









	Introduction
6	Motivation
	What is a systematic literature review?
	• A systematic review is a means of evaluating and interpreting all available research relevant to a particular research question or phenomenon of interest.
	• Individual studies contributing to a systematic review are called primary studies; a systematic review is a form of secondary study.
4	• Systematic reviews aim to present a fair evaluation of a research topic by using a trustworthy, rigorous, and auditable methodology.
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	Introducti	on
5 6 C 5	Motivatio	n
	Reasons to make a systematic literature review	
	• To summarize the existing evidence concerning a treatment or technology (e.g. to summarize the empirical evidence of the benefits and limitations of a specific agile method).	
	• To identify any gaps in current research in order to suggest areas for further investigation.	
	• To provide a framework/background in order to appropriately position new research activities.	
	• To examine the extent to which empirical evidence supports/contradicts theoretical hypotheses, or even to assist the generation of new hypotheses	
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	Introduction
S	G. Motivation
	Features of systematic literature reviews
	• SLRs start by defining a review protocol that specifies the research question being addressed and the methods that will be used to perform the review.
	• SLRs are based on a defined search strategy that aims to detect as much of the relevant literature as possible.
	• SLRs document their search strategy so that readers can access its rigorous and completeness.
	• SLRs require explicit inclusion and exclusion criteria to assess each potential primary study.
	• SLRs specify the information to be obtained from each primary study including quality criteria by which to evaluate each primary study.
	• SLRs are a prerequisite for quantitative meta-analysis.
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- Ale	The review process
	Planning the review
	Identification of the need for a review
	Researchers should identify and review any existing systematic reviews of the phenomenon of interest against appropriate evaluation criteria:
	 What are the review's objectives? What sources were searched to identify primary studies? Were them are protrictions?
	 What were the inclusion/exclusion criteria and how were they applied?
	• What criteria were used to assess the quality of primary studies and how were they applied?
	 How were the data extracted from the primary studies? How were the data synthesised? How were differences between
SL I	studies investigated? How were the data combined? Was it reasonable to combine thestudies? Do the conclusions flow from
	the evidence?

	The review process
6	Planning he review
	Commissioning a review
	• When an organisation requires information about a specific topic but does not have the time or expertise to perform a systematic literature itself.
	• It will commission researchers to perform a systematic literature review of the topic.
	• A commissioning document specifying the work required must be written.
	• A commissioning document will contain or consider the following items:
	Project Title, Background, Review Questions, Advisory/Steering Group Membership (Researchers, Practitioners, Lay members, Policy Makers etc.) Methods of the review Project Timetable
	Dissemination Strategy, Support Infrastructure, Budget,
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	The review process
	Planning the review
The research	n question: An Example
Jorgensen, M., Shep software developmer	perd, M. (2007). A systematic review of at cost estimation studies. IEEE TSE 33(1), 33-53.
Research Question	Main Motivation
R01: Which and how many journals include papers on software cost estimation?	 Support cost estimation researchers with a list of journals with potentially relevant papers.
PiO2: To what extent are software cost estimation researchers aware of the breadth of potential estimation study sources?	I Identify possible shortcomings of cost estimation researchers' searches for related work.
R03: Which journal is the dominant software cost estimation journal? To what extent does this journal have research topic biases?	 Identify the most important software cost estimation journal and the extent to which this journal reflects the totality of software cost estimation research.
RQ4: How easy is it to identify relevant software cost estimation journal papers?	 Identify possible shortcomings of internet and library-based searches to identify cost estimation papers.
RQS: How many researchers are there who have a long term interest in software cost estimation? To what extend do the interests of these researchers affect the distribution of research topics?	Assess the vulnerability of software cost estimation research; for example, there being few researchers on particular topics may increase vulnerability.
Ft06: What are the most investigated software cost estimation research topics and how has this changed over time?	 Identify trends and possible shortcomings / opportunities for research topic focus.
RQ7: What are the most investigated estimation methods and how has this changed over time?	 Identify trends and possible shortcomings / opportunities for estimation method focus.
FiQ8: What are the most frequently applied research methods, and in what study context (including use of data sets)? How has this changed over time?	Identify trends and possible shortcomings / opportunities for the use of research methods.
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		The review proces	SS
56	P Cs	Planning the review	V
	The research q Marcela Genero, Ana M. Fernánd (2011). A Systematic Literature Databas	uestion: An Example ez, H. James Nelson, Geert Poels, Mario Piattini. Review on the Quality of UML Models. Journal of the Management (to appear).	
	Research questions	Main motivation	
	RQ1. Which type of UML model quality has been investigated by researchers?	To discover the different types of model quality that research has paid attention to. Within each type we also wished to find out what concrete quality characteristics were addressed.	
	RQ2. Which research methods are used in research on UML model quality?	To determine the level of maturity of this research field as well as to identify opportunities for research.	
	RQ3. What is the nature of the research results on UML model quality?	To find the kind of outputs produced by UML model quality research. This will allow assessing the state of the field.	
đ	RQ4. Which research goals are aimed at in research on UML model quality?	To get an idea of the level of maturity and the state of this research field: is it exploring basic concepts, gathering knowledge of current practices or aiming at advancing practice through design science?	
	RQ5. Which type of UML diagrams is the focus of the research on UML model quality?	To discover the UML diagrams that research has focused upon. This could reveal the parts of UML that are considered more important than others as well as identify opportunities for further research.	
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	The review process
10	Planning the review
	 Study selection procedures. The protocol should describe how the selection criteria will be applied e.g. how many assessors will evaluate each prospective primary study, and how disagreements among assessors will be resolved. Study quality assessment checklists and procedures. The researchers should develop quality checklists to assess the individual studies. The purpose of the quality assessment will guide the development of checklists. Data extraction strategy. This defines how the information required from each primary study will be obtained. Synthesis of the extracted data. This defines the synthesis strategy. This should clarify whether or not a formal meta-analysis is intended and if so what techniques will be used. Dissemination strategy (if not already included in a commissioning document). Project timetable. This should define the review schedule.
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The review process
Planning the review
 Protocol review The protocol is a critical element of any systematic review.
 Researchers must agree a procedure for reviewing the protocol. If appropriate funding is available, a group of independent experts should be asked to review the protocol. The same experts can later be asked to review the final report. PhD students should present their protocol to their supervisors for review and criticism.
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		The review process			
J.S.	Alt gs	Conducting the review			
	Identification of research: Documenting				
		the search			
	Data Source	Documentation			
1992	Electronic database	Name of database			
		Search strategy for each database			
		Date of search			
		Years covered by search			
-	Journal Hand Searches	Name of journal			
Years searched		Years searched			
		Any issues not searched			
Conference proceedings Title of proceedings		Title of proceedings			
		Name of conference (if different)			
		Title translation (if necessary)			
Journal name (if published as part of a journal)		Journal name (if published as part of a journal)			
	Efforts to identify	Research groups and researchers contacted (Names and contact details)			
unpublished studies Research web sites searched (Date and URL) Other sources Date Searched/Contacted URL Any spacific conditions partnings to the search		Research web sites searched (Date and URL)			
		Date Searched/Contacted			
		URL			
Any specific conditions pertaining to the search					
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	NI CON	The review proce	ess
S	do.	Conducting the rev	view
	Identification of rea	search: Search String	
	An example: Gener	o et al. (2011)	
	Major terms	Alternative terms	
	Quality	quality OR consistency OR maintainability OR understandability OR completeness OR comprehension OR comprehensibility OR testability OR defect OR effectiveness OR complexity OR readability OR metric OR measure OR efficiency OR validation OR verification OR layout	
a state of the	UML	UML OR Unified Modeling Language	
	Representation	Representation OR diagram OR model	
	Therefore, we defined the following (UML OR UNIFIED MODELING DIAGRAM OR MODEL) MAINTAINABILITY OR UNDE COMPREHENSION OR COMPR OR EFFECTIVENNES OR COM OR VALIDATION (g search string: i LANGUAGE) AND (REPRESENTATION OR NND (QUALITY OR CONSISTENCY OR RSTANDABILITY OR COMPLETENESS OR EHENSABILITY OR TESTABILITY OR DEFECT IPLEXITY OR READABILITY OR EFFICIENCY OR VERIFICATION OR LAYOUT)	
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- 6	No.		The review process	
S	C P St		Conducting the review	
7	Study quality assessment			
		Quality relate	es to the extent to which the	
		study minin	mises bias and maximises	
		interna	l and external validity	
	Term	Synonyms	Definition	
1205	Bias	Systematic error	A tendency to produce results that depart systematically from the 'true' results. Unbiased results are internally valid	
HART DOLLAR	Internal validity	Validity	The extent to which the design and conduct of the study are likely to prevent systematic error. Internal validity is a prerequisite for external validity.	
External validity Generalisability, Applicability The extent to which the effects observed in the study applicable outside of the study.			The extent to which the effects observed in the study are applicable outside of the study.	
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Section	Subsection	Scope
Title*	3.5	
Authorship*		
Executive summary or Structured Abstract*	Context	The importance of the research questions addressed by the review
	Objectives	The questions addressed by the systematic review
	Methods	Data Sources, Study selection, Quality Assessment and Data extraction
	Results	Main finding including any meta- analysis results and sensitivity analyses.
	Conclusions	Implications for practice and future research
Background		Justification of the need for the review Summary of previous reviews
Review questions		Each review question should be specified
Review Methods	Data sources and search strategy	
	Study selection	
	Study quality assessment	
	Data extraction	
	Data synthesis	
Included and excluded studies		Inclusion and exclusion criteria List of excluded studies with rationale

Results	Findings	Description of primary studies Results of any quantitative summaries Details of any meta-analysis
	Sensitivity analysis	
Discussion	Principal findings	
	Strengths and Weaknesses	Strength and weaknesses of the evidence included in the review Relation to other reviews, particularly considering any differences in quality and results.
	Meaning of findings	Direction and magnitude of effect observed in summarised studies Applicability (generalisability) of the findings
Conclusions	Recommendations	Practical implications for software development
]	Unanswered questions and implications for future research
Acknowledgements*		All persons who contributed to the research but did fulfil authorship criteria
Conflict of Interest		
References and Appendices		· · · · · · · · · · · · · · · · · · ·





	1.10			Le	essons learne
	It is usef	ul to show t	he temporalization	of activ	ities (Smite et al.
- U P	2010) ·		1		`
	2010).	Planning	Realization	Reporting	Outcomes
	November 2007 📥	Protocol development			Review protocol
	Ī		Data retrieval		Repository with articles
		MI-M-MC-MC	Study selection upon titles		
	December 2007		Study selection upon abstracts		
Section 1			Consensus meeting		Primary studies screened
			Pilot: data extraction, 3 papers (all)		3 papers reviewed
	January 2008 🎃	Process improvement	an a		Draft: data extraction form
			Revisit reviewed papers		
			Pilot: data extraction, 10 papers (in pairs)		13 papers reviewed
		Process improvement			Definition dictionary
100 C					Refined: data extraction form
and the second se		rare we and a subscription of the second	Revisit reviewed papers (in pairs)		
	February 2008 🏟		Pilot data extraction: 11 papers (in pairs)		24 papers reviewed
			Disagreement resolution (in pairs)		
and the second	1		Pilot: data synthesis		
and a second	March 2008 🍏			Pilot Report	
			Review: data extraction remaining papers		109 papers reviewed
	June 2008 🧅		Data synthesis		
64 A	October 2008 🍏			Final Report	
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- <u>- </u>	Lessons Learned
10	95 C
	Main findings (da Silva et al., 2011):
	• The software engineering research community is starting to adopt SLRs consistently as a research method.
	 The number of SLRs is increasing. The number of researchers and organizations performing them is increasing. The integration of the results of the primary studies was poorly conducted by many SLRs. There was very little consistency in the way the SLRs are
	 Many SLRs omitted essential data, including important parts of the review protocol. The majority of the SLRs: >Did not evaluate the quality of primary studies.
	➤Fail to provide guidelines for practitioners, thus decreasing their potential impact on software engineering practice.
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	Final remarks
5 0 3	
	 Many of the steps in a systematic review assume that it will be undertaken by a large group of researchers. In the case of a PhD student, the most important steps to undertaken are: Developing a protocol Defining the research question Specifying what will be done to address the problem of a single research applying inclusion/exclusion criteria and undertaking all the data extraction Defining the search strategy Defining the data to be extracted from each primary study including quality data Maintaining list of included and excluded studies Using the data synthesis guidelines
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