

INF 5500

Review and Synthesis of Evidence

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Literature

- **Guidelines for performing Systematic Literature Reviews in Software Engineering**
 - EBSE Technical Report
 - Software Engineering Group School of Computer Science and Mathematics
Keele University, Keele, UK
 - Synthesis of evidence: p 34-39

Review and synthesis

Review - the process of bringing together a body of evidence from different sources

Systematic review: a review which tries to adhere to a set of 'scientific' methods to limit error (bias) mainly by attempting to locate, appraise and synthesize (attempt to reconcile) all relevant evidence (from research or more widely) to answer a particular question(s)

Synthesis - stage of a review in which evidence extracted from different sources is *compared* to identify patterns & direction in the findings, or *integrated* to produce an overarching, new explanation/theory which attempts to account for the range of findings

Meta-analysis: Use of statistical techniques to synthesize results into a single quantitative estimate of an effect.

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The purpose

- To weight the strength and direction of the evidence in relation to a question
- To identify the areas of uncertainty
- To identify gaps in knowledge (in general and in a particular context)
- For a treatment (method, process, tool, ...)
 - To identify what is effective/cost-effective and to reduce uncertainty in estimates of effectiveness in general
 - To identify what is likely to be effective in particular populations and institutional contexts
 - To help develop new interventions which may work
- This should be synthesized so that it provides valuable evidence on which specific decisions can be based.

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Desirable features

- Systematic (no bias, all relevant studies included, up-to-date)
- Rigorous
- Explicit (transparent methods)
 - Search
 - Evaluation criteria
- In practice, reviews will be iterative and not completely explicit. In your case, the search may not be fully systematic and rigorous.

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How to synthesize

- No mechanical process available (other than for meta-analysis based synthesis)
- Typical process:
 - Preliminary synthesis of individual results to organize findings, get a sense of patterns and develop understanding of effects
 - Exploration of relationships of findings wrt:
 - Similarity of results
 - Variation in results
 - Contradictions, context dependencies
 - Formulation of general results consistent with the individual results – and the robustness/trustworthiness/limitations of the general results
 - Identify research gaps

NB: Remember that the synthesis should be relative to the research question! Clarify the purpose of the synthesis in the beginning of your report.

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Other things to remember ...

- Preferably, the synthesis should be formulated so that it can easily be used to guide a decision.
 - This requires an understanding of organizational politics, user needs, etc.
 - Synthesis conclusions should therefore often be written in a language used by the decisions makers.
- Assessment of publication bias
 - Is it likely that some results (e.g., no difference in effect) are not likely to be published?
- Synthesis is similar to “pattern matching”.
 - Avoid seeing patterns that are not there – ref. earlier presentations

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Example

- What do we know about agile development?
 - IEEE Software, Dybå and Dingsøy

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Exercises

- Searches using google scholar/ISI web of knowledge
 - Automatic search, manual search, snowball search ...
 - Search domains:
 - Exploratory testing vs test-case based testing
 - Expert estimation vs model-based estimation
- Example report

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