department of Computers and Automatics
University of Salamanca, Salamanca, Spain.

juancb@usal.es

@_juancb

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