Literature review
as a research method

T-76.5050 Methods for Software Engineering and Business Research

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Overview of this lecture

• Literature review as a research methodology in software engineering
• Conducting the literature review
• To think about during this lecture
  – Why and when to do literature review(s) during your thesis work?
  – How to conduct the review for your thesis work?
Literature review as a research methodology in software engineering
A literature review...

Identifies, analyzes and synthesizes available relevant research to a particular research question or topic (Kitchenham, 2004)

A study that uses other studies as its data

Secondary study

Primary study

Identifies
Analyzes
Synthesizes
Motivation

Why to do a literature review?

Secondary study

Identifies
Analyzes
Synthesizes

Primary study
Motivation

- Identify gaps in the current research
- Understand an established but fragmented topic
- Understand a new research topic
- Study how a theory or method is supported by empirical evidence

(Webster & Watson, 2002; Kitchenham, 2004)
Literature review: standalone or supporting method?

- Literature review as the main contribution
  - Bachelor’s theses
  - Seminar reports
  - Scientific publications
  - Master’s theses
  - PhD theses

- Literature review to support the main contribution
How to support the main contribution with a literature review?

Consider the following Master’s thesis:

Research question:
What are the challenges of applying agile development methods in global software development?

Research method: Case study
Research Problem

Research Questions

Previous work

Results

Comparison with previous work

Research Method

Support in understanding and formulating

Are used to find and analyze

Is used to evaluate and argue novelty

Is used to do

Background

Are used to find and analyze

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Possible challenges identified?

Using agile methods for global SW development

Are used to find and analyze

Support in understanding and formulating

Research Questions

Previous work

Agile methods

Global SW development

Background

Research Problem

Research Method

Results

Comparison with previous work

Is used to do

Is used to evaluate and argue novelty

Research Questions

Support in understanding and formulating

Previous work

Using agile methods for global SW development

Possible challenges

Are used to find and analyze

Research Problem

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Conducting the literature review
Conducting the literature review

Planning
- Review protocol
- Potentially relevant studies
- Relevant studies
- Analysis and synthesis
- Manuscript

Selecting

Searching

Analyzing

Writing

How systematic and explicit?
Planning

- Identifying the need to the review
- Specifying the research questions (standalone review)
- Identifying the topics to be covered from the research questions (supporting review)
- Developing and validating a review protocol

The level of planning often decides how systematic and explicit your literature review will be
Searching

Potentially relevant studies

Database searching

Snowballing

How to deal with the huge number of potential studies?
Database searching

Select databases

Construct search strings

Iterate

Potentially relevant studies
Database searching

Select databases

IEEE Xplore
ACM Digital Library
SpringerLink

ScienceDirect Elsevier
Wiley Interscience

Web of Science
Scopus

Don't use Nelli directly to search for studies
Research question:
What are the challenges of applying agile development methods in global software development?

- (agile <or> lean)
- <and>
- (global <or> offshor*)

Construct search strings

- Add concepts to get fewer hits
- (global <or> offshor*)

- Add synonyms from relevant studies
- (or outsourc*)

- Leave concepts for analysis
- (challenges)
Snowballing

Searching

Potentially relevant studies

Snowballing

Backward snowballing

Which studies a relevant study cites?

Forward snowballing

Which studies cite a relevant study?

Recommended!

More effort, needs a reference DB (Web of Science, Scopus)
Q: How to select relevant studies?
... and to do it systematically?

A: Apply explicit inclusion and exclusion criteria derived from the research questions.

**Included if:**
Addresses any agile or lean SW development method
AND Addresses global SW development

**Excluded if:**
Does not concentrate on SW development
OR Does not report any challenges
OR Is not a peer-reviewed publication
Selecting studies

Q: How to deal with a huge number of potentially relevant studies?

Potentially relevant studies

Include / exclude studies based on titles

Include / exclude studies based on abstracts

Include / exclude studies based on full paper content

(modified from Dybå et al., 2007)
Primary studies = Data

Some analysis activities

Coding: mark all passages of text that are related to a certain study concept

Extract data about a certain study concept to a concept matrix

Create a conceptual model
Analyzing

Coding
Based on the results, it seems the practice of on-site customer is less frequently utilized in the outsourced development teams. This was...

Concept matrix

<table>
<thead>
<tr>
<th>Article</th>
<th>Scrum</th>
<th>Lean</th>
<th>On-site customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith et al, 2009</td>
<td>X</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Lee et al, 2013</td>
<td>x</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Steffen, 2014</td>
<td></td>
<td>x</td>
<td>Not known</td>
</tr>
<tr>
<td>Woods et al, 2011</td>
<td></td>
<td>x</td>
<td>Part-time</td>
</tr>
</tbody>
</table>
The most important phase in the literature review!

More than just a summary of the literature. Focus on the concepts, not on the articles.
• Report the analysis and synthesis results
• Report the review method
  (all activities in all steps)
• Use present tense
  – ”Staples and Niazi (2007) report their experiences on...”
  – ”CMMI seems to be suitable for small organizations (Staples and Niazi, 2007).”
• Be careful in distinguishing findings in primary studies vs. your analysis
  – Also, keep own study setting / results out

• Do not cite a primary study without analyzing it well!
  – Citations based on abstract / introduction only
  – Would the original author agree with your interpretation?
Conclusions

• Literature review
  – Identifies, analyzes and synthesizes research on a certain topic

• As part of a Master’s thesis
  – Gives background, identifies what is already known, provides a yardstick for the results

• Conducting the literature review
  – Planning
  – Searching for primary studies
  – Selecting the primary studies
  – Analyzing
  – Writing


