

General Remarks about Scientific Working at TIM



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Introduction

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Statistical fundamentals

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Scientific reading + literature management programmes

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Structure and contents of the seminar paper

What constitutes scientific work?

Characteristics

- Make the work's results **objectively comprehensible**
- **Disclose sources**
- Deal with scientific findings, then formulate **own thoughts** and formally present them in a methodically verifiable manner
- Name all **facts and evidences** that lead to conclusions

Key parameters

Objectivity

- Result is independent of the researcher

Validity

- Extent to which the study reflects the given research question

Reliability

- Repeatability of an investigation (under the same conditions, the study leads to an identical result)

Aims of scientific work

Basic prerequisite for a study that is as objective & standardised as possible



Gain knowledge through a systematic and logical approach



Transparency by making one's own and other people's thoughts recognisable



Enable accessibility, incorporate knowledge gained into progressive research process



Protect intellectual property

Paradigm

Fundamental way of thinking; “world view”

	(Post-) positivism	Social constructivism
Ontology	Hypotheses as facts / laws	Individual reconstruction of consensus
Epistemology	Finding the truth through causal connections	Subjectively created understanding through general understanding of the situation
Methodology	Checking generality through statistical probability	Reasoned understanding through theoretical abstraction
Knowledge Allocation	Cause-effect links	Grounded reconstructions
Units of analysis	Reduced as much as possible to simple concepts	Includes complexity of the whole situation, if applicable
Sample size	Large number, randomly selected	Small number, selected for specific reasons
Quality criteria	Validity, reliability, objectivity	Trustworthiness, authenticity

There is nothing as practical as good theory...

What is a theory?

- A theory is a **statement of relations among concepts** within a set of boundary assumptions and constraints
- Theory goes **beyond mere description** such as representations of data, typologies, metaphors
- Theory includes following elements:
 - **What?** Which factors (variables, constructs, concepts) should be considered as part of the explanation of the phenomena of interest (right ones & parsimonious)?
 - **How?** How are the factors related (usually causal relationships)?
 - **Why?** What are the underlying mechanisms, the rationale that justifies the factor's selection and relationships?
 - **Who, when, where?** What are temporal and contextual factors that set boundaries of generalizability?
- Theory can be evaluated with respect to **Falsifiability** and **Utility**

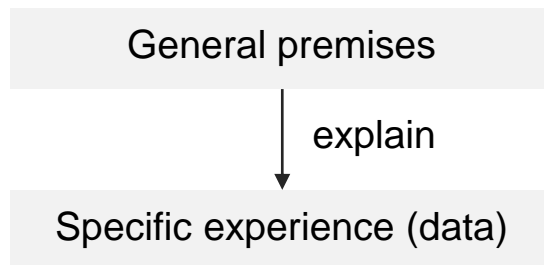
Methodology (in the broadest sense)

Methodology

Systematic, theoretical conception of an investigation's methods

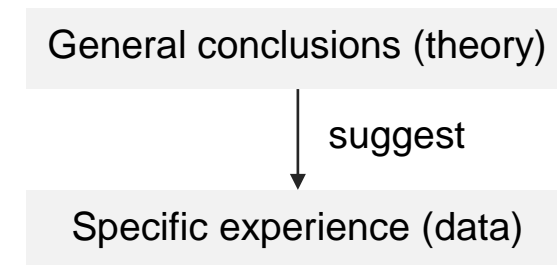
1. Deduction

- Reasons (premises) lead to conclusions about specific cases
- Testing theory: Top-down
- E.g. Hypothesis Testing, Survey Research, Experimental Research



2. Induction

- Specific evidence points to a conclusion
- Building theory: Bottom-up
- E.g. Grounded Theory, Action Research, Ethnography, Phenomenological Research

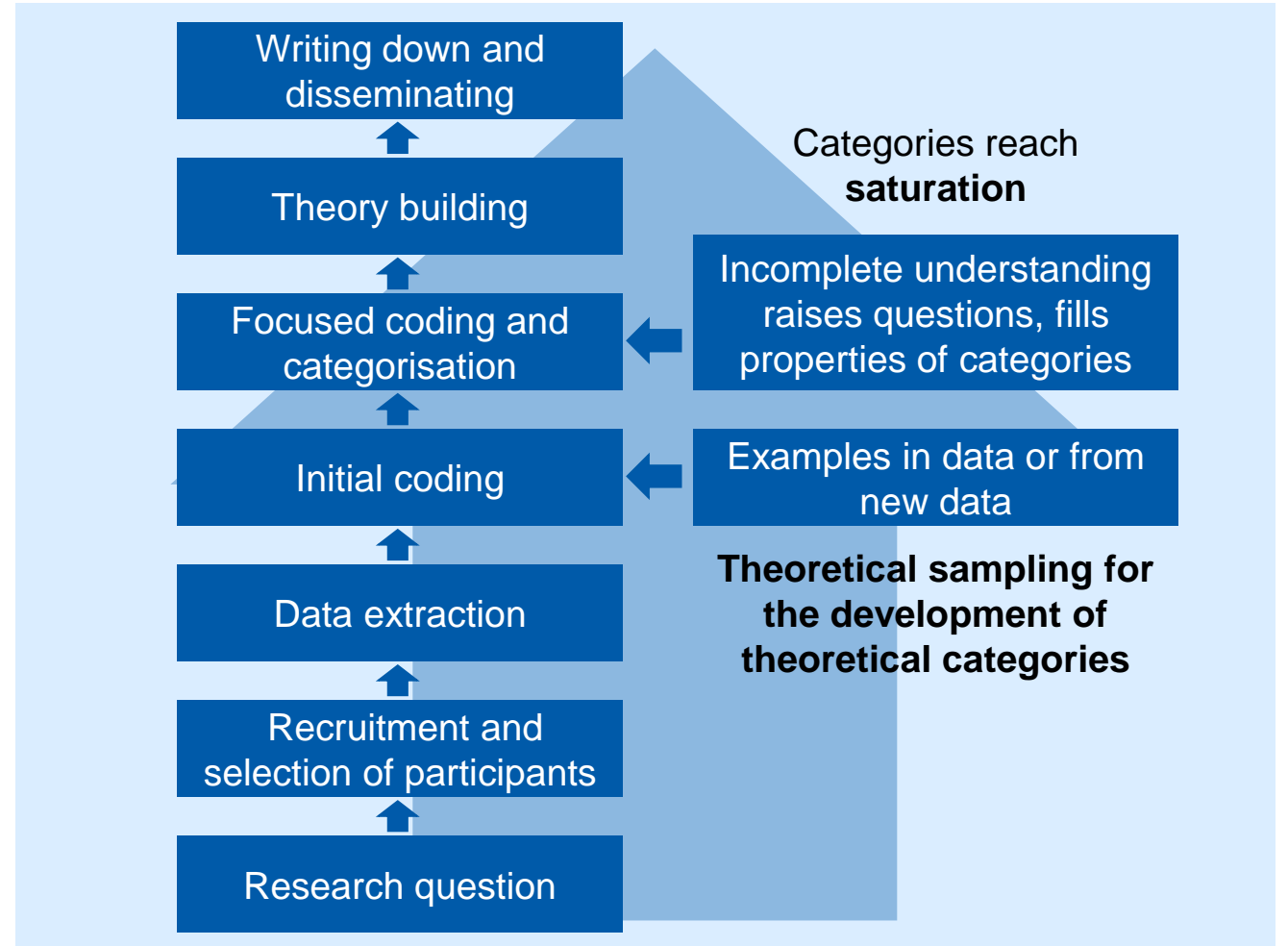


3. Mixed Theory: Combination of deductive and inductive approach

Methodology (in the narrow sense) (1/2)

E.g. Grounded Theory

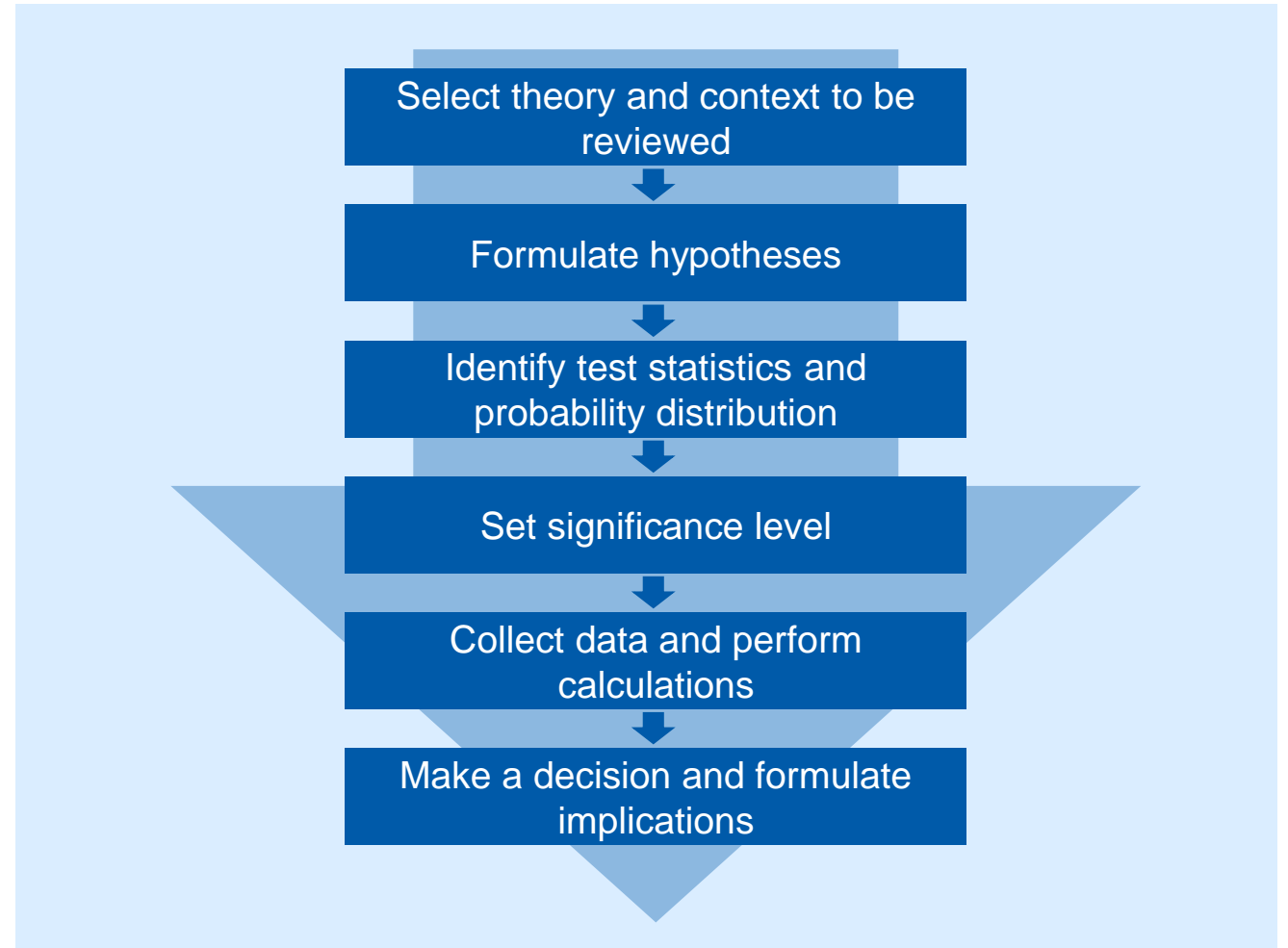
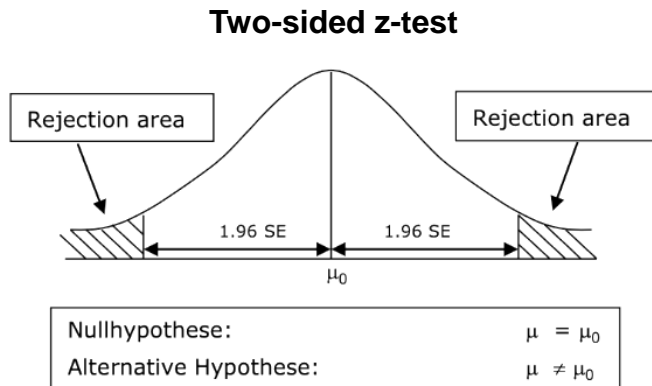
- Theory generation through systematic collection and analysis of qualitative data
- When?
 - Research is not fully guided by existing theory
 - Will for new research direction / research question
 - E.g. Team Work with Mountaineers



Methodology (in the narrow sense) (2/2)

E.g. Hypotheses testing

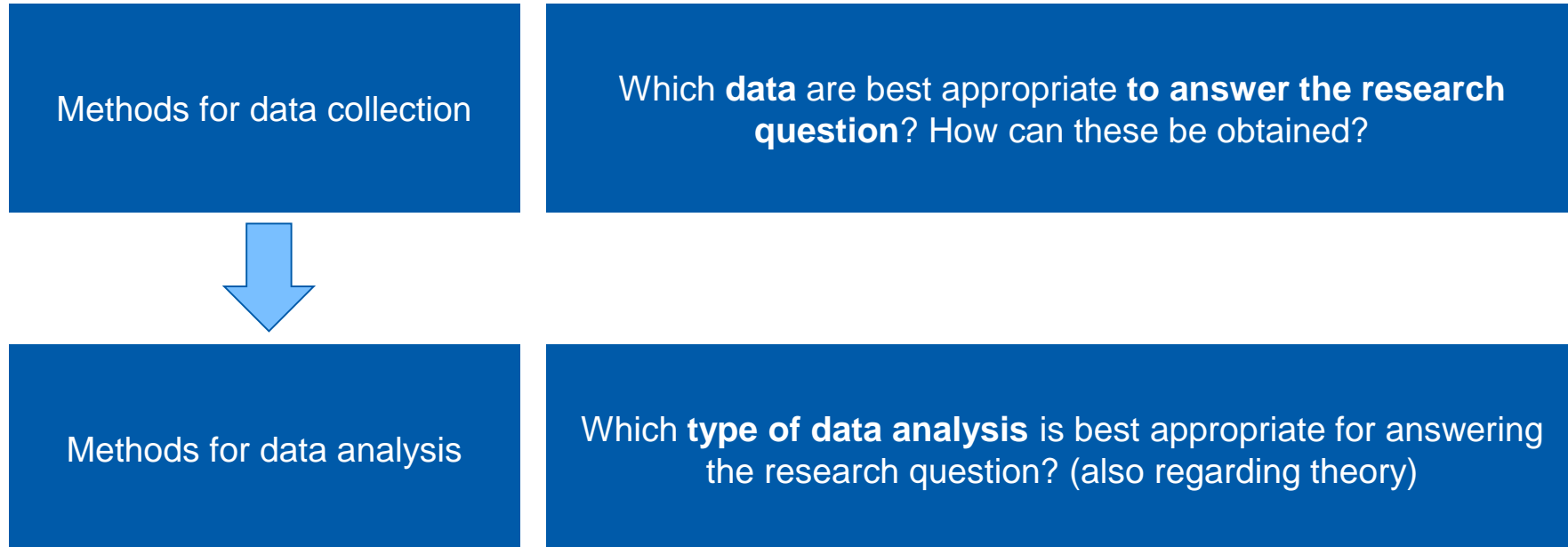
- Review the results of a survey to see if the results obtained are meaningful
- Testing the validity of the results by investigating whether the results are random
- Testing of theories & models for general validity



There are several dimensions of methodologies.

Method

Planned, systematic procedure to achieve a goal



Examples of methods: Data collection & data analysis

Qualitative

Data collection methods	Sources
Interview (problem-centred, narrative, explorative, ...)	Conversations, sound recordings
Group discussion, Focus Group	Conversations, sound recordings
(Participatory) observation	Videos, pictures, diaries, behaviour
Qualitative experiment	Behaviour, decisions

Data analysis methods

Case studies

Content analysis

Cognitive mapping

Comparative analysis

Quantitative

Data collection methods	Sources
Surveys	Thoughts, opinions
Counting / Measuring	Platform data, company data
Testing, Quantitative experiments	Characteristics, deviations

Data analysis methods

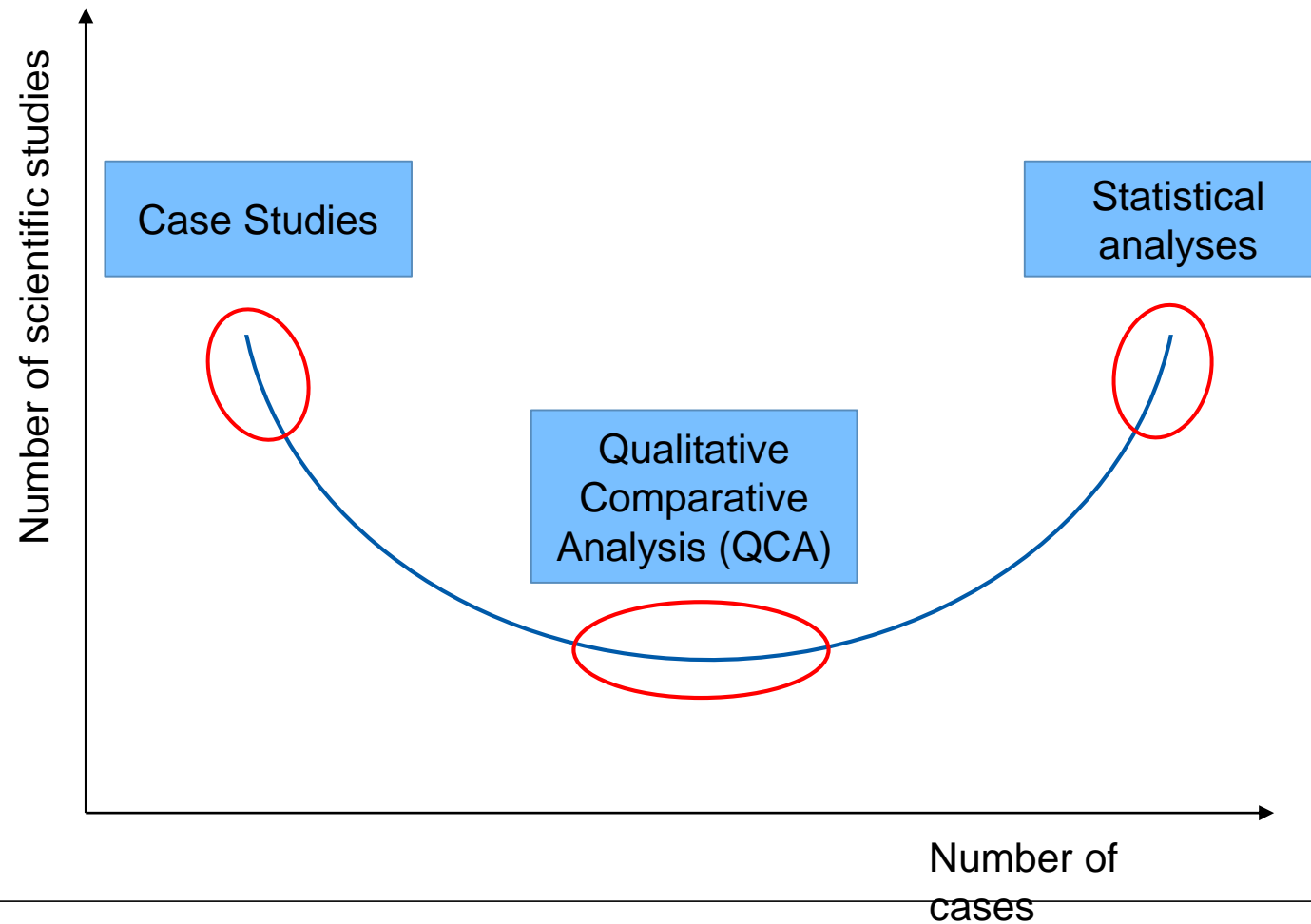
OLS regression

Logistic regression

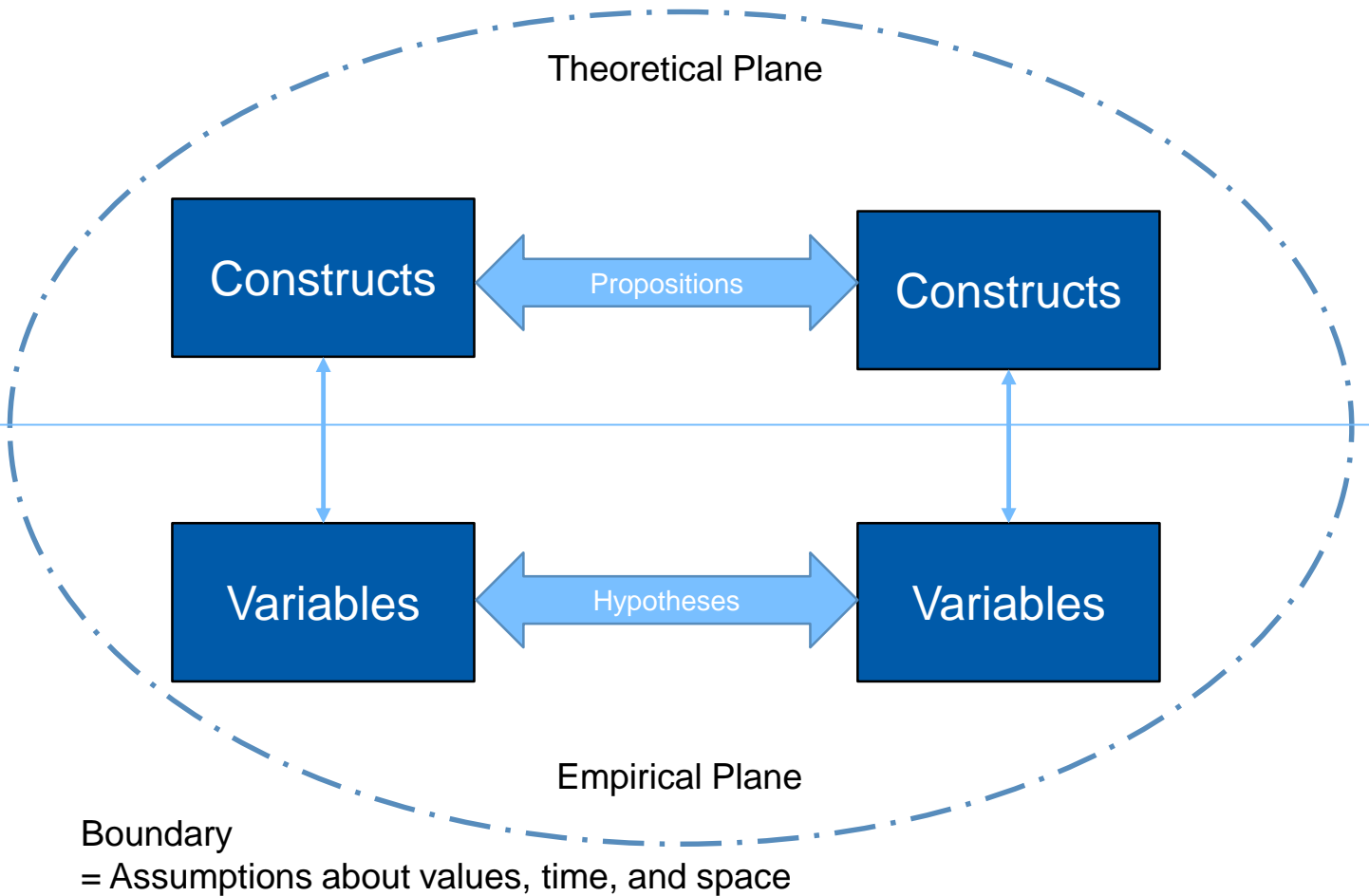
Clustering Algorithms

Independent component analysis

Choice of method depending on number of cases



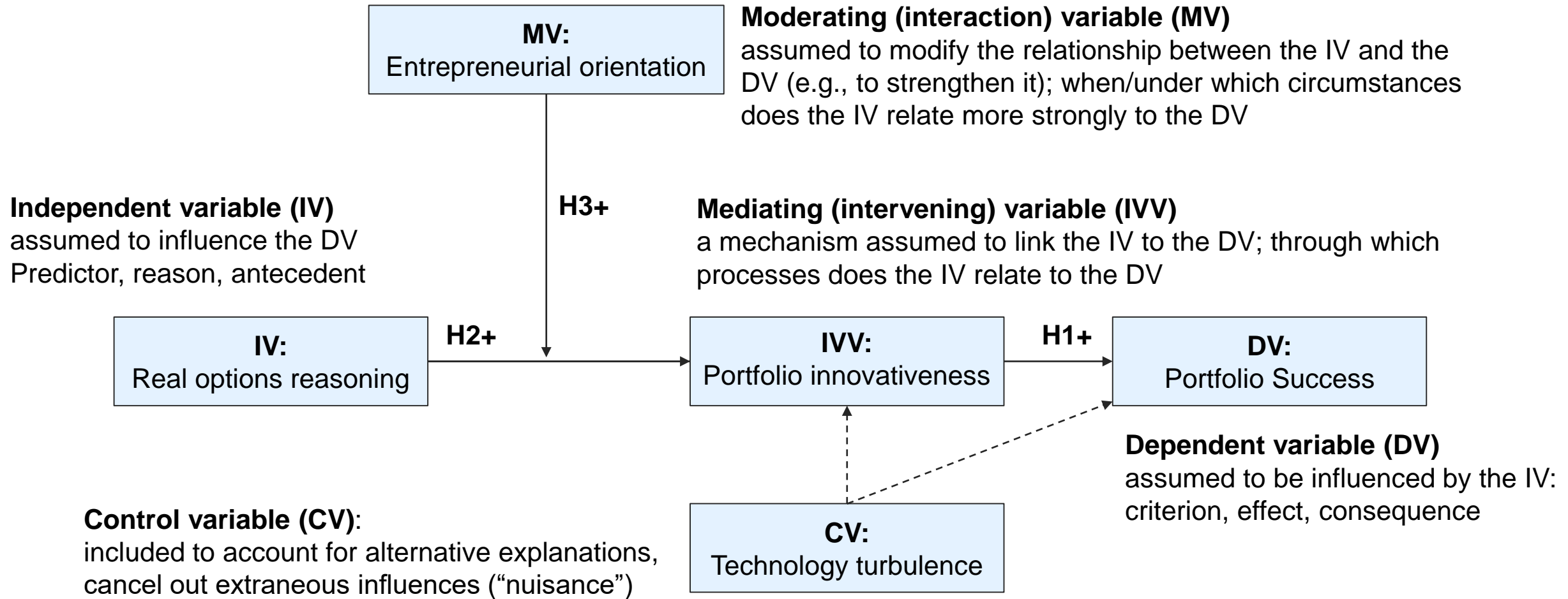
Differentiate theoretical and empirical models



Definitions

- **Construct:** a conceptual abstraction of a phenomenon that cannot be directly observed and have been deliberately invented or adopted for a special scientific purpose (e.g., firm success)
- **Proposition:** a statement about constructs that may be judged as true or false if it refers to observable phenomena
- **Variable:** a symbol to which we assign a numeral or value (e.g., earnings before tax, revenue)
- **Hypothesis:** a proposition that is formulated for empirical testing.

Different types of constructs/variables exist in a model



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Structure and contents of the seminar paper

Descriptive statistics

Description of the central tendency

- **Mode:** value that occurs most frequently
- **Median:** middle value that is in the central position
- **Mean:** average value; all values are included

Description of the dispersion

- **Range:** Difference between largest and smallest value
- **Standard deviation (SD):** Extent to which the data differ from the mean (coefficient of variation = $SD/mean$)

Description of association

- **Correlation coefficient r :** Strength of the linear relationship between two variables; range of values from -1 (perfect negative relationship) via 0 (perfect independence) to 1 (perfect positive relationship)

Example of interpretation of quantitative results - correlation table



TABLE III
CORRELATIONS AND DESCRIPTIVES

Variable	M	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
(1) Project Portfolio Success	4.58	0.80	1									
(2) Portfolio Budget (ln)	74.08	182.4	-0.07	1								
(3) Maturity of Single Project Management	5.28	1.09	0.34	-0.08	1							
(4) Formalization of Portfolio Management	4.71	1.74	0.32	-0.01		1						
(5) Number of Projects (ln)	4.03	1.21	0.03	0.02			1					
(6) Project Interdependency	3.95	1.16	-0.05	-0.08				1				
(7) External Turbulence	4.01	1.07	0.11	-0.01					1			
(8) Accountability	4.49	1.41	0.16	0.03						1		
(9) Incentives	2.22	1.26	0.12	0.08							1	
(10) BCC	4.20	1.28	0.30	0.12								1

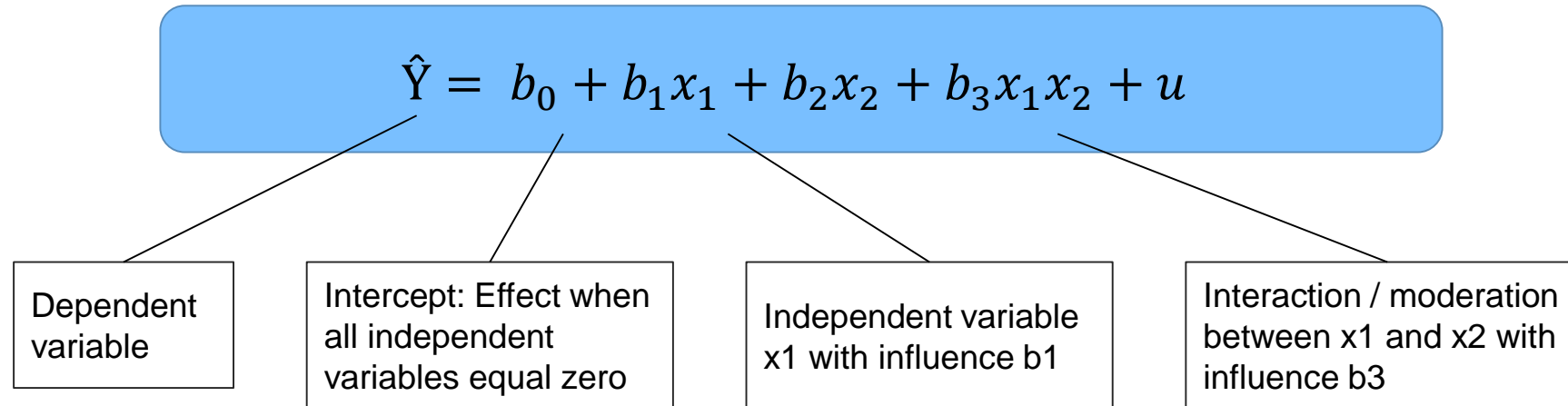
$n = 183$; M: mean; SD: standard deviation; $p < 0.05$ for all correlations larger than 0.19.

Example *Maturity of Single Project Management*

- Mean value of this variable is 5.28
- The standard deviation is 1.09
- The correlation with the variable project portfolio success is 0.34; it is statistically significant at a 5% level (i.e., if in reality the variables are uncorrelated ($r=0$), the probability of the result observed here is less than 5%. Therefore, it is assumed that the correlation is not zero).
- The correlation with the variable portfolio budget is -0.08; it is statistically not significant.

From Kopmann et al., 2015

Basics of Regression Analysis



- **Regression analysis:** assess which **independent variables are significantly related to the dependent variable** and to calculate the coefficient of determination R^2
- **Multiple regression analysis:** investigate the influence of **several independent variables**
- **Coefficient of determination R^2 :** Indicates what percentage of the variation in the dependent variable is explained by the independent variable(s).

Example of interpretation of quantitative results - regression

		Project Portfolio Success						
		(1)	(2)	(3)	(4)	(5)		
Control variables	<i>Controls</i>							
	Portfolio Budget (ln)	0.00	0.00	0.00	0.00	0.00		
	Maturity of Single Project Management	0.17**	0.13*	0.13*	0.14*	0.14*		
Moderating variables	Formalization of Portfolio Management	0.11**	0.10**	0.09**	0.10**	0.09*		
	<i>Moderators</i>							
	Accountability for Benefits Realization	0.02	-0.04	-0.02	-0.04	-0.05		
	Number of Projects (ln)	-0.03	-0.03	-0.05	-0.04	-0.04		
	Project Interdependency	-0.07	-0.09	-0.08	-0.06	-0.08	-0.10*	-0.08
Independent variable	External Turbulence	0.09	0.10	0.09	0.10	0.10*	0.11*	0.13*
	Incentives for Portfolio Success	0.04	0.02	0.04	0.01	0.02	0.04	0.02
Interaction effects	<i>Independent Variable</i>							
	H1: Business Case Control (BCC)		0.14**	0.15**	0.16**	0.14**		
	<i>Interaction Effects</i>							
	H2: BCC × Accountability			0.06*				
	H3: BCC × Incentives				0.10**			
	H4a: BCC × Number of Projects					0.10**		
H4b: BCC × Project Interdependency								
H4c: BCC × Turbulence								
	Constant	4.58**	4.59**	4.53**	4.55**	4.57**		
	R ²	0.19	0.22	0.24	0.25	0.25		
	R ² (adjusted)	0.15	0.18	0.19	0.21	0.21		
	Delta R ²		0.03*	0.02*	0.03*	0.04**	0.02	0.04
	F	4.94**	5.32**	5.32**	5.83**	5.85**	5.48**	6.23**

Example: Influence of “Business Case Control” on “Project Portfolio Success”; increasing BCC by one unit increases Success by 0.14 units; influence is significant (probability that BCC = 0 is $p < 0.01$)

Example: 22 % of the variance of the variable “Project Portfolio Success” is explained in this model by the variance of the control and moderating variables as well as the variance of the independent variable BCC

Hierarchical OLS regression; $n = 183$; mean-centered variables; unstandardized regression coefficients are reported; $*p < 0.05$; $**p < 0.01$ (two sided); BCC = business case control.

From Kopmann et al., 2015

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Structure and contents of the seminar paper

Overview

Type	Examples	Possible application
Academic Journals	Academy of Management Journal, International Journal of Project Management	<ul style="list-style-type: none"> Published articles in journals are THE medium of scientific communication (~especially at the A/B ranking level) Certain schools of thought & streams of research cluster around certain journals
Conference proceedings	Publication of discussion papers and/or lecture manuscripts	<ul style="list-style-type: none"> Only of <i>limited relevance</i> for seminar papers ~ important indication: name of the editor/author
Discussion contributions	Working Papers, Discussion Papers	<ul style="list-style-type: none"> Only of <i>limited relevance</i> for seminar papers Use the bibliography of the working paper -> reference to current research Valuable to get a first overview

Overview

Type	Examples	Possible application
Monographs	Commemorative publications, dissertations	<ul style="list-style-type: none">Established state of knowledge is summarised and reviewed by an author on a topicIn seminar papers, monographs can serve as an introduction to a specific topic or can be used as sources to a limited extent (max. 5)
Textbooks, manuals and encyclopaedias	Course Manuscripts, Springer Link Books	<ul style="list-style-type: none">No scientific literature in the narrower sense, as the target group are academics in training ~ Contents are didactically well preparedNot citable in seminar paper, but suitable for first reading
Data	Figures, detailed information	<ul style="list-style-type: none">Current figures / studies are required for some topicsPossible sources: Economic research institutes, ministries, authorities, management consultancies/strategy consultancies

Relevant journals for this seminar

Ranking

- <https://www.vhbonline.org/vhb4you/vhb-jourqual/vhb-jourqual-3/gesamtliste>
- Not every journal is of the same quality

Title	Ranking
Innovations	
Academy of Management Journal (AMJ)	A+
Research Policy	A
Organization Science	A+
Strategic Management Journal (SMJ)	A
Information Systems	
Management Information Systems Quarterly (MISQ)	A+
Information Systems Research (ISR)	A+

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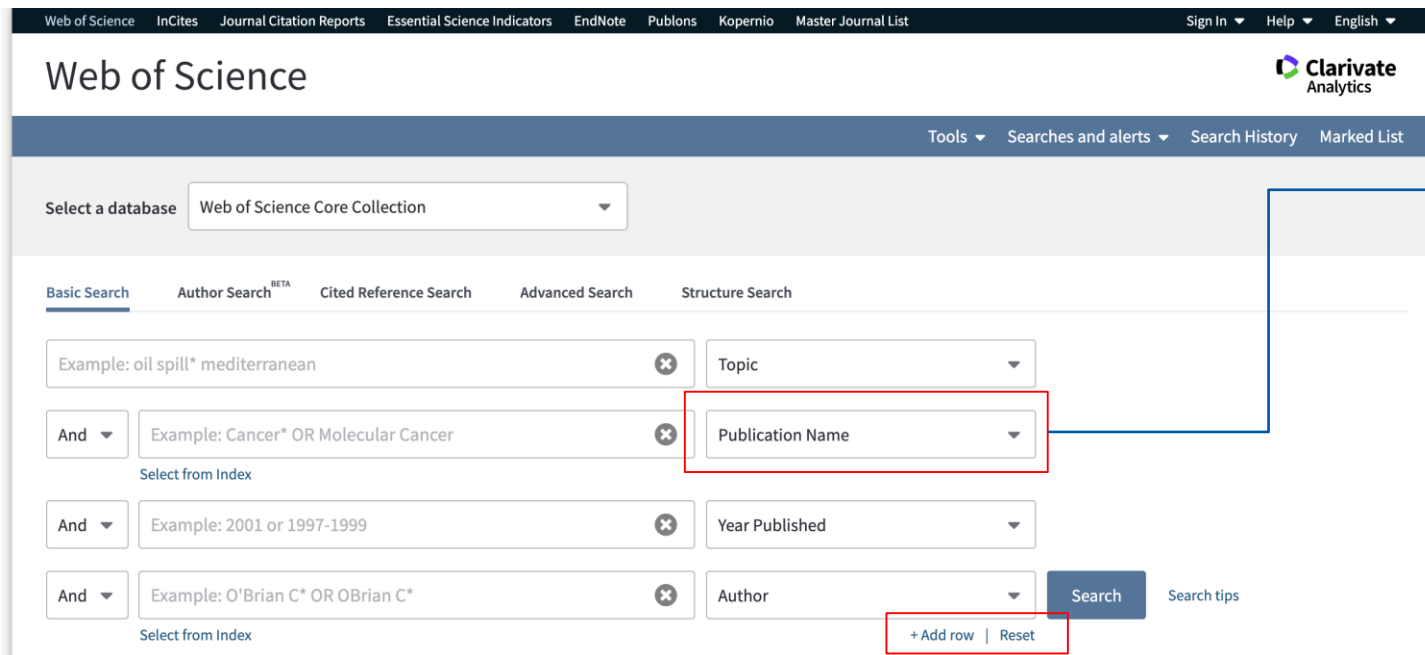
Scientific reading + literature management programmes

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Structure and contents of the seminar paper

Web of Knowledge – one of the best databases for journals

- [LINK](#)
- Allows access to pdf-files
- Can only be used via VPN



The screenshot shows the Web of Science search interface. At the top, there are navigation links for 'Web of Science', 'InCites', 'Journal Citation Reports', 'Essential Science Indicators', 'EndNote', 'Publons', 'Kopernio', and 'Master Journal List'. The main header includes 'Web of Science' and the 'Clarivate Analytics' logo. Below the header, there are tabs for 'Tools', 'Searches and alerts', 'Search History', and 'Marked List'. A dropdown menu shows 'Select a database' with 'Web of Science Core Collection' selected. The search area is divided into 'Basic Search', 'Author Search', 'Cited Reference Search', 'Advanced Search', and 'Structure Search'. The 'Basic Search' section contains four search criteria: 'Topic' (with example 'oil spill* mediterranean'), 'Publication Name' (with example 'Cancer* OR Molecular Cancer'), 'Year Published' (with example '2001 or 1997-1999'), and 'Author' (with example 'O'Brian C* OR OBrian C*'). A 'Search' button is located to the right of the criteria. Below the search criteria, there are links for '+ Add row' and 'Reset'.

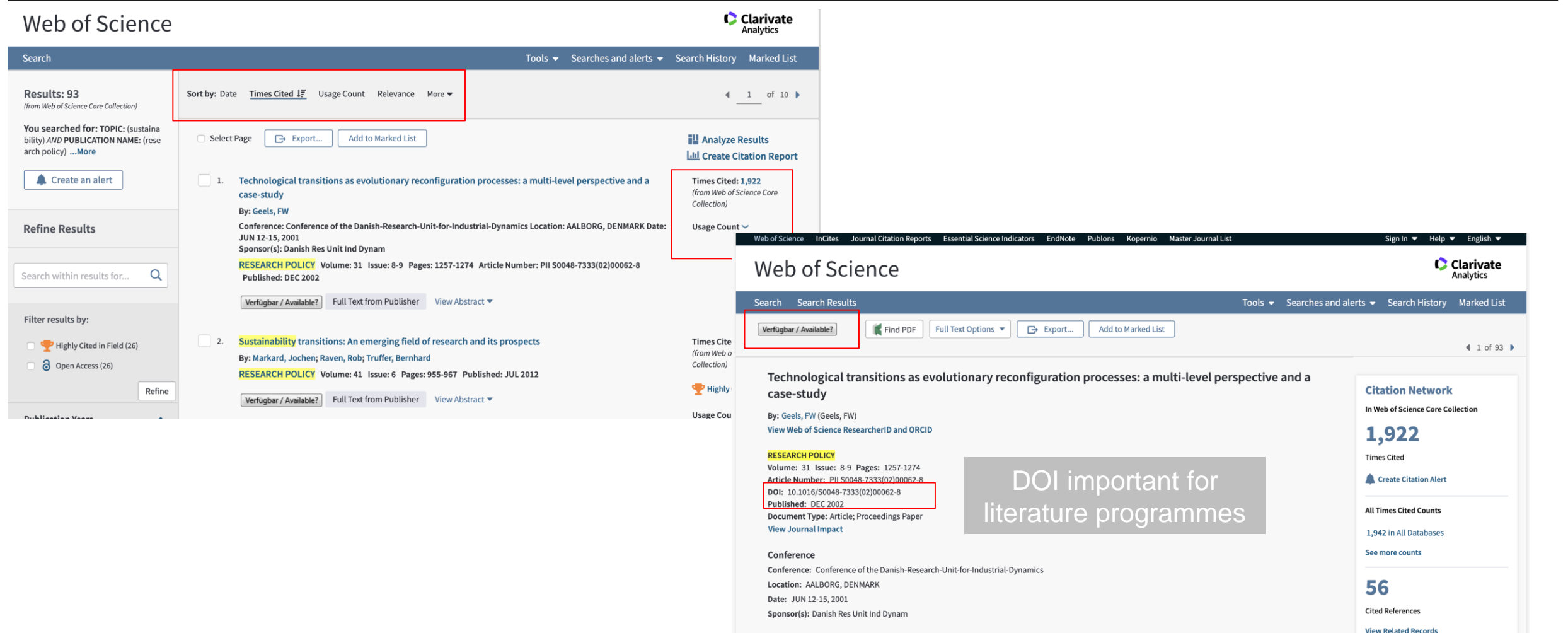
Publication Name = Journal Name

**Access to many journals only
via VPN**

https://www.hrz.tu-darmstadt.de/netz/netzzugang_internet/netz_datennetz_internet_vpn_1/index.de.jsp



VPN access
with Cisco
AnyConnect



The screenshot displays the Web of Science interface. On the left, a sidebar shows search filters and options. The main area lists search results, with the first result highlighted. A detailed view of the first article is shown on the right, including its title, author, and citation information. A red box highlights the DOI in the article details. A grey box with white text is overlaid on the article details, stating: "DOI important for literature programmes".

Web of Science (from Web of Science Core Collection)

Results: 93

You searched for: TOPIC: (sustainability) AND PUBLICATION NAME: (research policy) ...More

Sort by: Date Times Cited Usage Count Relevance More

1 of 10

Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study

By: Geels, FW

Conference: Conference of the Danish-Research-Unit-for-Industrial-Dynamics Location: AALBORG, DENMARK Date: JUN 12-15, 2001

Sponsor(s): Danish Res Unit Ind Dynam

RESEARCH POLICY Volume: 31 Issue: 8-9 Pages: 1257-1274 Article Number: PII S0048-7333(02)00062-8

Published: DEC 2002

Verfügbar / Available? Full Text from Publisher View Abstract

2. Sustainability transitions: An emerging field of research and its prospects

By: Markard, Jochen; Raven, Rob; Truffer, Bernhard

RESEARCH POLICY Volume: 41 Issue: 6 Pages: 955-967 Published: JUL 2012

Verfügbar / Available? Full Text from Publisher View Abstract

Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study

By: Geels, FW (Geels, FW)

View Web of Science ResearcherID and ORCID

RESEARCH POLICY

Volume: 31 Issue: 8-9 Pages: 1257-1274

Article Number: PII S0048-7333(02)00062-8

DOI: 10.1016/S0048-7333(02)00062-8

Published: DEC 2002

Document Type: Article; Proceedings Paper

View Journal Impact

Conference

Conference: Conference of the Danish-Research-Unit-for-Industrial-Dynamics

Location: AALBORG, DENMARK

Date: JUN 12-15, 2001

Sponsor(s): Danish Res Unit Ind Dynam

Times Cited: 1,922 (from Web of Science Core Collection)

Usage Count

Web of Science InCites Journal Citation Reports Essential Science Indicators EndNote Publons Kopernio Master Journal List Sign In Help English

Web of Science

Search Search Results

Verfügbar / Available? Find PDF Full Text Options Export... Add to Marked List

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Citation Network

In Web of Science Core Collection

1,922

Times Cited

Create Citation Alert

All Times Cited Counts

1,942 in All Databases

See more counts

56

Cited References

View Related Records

DOI important for literature programmes

Database Information System DBIS

ULB offers a variety of databases























(http://rzblx10.uni-regensburg.de/dbinfo/fachliste.php?bib_id=tuda&lett=l&colors=&ocolors=)

- DBIS is helpful in the search for...
 - Statistics, discussion papers, general literature research
 - Business Source Premier (via **EBSCO Host**) → searches the complete available holdings by keyword (full text/abstracts)



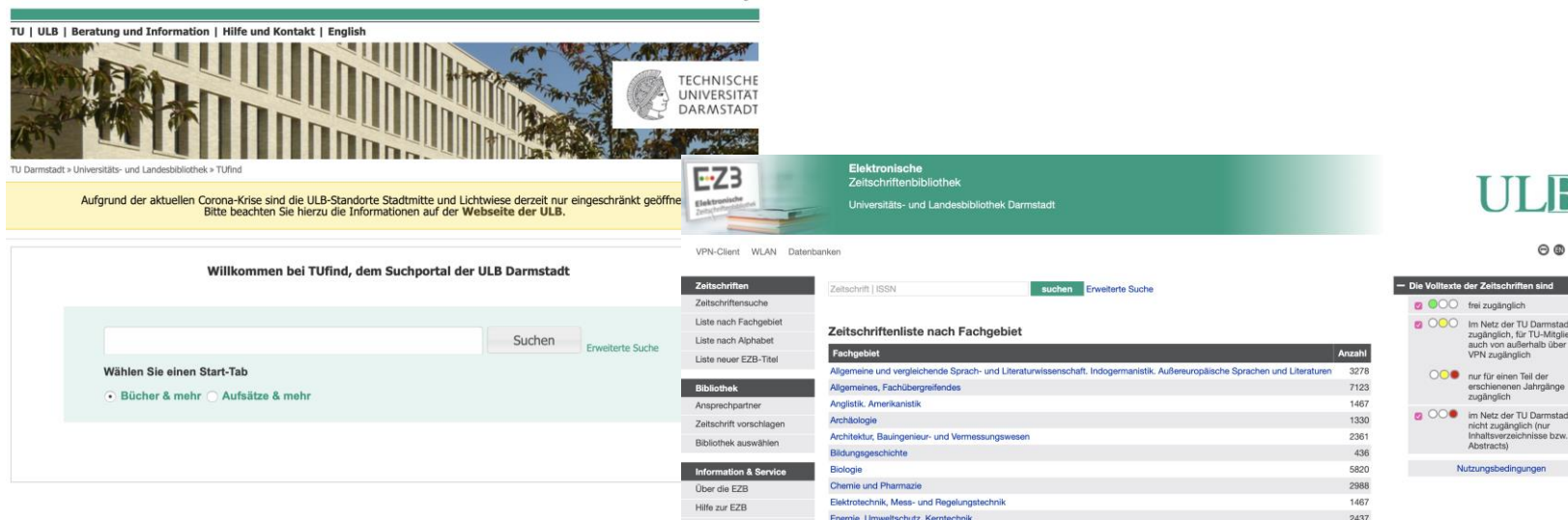
The screenshot shows the homepage of the 'Datenbank-Infosystem (DBIS)' at the 'Universitäts- und Landesbibliothek Darmstadt'. It features a search bar with a 'Go!' button and a 'Fachübersicht' section. The 'Fachübersicht' table lists various subject areas and their corresponding document counts.

Fachgebiete	Anzahl
Allgemein / Fachübergreifend	1088

TOP-Datenbanken (5 Treffer)	Zugang
Business Source Premier (via EBSCO Host)	auch extern 
Compliance Digital	auch extern 
WISO	auch extern 
Nexis (bisher LexisNexis / Wirtschaft)	auch extern 
EconLit	auch extern 
Gesamtangebot (322 Treffer)	Zugang
ABC der deutschen Wirtschaft	frei im Web 
ACR Conference Proceedings Catalogue / Association for Consumer Research	frei im Web 
Africa Development Indicators	frei im Web 
Africana Periodical Literature: Bibliographic Database	frei im Web 
Aktieblog 1901-1935	frei im Web 
Alfred Escher-Briefedition	frei im Web 
AllThatStats.com	frei im Web 
American Fact Finder	frei im Web 
AMT - Produktverzeichnis der Mitgliedsfirmen	frei im Web 
Aquaculture Compendium	deutschlandweit frei 
Arbeits- und Industriosozologische Fallstudien	frei im Web 
Arbeitsmarktpolitisches Informationssystem	frei im Web 
ARCHISplus	frei im Web 
Atlas of Social Protection, The: Indicators of Resilience and Equity	frei im Web 
Aufsatzdatenbank Osteuropa	frei im Web 
Außenhandelsdatenbank	frei im Web 
Australian Social Science Data Archive	frei im Web 

Online catalogue ULB

- Online catalogue of the University and State Library of the TU Darmstadt: <https://hds.hebis.de/ulbda/index.php>
- Electronic Journals Library (EZB) (<http://rzblx1.uni-regensburg.de/ezeit/fl.phtml?bibid=TUDA>)
 - Overview of different portals for desired content



The screenshot shows the homepage of the TU Darmstadt library website. At the top, there is a navigation bar with links for 'TU | ULB | Beratung und Information | Hilfe und Kontakt | English'. Below this is a banner image of the library building with the TU Darmstadt logo. A yellow warning box states: 'Aufgrund der aktuellen Corona-Krise sind die ULB-Standorte Stadtmitte und Lichtwiese derzeit nur eingeschränkt geöffnet. Bitte beachten Sie hierzu die Informationen auf der Webseite der ULB.' The main content area is titled 'Willkommen bei TUfind, dem Suchportal der ULB Darmstadt' and features a search bar with 'Suchen' and 'Erweiterte Suche' buttons. Below the search bar, there are radio buttons for 'Bücher & mehr' (selected) and 'Aufsätze & mehr'. To the right, there is a sidebar with navigation options: 'Zeitschriften', 'Bibliothek', and 'Information & Service'. The 'Zeitschriften' section is active, showing a search bar with 'Zeitschrift | ISSN' and a 'suchen' button. Below the search bar is a table titled 'Zeitschriftenliste nach Fachgebiet' with columns for 'Fachgebiet' and 'Anzahl'. The table lists various disciplines and their corresponding journal counts.

Fachgebiet	Anzahl
Allgemeine und vergleichende Sprach- und Literaturwissenschaft, Indogermanistik, Außereuropäische Sprachen und Literaturen	3278
Allgemeines, Fachübergreifendes	7123
Anglistik, Amerikanistik	1467
Archäologie	1330
Architektur, Bauingenieur- und Vermessungswesen	2361
Bildungsgeschichte	436
Biologie	5820
Chemie und Pharmazie	2988
Elektrotechnik, Mess- und Regelungstechnik	1467
Energie, Umweltschutz, Kerntechnik	9437

Wiley
Online
Library

Google
scholar

ULB

SpringerLink

STATIS
Statistisches Bundesamt

STOR

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Structure and contents of the seminar paper

Methods for reading

PQ4R

- **Preview** = Skim chapters, identify the most important sections and then apply the following steps for each section.
- **Questions** = Rephrase section headings into questions.
- **Read** = Reading while making marginal notes.
- **Reflex** = Relate text to prior knowledge, think up examples.
- **Recite** = Reproduce the information contained in the text passage in your own words and answer questions you have thought about.
- **Review** = Go through the chapter again and remind yourself of the main points.

Reading for meaning

- (1) **Create overview:** Headings and subheadings, table of contents, outline, preface, introduction and conclusion
- (2) **Cross-reading:** Understand what it is about; grasp important terms and central statements
- (3) **Thinking:** Filter out interesting aspects, record contradictions and questions
- (4) **Read:** Highlight the most important content in the text, look at central concepts and levels of reflection
- (5) **Summarise the essentials:** Write summary, note questions and comments
- (6) **Conclusion:** What remains? What can I reproduce?

Literature management

ULB offers campus licences (via VPN)

- https://www.ulb.tu-darmstadt.de/service/literaturverwaltung_start/vergleich_litverw/litv_uebersicht.de.jsp
- Decision is up to students
- LaTeX / BibTex also possible

Jadana: Endnote + Word
Tim: Citavi + LaTeX

	EndNote	EndNote Web	Citavi	Zotero
Kosten/Bezug	Campuslizenz , weitere Infos hier	kostenlos im Uni-Netz nach individueller Registrierung	Campuslizenz , weitere Infos hier	kostenlos (zur Download-Seite)
Plattform	Windows/Macintosh	browserbasiert, unabhängig vom Betriebssystem	nur Windows	Firefox-Plugin
Funktionsumfang	am größten	mittel	groß	das Wesentliche
Cite while you write mit Word	+	+	+	+
manuelle Eingabe , Dateiimport & Import aus Online-Datenbanken	+	+	+	manuelle Eingabe Datenextraktion aus Webseiten
Datenausgabe in verschiedenen Formaten (z.B. Textverarbeitung)	+	+	+	+(eingeschränkt)
Zusatzinfos	EndNote Homepage	EndNoteWeb Homepage Bildschirm-Tutorial	Citavi Homepage	Zotero Homepage Bildschirm-Tutorials

DOI?

- Digital Object Identifier – each paper has its own DOI
- By entering the DOI, the data in the programmes update themselves automatically
 - When creating the source
 - When there is a new version of this

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Structure and contents of the seminar paper

Formal structure of the seminar paper (1/2)

Formal components of the work

- Title page
- Abstract
 - max. 1 page with precise overview: objective / research question, methodology / procedure, results, implications
- Table of contents
 - Pay attention to the thread & weighting of the chapters
- List of abbreviations and list of figures and tables, if applicable
- Text section with introduction, main chapters and conclusion
- Literature list
- Appendix, if applicable
- Declaration on oath

Formal structure of the seminar paper (2/2)

Format & Layout

- Font: Times New Roman (12pt) or Arial (11pt)
- 1,5 line spacing
- Justified text
- Each sheet is written on one side only (if print is required)
- Page margins: Top: 3 cm, bottom: 2.5 cm, left: 3 cm, right: 2.0 cm
- Roman numerals for directories & accompanying texts
- Arabic numerals for the text part
- Exception: Abstract does not get a page number

Word template will be available in Moodle!

Cite

As a footnote

- marked in the text by superscript Arabic numerals
- Name(s) of the author(s)
- Publication year of the source, in brackets
- **Page(s)** on which the citation can be found in the source (the page reference is omitted for citations from the Internet).
- Start with capitalisation, end with a punctuation mark (.)
- Ex.: * Cf. Gemünden (1983), p.17.

In the text flow (in brackets in the text)

- Name(s) of the author(s)
- Publication year of the source
- **Page(s)** on which the citation can be found in the source (the page reference is omitted for citations from the Internet)
- Start with capitalisation
- Connecting two authors with „and”
- Three or more authors: First author et al.
- Ex.: Gemünden et al. (1983, p.17) show...
- Ex.: ... (Gemünden et al., 1983, p.17).

Settings regarding citations possible in the literature management programmes