

# **The Literature Review Seminar**

#### **Steps of the process**

- Understand the generic steps of the review process
- Appreciate the critical methodological choices in the search, screen, and analysis



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#### **Generic steps: Examples**





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# Table 8. Frequency of reporting items per review type.

	Narrative $(n = 25)$	Descriptive (n = 22)	Scoping (n = 9)	Critical ( <i>n</i> = 16)	Meta-analysis (n = 12)	Qualitative sys- tematic ( $n = 6$ )	Theory devel- opment ( <i>n</i> = 52)
Step 1: Problem formulatio	n						
Primary goals or research questions	100	100	100	100	100	100	100
Key concepts or theories being investigated	84	91	89	94	100	100	100
Step 2: Literature search							
How the literature search is performed	44	95	89	69	100	100	25
Multiple search			44	19	100	33	13
Multiple publication			22	13	92	33	17
Comprehensiveness of search & restric- tions if applicable		86	78	50	100	83	21
How reputation of the sources is considered	28			63			13
Strategies used to minimise publica- tion bias					25	0	
Step 3: Screening for inclus	ion						
How primary studies are screened or selected	20	91	67		67	67	21
Res <mark>di</mark> ts of parallel		5	11		8	0	

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Step 4: Quality assessment							
How quality assess-					8	0	
ment is performed Results of parallel independent assessment					8	0	
Step 5: Data extraction							
Data extraction plan		95	56		92	100	
Tools or methods used to extract data		77	67		83	83	10
Results of parallel in- dependent coding process		41	33		67	67	
Step 6: Data analysis and ir	nterpretation						
How data analysis is performed			56		100	83	19
How study quality is considered in interpretation of findings					0	0	
Profile of the included studies		91	67		75	67	
Justification of data			22		100	67	

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#### **Generic steps**

Summary

- The nature of steps varies, including their labels, their characteristics, and how they are arranged
- The steps depend on the review type
- Some steps are more generic, while others are more specific and only apply to selected types of reviews

In the following, we focus on the steps summarized by Templier and Paré (2018):

- 1. Problem formulation
- 2. Literature search
- 3. Screening for inclusion
- 4. Quality assessment
- 5. Data extraction
- 6. Data analysis and interpretation



# **Problem formulation**

- Rationale for the review, including an overview of related review papers
- Gap-spotting or problematization (Alvesson and Sandberg 2011):
  - Gap-spotting is seen as (too) common, and may only signify a contribution if the authors can make a convincing argument that the gap is important
  - Problematization, as an approach that challenges existing theory and the underlying assumptions, can lead to more interesting and noteworthy contributions
- Research question or objectives



### Literature search: Foundations

- Search types: Lookup vs. exploratory vs. systematic search (Gusenbauer and Haddaway 2021)
- Search scope: time, journals, and academic vs. gray literature
- Search techniques (with associated search sources):
  - Database search (keyword-based)
  - Backward search, i.e., search reference sections to go back in time (aka. snowballing, pearl-growing)
  - Forward search, i.e., using citation indices to go forward in time
  - Table-of-content search (whole journals)
  - Sampling from prior review papers
  - Consulting with peers (e.g., through direct contact or mailing lists)

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#### Literature search: The database search

- Most common search strategy in the management disciplines (58% according to Hiebl, 2023)
- Common databases: Web of Science, EBSCO Host, ABI Informs, AIS eLibrary, ACM Digital Library, IEEEXplore, etc. (Knackstedt and Winkelmann 2006, Hiebl 2023)
- Effective search strategies for database searches combine search terms with Boolean operators





#### Literature search: The "building-blocks" approach

• RQ: What factors do influence physicians' acceptance of telemedicine?

			Concept 1 AN	D Concept 2	AND Concept 3
			Telemedicine	Physician	Acceptance
	C	DR -	Telehealth	Doctor	Adoption
	C	R	eleconsultation	Clinician	Resistance
3000		R	Tele-expertise		
		R			
Ĵ		DR -			
	c	DR .			

Resulting search string: (telemedicine OR telehealth OR ...) AND (physician OR doctor OR ...) AND (adoption of de/digital-work/



# Literature search: Application

• Draft a search strategy for your topic, following the building-blocks approach.



• Does the building block approach provide a good fit with your context?



### **Exercise: Reviewing a search strategy**

Imagine you serve as a reviewer for a conference. You review a paper on algorithmic decision-making, along with Table 2.

**Task**: Evaluate the proposed search strategy critically, taking into account the building-block approach. Make a recommendation to accept, revise, or reject.

\* Note: Example taken from Mahmud, H., Islam, A. N., Ahmed, S. I., & Smolander, K. (2022). What influences algorithmic decision-making? A systematic literature review on algorithm aversion. *Technological Forecasting and Social Change*, 175, 121390.

The search-query package supports the validation (linting) of search queries to identify syntactical errors and suggest improvements.

#### Table 2 Search terms.

Themes of search term: algorithm, artificial intelligence, and machine learning; decision, advice, recommendation, and decision aid

ID	Search syntax	Total hits	Ultimately retained**
1	Algorithm* Aversion	840	16
2	Algorithm* Appreciation	788	3
3	(AI OR "Artificial Intelligence") AND Aversion	162	2
4	(AI OR "Artificial Intelligence") AND	197	-
5	Appreciation "AI recommendation" OR "Artificial intelligence recommendation" OR "Algorithm* recommendations" OR "Machine Learning	249	1
6	recommendation" OR "ML recommendation" "AI decision*" OR "Artificial intelligence decision*" OR "Algorithm* decision*" OR "Machine Learning decision*" OR "ML decision*"	2009	3
7	"AI Advice" OR "Artificial intelligence Advice" OR "Algorithm* advice" OR "Machine Learning advice" OR "ML advice"	15	3
8	("AI" OR "Artificial intelligence" OR "Algorithm*" OR "Machine Learning" OR "ML") AND "Decision aid"	697	5

<sup>\*</sup> Takes the place of one or more characters in the search term.

\*\* Figures represent the number of studies after completing selection process.



# Literature search: Strengths and shortcomings of database searches

Strengths:

- Relatively efficient (see Wagner et al. 2021, Appendix A3)
- Transparent and reproducible

Shortcomings:

- Keyword searches rely on exact matches \*
- Need to be familiar with the vocabulary (check keywords or taxonomies like MeSH etc.)
- Assumption of controlled scientific vocabulary although disciplines like Information Systems have abandoned corresponding efforts decades ago (Weber 2003)
- Some literature reviews report the intended coverage (e.g., comprehensive), but none report to which degree it was accomplished (using evidence and metrics)

\* This is why the health sciences strictly enforce the use of descriptive titles and standard terminology in primary studies.



### **Literature search: Search metrics**

The common objective is to identify all relevant papers. Literature searches retrieve documents:



Three key metrics are particularly relevant in the context of literature searches (Cooper et al. 2018):

1. Sensitivity aka. recall: TP/(TP + FN). How many of the relevant papers do we find? ? www.uni-bamberg.de/digital-work/



#### Literature search: Assessing searches

- **Precision** is the only metric that can be measured in a typical literature review
- A highly precise search strategy should be suspicious because the search may not be comprehensive enough
- Based on the SYNERGY dataset, average precision is 2% 4% in medicine, chemistry, and computer science

**Question**: Would you expect more precise searches in disciplines like Information Systems, Management, or the Social Sciences?

#### Datasets and variables 🖉

The SYNERGY dataset comprises the study selection of 26 systematic reviews. The dataset contains 169,288 records of which 2,834 records are manually labeled as inclusion by the authors of the systematic review. The list of systematic review and basic properties:

Nr	Dataset	Topic(s)	Records	Included	%
1	Appenzeller-Herzog_2019	Medicine	2873	26	0.9
2	Bos_2018	Medicine	4878	10	0.2
3	Brouwer_2019	Psychology, Medicine	38114	62	0.2
4	Chou_2003	Medicine	1908	15	0.8
5	Chou_2004	Medicine	1630	9	0.6
6	Donners_2021	Medicine	258	15	5.8
7	Hall_2012	Computer science	8793	104	1.2
8	Jeyaraman_2020	Medicine	1175	96	8.2
9	Leenaars_2019	Psychology, Chemistry, Medicine	5812	17	0.3



### **Terminating the search**

No formal "stopping rule" exists — reviewers look for **completeness, transparency**, and **justifiability**.

#### Often guided by the criterion of saturation:

- Saturation in understanding (Boell & Cecez-Kecmanovic, 2014)
- "New articles only introduce familiar arguments, methodologies, findings, authors, and studies" (Levy and Ellis, 2006)
- Theoretical saturation (Wolfswinkel et al., 2013)

Credibility depends on:

- Comprehensiveness of the applied search techniques
- Alignment with the topic's **epistemological context**:
  - High-paradigm disciplines: database search may suffice
  - Low-paradigm or emergent fields: require iterative, citation-based strategies (e.g., forward/backward search)

<sup>&</sup>quot;Saturation is a matter of judgment, not of formula."

<sup>—</sup> Boell & Cecez-Kecmanovic (2014)



# Literature search: Outlook

Open challenge:

- How can we iterate efficiently?
- How do we justify the decision to terminate a search?
- How can we use evidence to search effectively?
- How can we make progress without database providers?





#### Screen

- The screen is typically completed in two parts:
  - A pre-screen based on metadata ("include if in doubt")
  - A screen based on full-text documents, resulting in the final sample
- The screen is often based on explicit inclusion and exclusion criteria

#### **Study Selection**

Studies were included if (1) a randomized controlled trial (RCT) design was used, (2) the intervention involved using a Fitbit device to improve PA and/or other health-related outcomes (eg, weight loss), and (3) the study reported outcomes related to healthy lifestyle measures (eg, steps, MVPA, weight, and BMI). Only peer-reviewed journal and conference papers were considered.

Articles were screened in a two-step process. First, all titles and abstracts were examined by one author (MR). Any citations that clearly did not meet the inclusion criteria were excluded. Second, all abstracts and full-text articles were examined independently by two authors (MR and GW). Any disagreements in the selection process were resolved through discussion with a third author (GP or SK).



# **Screening reliability**

Screening tasks are often split among the review team to complete the process **more quickly**, and to ensure **reliable decisions**. Process:

- 1. Definition of criteria, training, and pilot test
- 2. Parallel-independent screen (partially or fully overlapping sample)
- 3. Independent screen of the remaining papers (if any)
- 4. Reconciliation: in case of disagreements, final decisions are made by selected team members (often more senior researchers)
- 5. Calculate inter-rater agreement (e.g., Cohen's Kappa) and report the process



#### **Interpretation of Kappa Values**

Kappa Value Range	Interpretation
≤ 0	No agreement
0.01 - 0.20	None to slight
0.21 - 0.40	Fair
0.41 - 0.60	Moderate
0.61 - 0.80	Substantial
0.81 - 1.00	Almost perfect agreement

Note: When data is skewed—meaning one category is much more common than others—the Kappa statistic can be artificially low even if there is a high level of agreement. This occurs because Kappa adjusts for the level of agreement that would be expected purely by chance. In skewed distributions, the expected chance agreement tends to be high, which lowers the Kappa score. Essentially, in skewed distributions, even a relatively high observed agreement may not lead to a high Kappa, as the metric accounts for the imbalance.

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#### Figure 1. Flow diagram. RCT: randomized controlled trial.



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# Break





# **Reading strategies**

The reading activities can be organized strategically at two levels:

- The overall corpus level: In which order should papers be read or skimmed?
- The individual paper level: How should the different parts of a paper be read?

DQuestion: Assume you have 300 papers to cover, how would you organize the reading activities?



#### Data analysis

Key differences with regard to data extraction and analysis:

- Focus on metadata vs content
- Inductive vs deductive reasoning



Note: The distinction between inductive and deductive modes of reasoning has critical implications. For instance, it would be incoherent to present an inductive analysis with inter-coder reliability assessment, or a deductive analysis without a pre-defined coding schema.



# Table A.2

Frequency table.

Journals and conferences	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Sum
Decision Support Systems	_	1	_	_	1	_	_	_	1	_	_	_	_	3
e-Service Journal	_	1	_	_	_	_	_	_	_	_	_	_	_	1
Electronic Markets	_	_	_	_	_	_	_	_	_	_	_	1	_	1
Information & Management	_	_	_	_	_	_	_	1	_	_	_	_	_	1
Information Systems Frontiers	_	_	_	_	_	_	_	1	_	1	_	_	1	3
Information Systems Journal	_	_	_	_	_	_	_	_	_	_	_	2	_	2
Information Systems Research	_	_	_	_	_	_	_	_	1	1	1	_	1	4
International Journal of Electronic	_	_	_	_	_	_	_	_	_	_	_	_	1	1
Commerce														
Journal of Management	_	_	_	_	_	_	_	_	_	_	1	_	_	1
Information Systems														
MIS Quarterly	1	_	_	_	_	_	_	_	_	_	_	_	_	1
MIS Quarterly Executive	_	_	_	_	_	_	_	_	_	_	1	_	_	1
The Journal of Strategic	_	_	_	_	_	_	_	_	_	1	1	1	_	3
Information Systems														
Americas Conference on	_	_	_	1	_	_	_	1	_	_	1	1	_	4
Information Systems														
European Conference on	_	_	_	1	_	_	_	_	_	_	_	1	_	2
Information Systems														
Hawaii Int. Conference on System	_	_	_	_	_	_	_	_	_	1	3	_	_	4
Sciences														
International Conference on	_	_	_	_	1	_	2	2	1	2	4	2	*	14
Information Systems														
Pacific Asia Conference on	-	-	_	_	-	-	_	_	-	1	1	_	1	3



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### Data analysis example: Inductive coding

Grounded theory is an inductive method commonly used in literature reviews (Wolfswinkel et al. 2013)

In the data analysis phase, the three coding techniques are central:

- **Open coding** generates higher-abstraction level type categories from sets of concepts/variables
- Axial coding develops categories and relates them to their possible sub-categories
- Selective coding integrates and refines the categories



1st Order Concepts	2nd Order Themes	Aggregate Dimensions
<ul> <li>Loss of parent company as direct (internal) comparison</li> <li>Shift in focus to comparisons with competitors</li> <li>Media attention shifts away from Bozco to industry</li> </ul>	Change in Social Referents	
<ul> <li>Who we are going to be? / How will we see ourselves?</li> <li>This is what independence means</li> <li>How do we get there from here?</li> </ul>	Temporal Identity Discrepancies	Triggers of Identity Ambiguity
<ul> <li>Misperceptions / false data reported in the media</li> <li>Quiet periods constrain our internal communications</li> <li>Stock price does not adequately reflect who we are</li> <li>Customers don't know we're independent</li> </ul>	Construed External Image Discrepancies	
<ul> <li>We don't even know who we are right now</li> <li>Understand the labels, but what do they mean?</li> <li>Sense of missed opportunity around the spin-off</li> <li>No consistency in labels during pre-spin-off and spin-off</li> </ul>	Identity Ambiguity	Change
<ul> <li>Growing sense of change overload</li> <li>Emerging identity tensions</li> </ul>	Sensegiving Imperative	Context
<ul> <li>Shift from "independent" and "innovative" to "doing the 30 ight thing"</li> <li>Providing more to work life than just a paycheck</li> </ul>	Refined Desired Future Image	

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Context:

- Scope: Digital platforms for knowledge-intensive services, such as Upwork, Fiverr, or TopCoder
- Sample: 50 papers, mostly published in the Information Systems discipline
- Data: Text fragments and figures have been pre-selected (see worksheet)

**Task**: Analyze extant research and inductively develop a process model



**Vote counting** is one technique to aggregate the evidence from prior empirical studies

- Key variables are extracted and compiled in a list of master codes
- Effects between independent and dependent variables are coded:
  - +1 for a positive significant effect
  - 0 for no-significant effects
  - -1 for negative significant effects



# Example: Lacity et al. (2011)



### Data analysis example: Aggregating evidence (II)

Strength of vote counting:

• Aggregates evidence from quantitative and qualitative studies

Shortcoming of vote counting:

- Risk of bias is not assessed
- Effect sizes are not determined

Meta-analysis techniques address these shortcomings.

# Quality appraisal / Risk of bias assessment (I)

- Example: Ringeval et al. (2020): "Fitbit-Based Interventions for Healthy Lifestyle Outcomes: Systematic Review and Meta-Analysis"
- The Cochrane risk-of-bias tool for randomized trials (RoB 2) covers seven domains of bias, as illustrated in the table

Note: For non-experimental studies, other domains of bias may apply (such as the use of fixedeffects for years as a control for omitted time-varying confounders/endogeneity).

Note: It is good practice to analyze whether results differ between high and low quality studies (e.g., through subgroup analyses) instead of excluding low-quality studies.

#### Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"[] using a computer-generated random number schedule of 10 permuted blocks of 6 and the final block of 8." (p. 3)
Allocation concealment (selection bias)	Low risk	"To ensure allocation concealment, randomization to groups was undertaken by a blinded remote investigator (MS) not involved in recruitment []" (p.3). It is a central allocation.
Blinding of participants and personnel (performance bias)	High risk	Due to the nature of the intervention and control conditions make blinding impossible.
Blinding of outcome assessment (detection bias)	Low risk	"We conducted a pilot randomized controlled trial with blinded outcome assessment." (p. 2) "Study investigators conducting data collection were blinded to group allocation" (p. 3)
Incomplete outcome data (attrition bias)	Low risk	"Overall, there were 20% of missing data at the 6-month questionnaire follow-up and 16% of missing data across the 6-month weekly surveys." (p. 7). The reasons for missing data are not related to true outcome (p. 7) but they just mentioned they analyzed data by "intention to treat" (p. 6)
Selective reporting (reporting bias)	Low risk	The study protocol is available and all of the study's pre-specified (primary and secondary) outcomes that are of interest in the review have been reported in the pre-specified way.
Other bias	Low risk	The study appears to be free of other sources of bias.



### **Quality appraisal / Risk**



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#### Data analysis: Data extraction

Research objective: "to assess the effects of Fitbit-based interventions, compared with non-wearable control groups, on healthy lifestyle outcomes." (Ringeval et al. 2020)

Type of primary studies: Randomized clinical trials (RCTs), as illustrated in the CONSORT flow diagram

Outcome of interest (at follow-up):

- Steps per day (our focus)
- Moderate-to-vigorous physical activity (MVPA)
- Weight loss
- Sedentary behavior (self-reported)

#### CONSORT Flow Diagram





## Data analysis

**Task**: Extract the data from two randomized controlled trials: Thorndike et al. 2014, van Blarigan et al. 2019 based on the following coding sheet:

	Interver	ntion group		Control group			
Study	Steps per day	SD	n	Steps per day	SD	n	
Thorndike et al. 2014							
van Blarigan et al. 2019							



#### Data analysis: Forest plot of standardized mean differences





## Data analysis: Meta-analysis

We extract or calculate Standardized Mean Differences (SMD):

$$d = rac{ar{X}_{ ext{intervention}} - ar{X}_{ ext{control}}}{SD_{ ext{pooled}}}$$

**Pooled standard deviation:** 

$$SD_{ ext{pooled}} = \sqrt{rac{(n_1-1)SD_1^2 + (n_2-1)SD_2^2}{n_1+n_2-2}}$$

SMD is also known as *Cohen's d*. For small sample sizes, the corrections of *Hedge's g* should be used. Note: For research models, we will typically rely on correlations as effect sizes (beta coefficients depend on the other variables of the model).





# **Random Effects Meta-Analysis**

We assume the true effect size varies between studies:

#### Weighted average of effects:

$$\hat{\mu} = rac{\sum_{i=1}^k w_i \cdot d_i}{\sum_{i=1}^k w_i}$$

Weights (account for variance):

$$w_i = rac{1}{SE_{d_i}^2 + au^2}$$

+  $au^2$ : between-study variance

•  $SE_{g_i}$ : standard error of each SMD

Interpretation: Larger  $w_i$  = more influence on pooled estimate. Output: Overall effect size with 95% CI shown in forest plot. The Doing Meta-Analysis in R book by Harrer et al. offers a good overview of meta-analysis methods.



#### **Discussion of the data analysis section**

**Task**: Create a quick draft for the data extraction and analysis section.

- Would you follow an inductive or deductive approach (why)?
- What outcomes would you expect ideally?



For the next session, please sign up for a GitHub account if you don't have one already.

**Task**: Select an exemplary review and fill out the PRISMA checklist to assess the transparency of reporting.



PRISMA	2020	Checklist

Section and Topic	ltem #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	



### Summary

- Literature reviews vary in steps and structure tailored to review type and disciplinary context
- We covered the following six steps (in line with Templier & Paré, 2018):
  - i. Problem formulation define contribution via gap-spotting or problematization
  - ii. Literature search combine database and citation strategies; justify stopping with saturation
  - iii. Screening apply transparent inclusion/exclusion criteria; ensure reliability
  - iv. **Quality assessment** assess risk of bias; consider study quality in the interpretation
  - v. Data extraction adopt inductive or deductive approaches in line with the review type
  - vi. Data analysis choose between techniques like thematic analysis, vote counting, or meta-analysis

Transparency, methodological rigor, and fit with the topic's epistemology are key to credibility.



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#### **Generic steps**

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#### **Problem formulation**

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