13. Basics of Information Gathering (Reading, Screening, Strategy, Literature Analysis)

Prof. Dr. Uwe Aßmann

Softwaretechnologie

Fakultät Informatik

Technische Universität Dresden

2016-0.4, 23.04.16

http://st.inf.tu-dresden.de/teaching/asics

1) Data, Information, Knowledge
2) Reading Process RIK
    1) Checking Relevance of Texts
    2) Information Aquisition
    3) Knowledge Aquisition
3) Other Reading Methods
4) Methods of Recite
5) Information gathering
6) Writing literature analysis papers

DRESDEN concept
Exzellenz aus Wissenschaft und Kultur

Obligatory Literature

- Philip W.L. Fong. 2009. Reading a computer science research paper. SIGCSE Bull. 41, 2 (June 2009), 138-140. DOI=10.1145/1595453.1595493 http://doi.acm.org/10.1145/1595453.1595493
- Joseph D. Novak, Alberto J. Cañas. The Theory Underlying Concept Maps and How to Construct and Use Them. Technical Report. CmapTools 2006-01 Rev 01-2008, Florida Institute for Human and Machine Cognition (IHMC)
  - http://cmap.ihmc.us/docs/theory-of-concept-maps
- Reading methods are well described under http://www.teachsam.de/
- http://cseweb.ucsd.edu/users/wgg/CSE210/howtoread.html

Other References

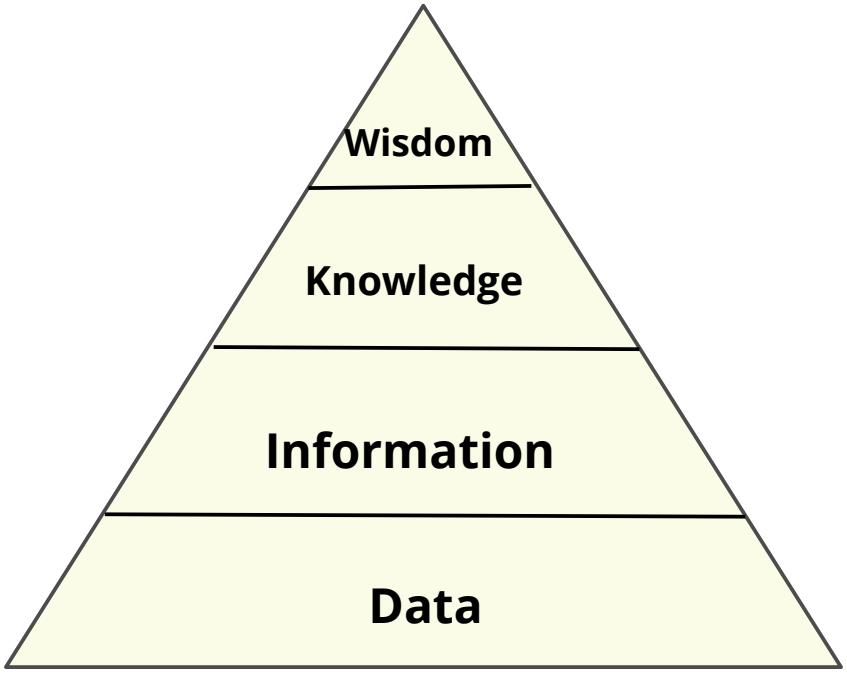
- Joachim Stary/Horst Kretschmer. Umgang mit wissenschaftlicher Literatur. Cornelsen.
- Christine Stickel-Wolf, Joachim Wolf: Wissenschaftliches Arbeiten und Lerntechniken. Erfolgreich studieren – gewusst wie! Gabler, 5., aktualisierte und überarbeitete Auflage 2009

13.1. Data, Information, Knowledge Aquisition in Science

- Repetition for ASICS

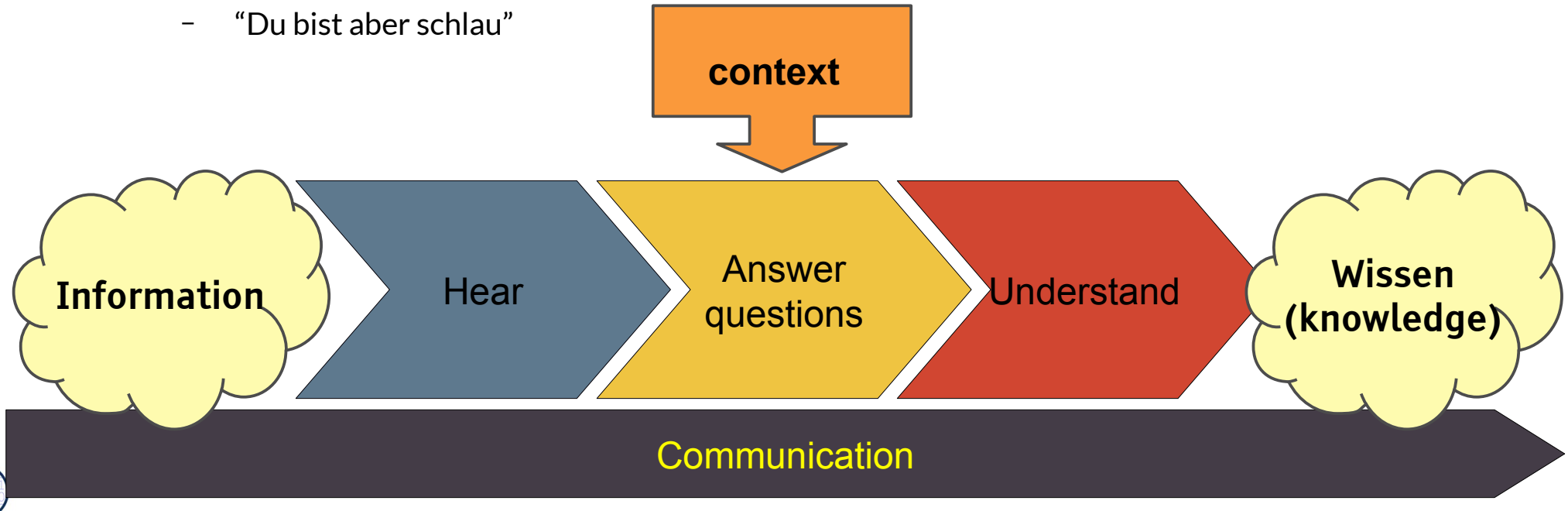
Science is about DIKW (Data, Information, Knowledge, Wisdom)

- Philosophy of Science quarrels about the right model for DIKW.
- The relationship of DIK and W is important for science, because
  - Natural science finds data in the world and has to interpret them to knowledge
  - Technical science should use knowledge to solve problems, but needs to be wise, because technology can be dangerous (e.g., see the use of nuclear energy)
- One DIKW model is the DIKW pyramid:



The Knowledge Aquisition Model from Spinner

- Knowledge is context-dependent and gained from information by interpretation
  [Prof. Helmut Spinner, Karlsruhe, Keynote at Fakultät Informatik, 1997]
- Every human being judges on a message immediately, answering 10-15 questions immediately
- Answering the questions creates knowledge
- What do I think about information such as:
  - "Das schmeckt gut."
  - "Das ist aber interessant"
  - "Du Idiot"
  - "Du bist ein Schlingel"
  - "Du bist aber schlau"



Typical Questions for Interpretation

About the sender:

- In which emotional state is the sender? (angry, sad, happy, joking, serious)
- Is the sender trustworthy? (unknown, friend, competitor, enemy, have I been disappointed by him already?)
- Which personality has the sender? (serious human being, funny, thinker, surperfical type, depressive,...)
- which channel has the sender used previously (facts, emotions, relations, etc.)?

About the receiver:

- Which are my current expectations? Which channel do I expect?
- My emotional state

About the context:

- In which state is the relationship (peace, quarrel, ..)
- the communication? (stress, hurry, joking, ..)

How Information Becomes Knowledge

- How do you interpret the remarks
  - “Das schmeckt gut.”
  - “Das ist aber interessant”
  - “Du Idiot”
  - “Du bist ein Schlingel”
  - “Du bist aber schlau”
- from your partner? from your friend? from your mother?
- from your competitor?
- from your boss?

Knowledge is what remains after answering questions.

Knowledge is what remains in the scientist after answering questions of his value system.

13.2. “Lazy” and Efficient Reading Process with Revelance Check, Information and Knowledge Aquisition (RIK)

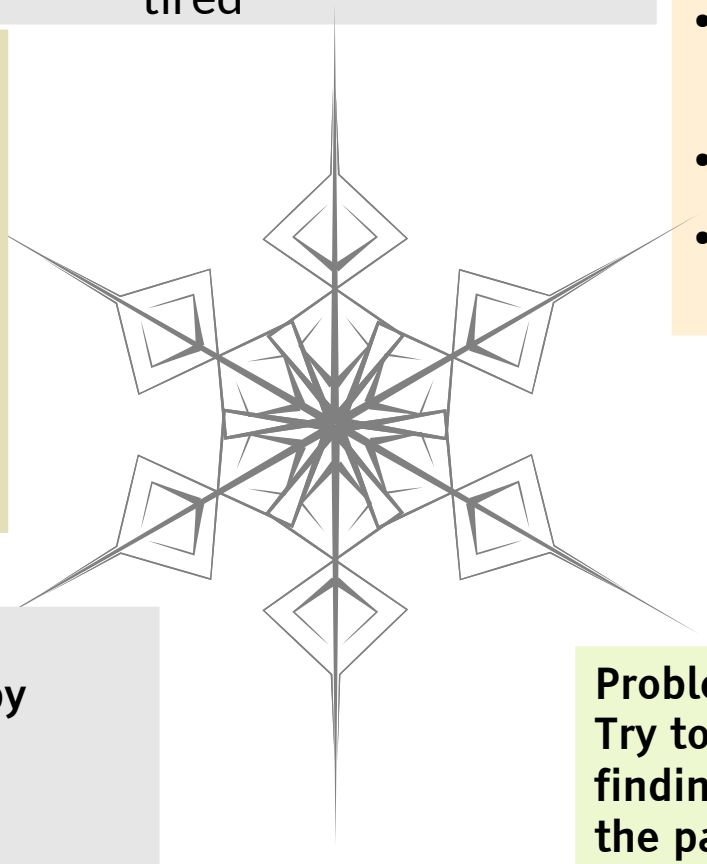
Problems with Reading

- Motivation
  - Bored, unfocusedness, tired

- Good Habits
  - Increase your width of focus
  - Try to read fast
  - Read slower, if text is hard to understand

- **Bad habits**

Read word by word
Jump back (regression)
Talk while reading
Listening to rock music while reading



- **Good steps**

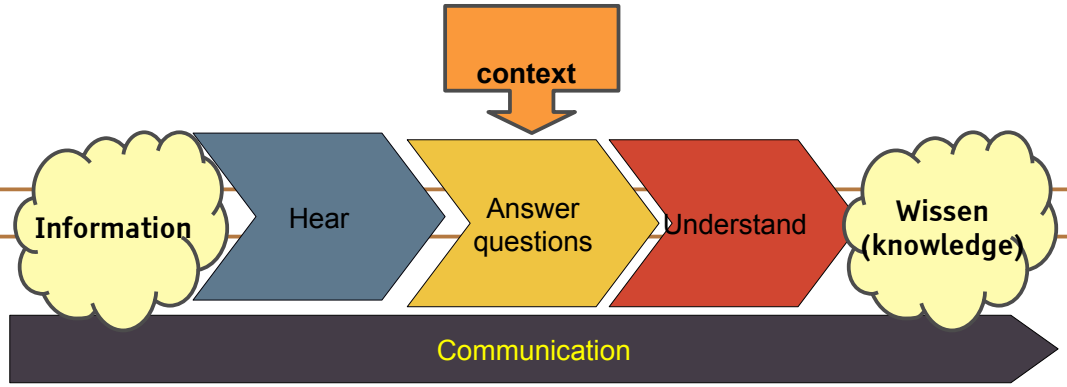
Cover read lines or unread by paper sheet or ruler
Jump-Stop movement
Summaries
Questions

Problems with Pertinence
Try to read everything, instead of finding the *thesis statement* of the paragraph
Only read, never draw

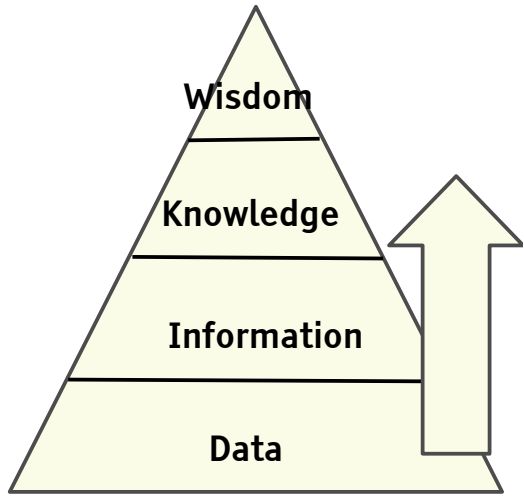
Reading: First Clearify Your Objectives

- Don't loose time: try to find out **relevant** things to read
  - Be quick in reading and filtering
- Learn one or two main concepts
  - Find out about important research questions
- Clearify your own position
- Find the position of your own work with regard to the paper you read (demarcation)
  - Research landscape
  - Qualitative analysis according to comparison criteria
- Prepare thesis writing
  - Be able to write a section on what you read into your thesis report
  - Be able to compare

Lazy Reading Process RIK



- RIK is a simple reading process allowing for stopping all the way and not wasting time
- The RIK process is structured along the DIKW pyramid and the Spinner IK knowledge acquisition process:
  - without questions no knowledge from information
  - without recitation no knowledge: no embedding of the information in your own knowledge (self-context)



Lazy Reading Process RIK

- Analyse Paratext: Table of Contents
  - Find out focus of work (Schwerpunkte)
  - Separate background from the author's work
  - Skip analysis: Find out chapters you know already and decide to skip them
- **Paging** through ("Durchblättern")
  - How long are main chapters?
  - What is side material?
- Analyse **Eye Catchers**
  - Figures, tables
  - Central definitions
  - Other structuring aids

Lazy Reading Process RIK

- Analyze the **abstract** and the **introduction** (with Fong method)
  - Research question? Research Hypothesis? Research Method? Research Validation?
  - Relevance, Positioning into the research landscape
    - Find out **Assumptions** of the paper
    - Find out **Restrictions (Limits)** of the paper
- Analyze **summary** or conclusion
  - Central points, results
  - What should be read more intensively? what are the main sections to be read?
- Read the **skeleton** (the first sentence of each section)
  - Relevance check of the sections
  - "Points" of the sections
  - Get an overview about the argumentative structure of the paper

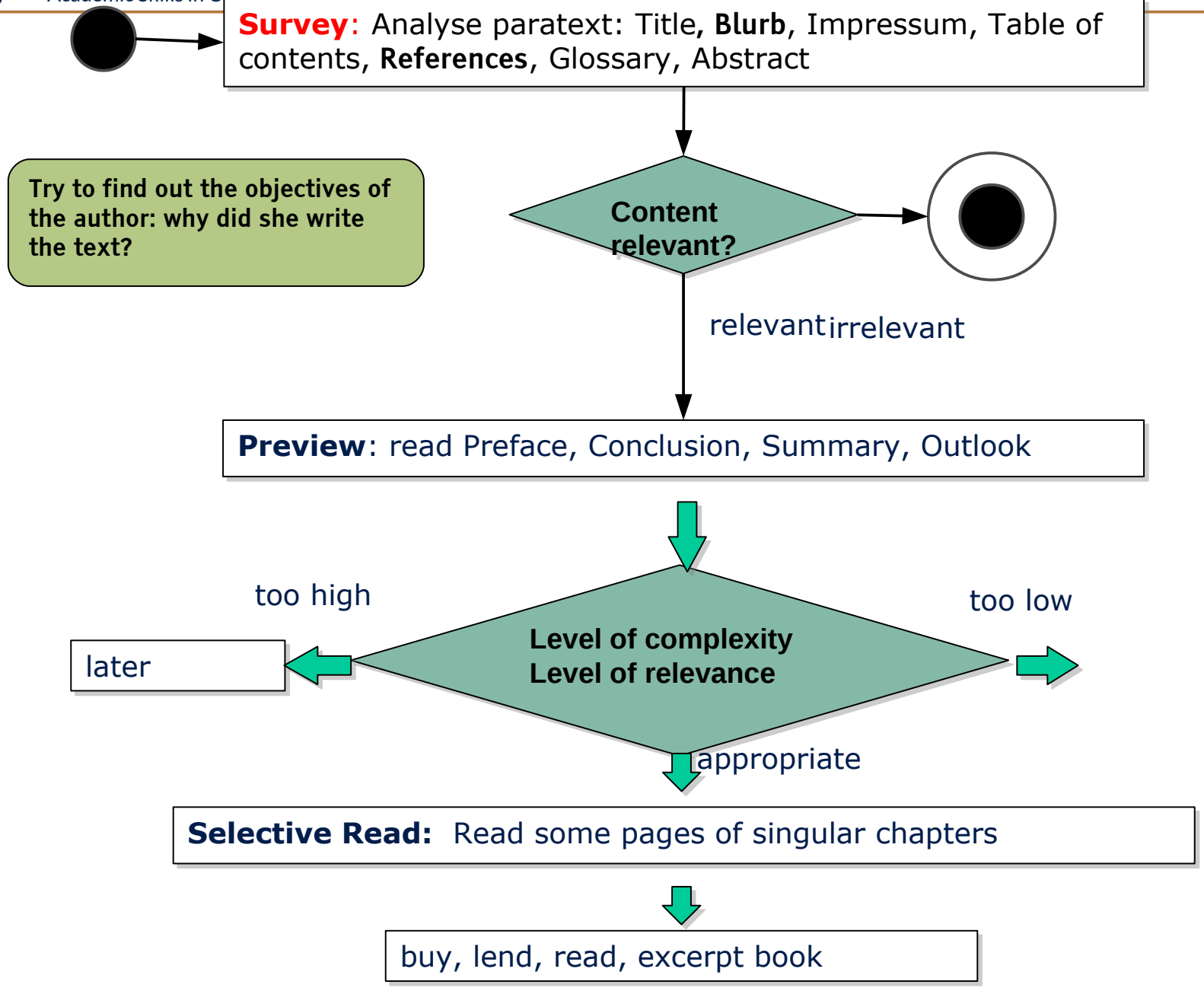
13.2.1. Relevance Check

Use *Paratext* to Check for Relevance

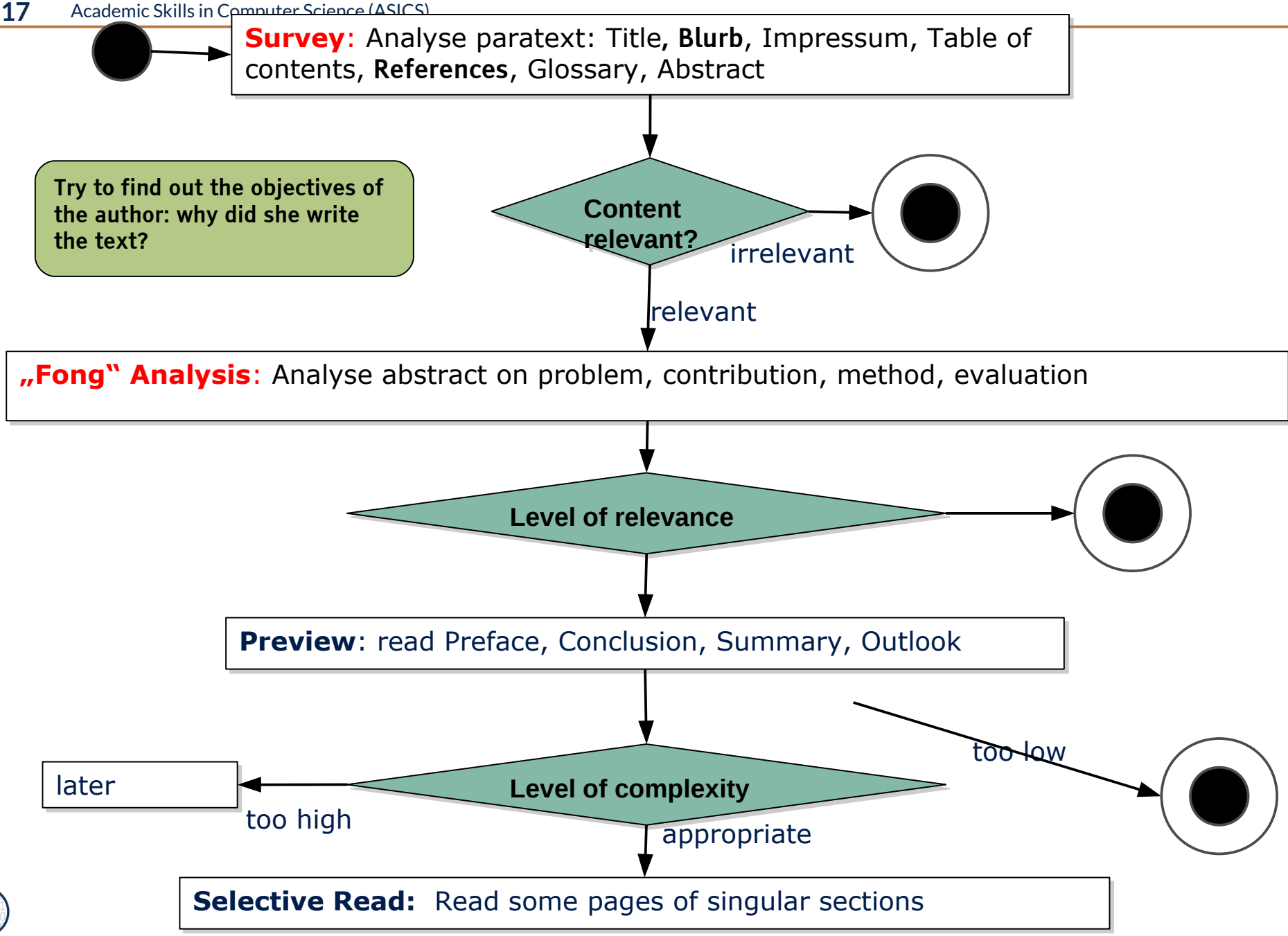
- Find out goal of the author
- Relevance of research topic
- **Main text**: Title, preface, introduction, table of contents, summary, …
- **Nebentext**: Envelope, Blurb, Recensions, Amazon comments…
- **Computer reviews**: a journal with reviews of papers
- **Abstract:** read the abstract and analyze it
- **Search on the internet** about the paper or book
  - summaries, reviews

- Ex.: **Blurb (Klappentext)** aus Wikipedia, der freien Enzyklopädie
- „Als Klappentext (auch unter der Bezeichnung *Waschzettel* bekannt) wird ein auf den Einschlagklappen eines Schutzumschlags stehender Text bezeichnet. Der Verleger Robert Langewiesche gilt als "der Erfinder" des Klappentextes. Üblich sind eine kurze, werbende Zusammenfassung des Buchinhalts (meist auf der vorderen Einschlagklappe), eine Autorennotiz (meist auf der hinteren Einschlagklappe) und gegebenenfalls Hinweise auf weitere Bücher des Verlags.“

Relevance Check: Survey, Preview, and Selective Reading of Books



Relevance Check Specific for Research Papers: Survey, Fong Analysis, Preview, and Selective Reading



„Fong“ Abstract Analysis

Analyse abstract (and intro, conclusion) on

- Research Problem
- Research Contribution
- Research Method and Evaluation
  - Scientific paper: Proofs? Experiments? Empirical studies?
  - Essay: Opinions and arguments?
- Conclusions

- Problem and contribution together are often also called:
  - Research question – if formulated as a question
  - Research hypothesis – if formuated as hypothesis

Training Unit: Writing Paratext

- What is important when you write a paratext as an author?

13.2.1.2 Relevance Analyses for Research

- Not all research is *relevant*
- Often, decisions have to be made about which way to go in research. Several general analysis for strategy can be used.
- [more material in course “Software Management (summer)”]

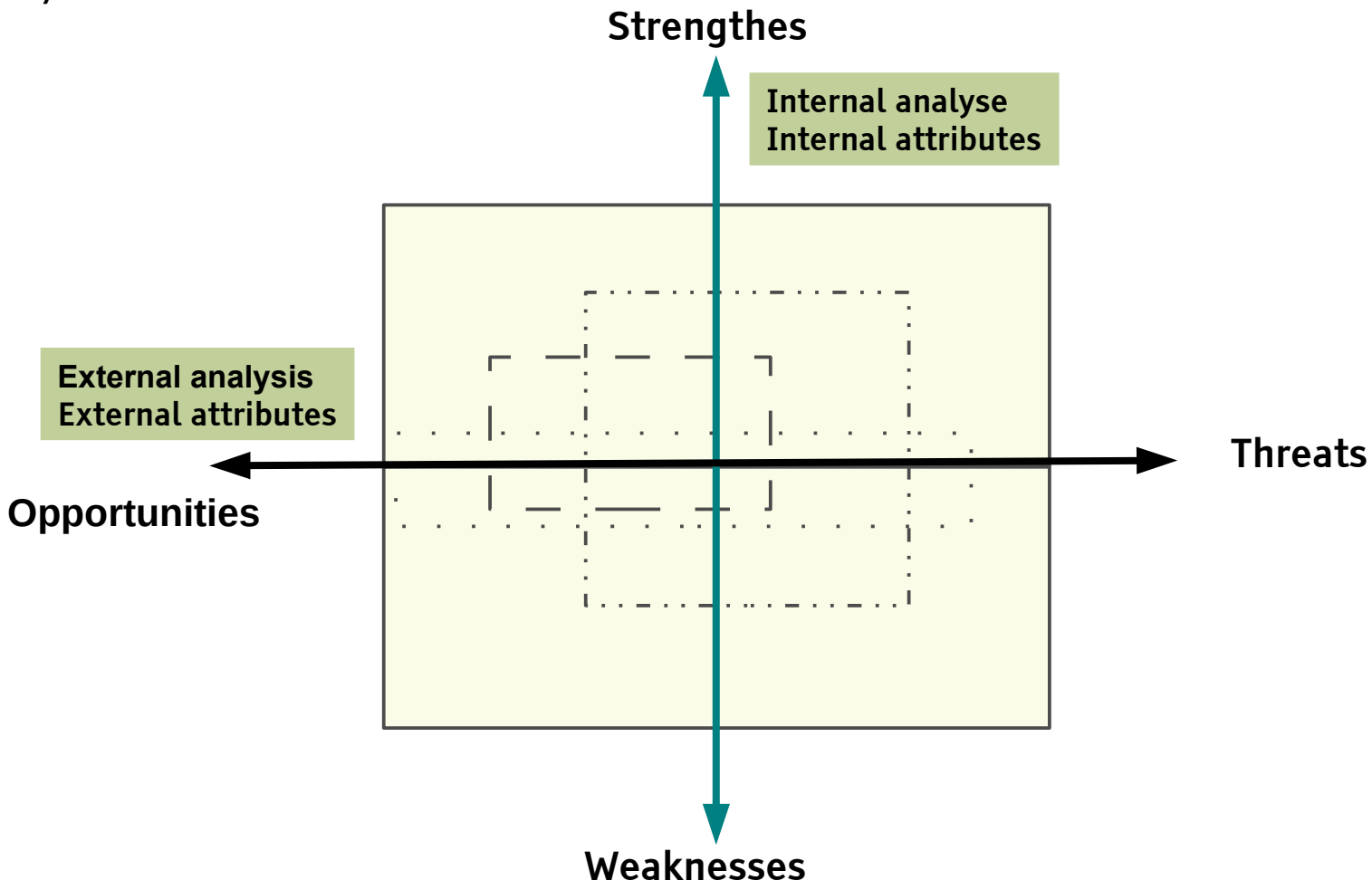
Different Classes of Research Results

Try to classify every paper you read according to the following classes: [Fong]

- **Relevant research**: Somebody, the **research stakeholder,** needs the result.
  - **Significant problem?**
  - **Significant result?**
- **High innovation depth**: research result lies much beyond the state of the art
- **Narrow result:** the research result will not influence many applications, products, or markets, nor other research.
- **Disruptive result:** The research result will change many technologies, products, markets, value chains.
- **Epsilon-result:** The research result is not far away from the state of the art, but contains a definite improvement.
- **“low hanging fruit”-result**: the research result is quite easy to achieve or to document

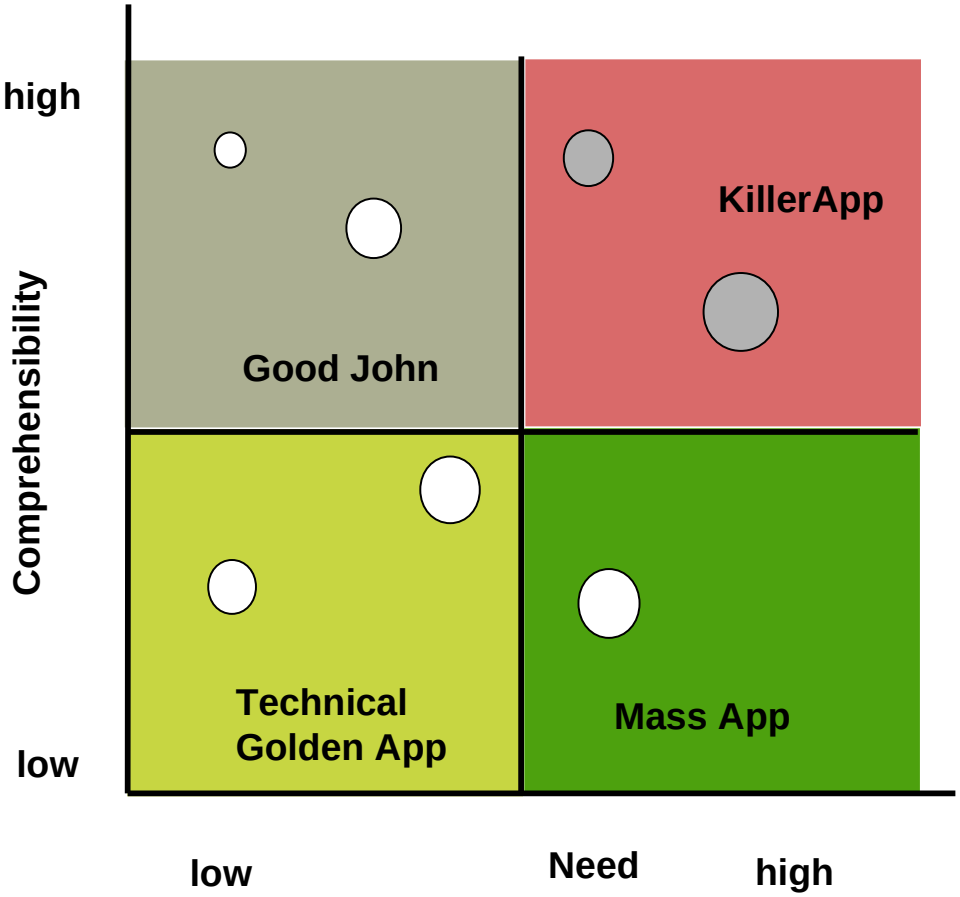
What are the Strategic Aspects of a Paper? SWOT Analysis as a 4-D Analysis

- SWOT is a 4-dimensional attribute analysis for the development of a strategy for of a project [Albert Humphrey]
- For strategic decisions of your thesis and your research
- Try to combine with the 6 honest men!



„KillerApp“ Analysis (Attractivity Portfolio)

- **“KillerApp”-Analysis** investigates for a product or a research paper
  - whether it is needed
  - whether it is comprehensible
- the **Attractivity Product** is a Utility-utility-product:
  - **Attractivity** = Need * Comprehensibility
- Most attractive papers or projects are “KillerApps”, because they are easy to comprehend and useful for many



Home Work

- Conduct a “low hanging fruit” analysis for the topic “Smart Grid”
- Conduct a “killer app analysis” for the topic Smart Grid
  - find a killer ap
  - find a golden technical app

13.2.2. Information Aquisition

Lazy Reading Process RIK - Information Aquisition

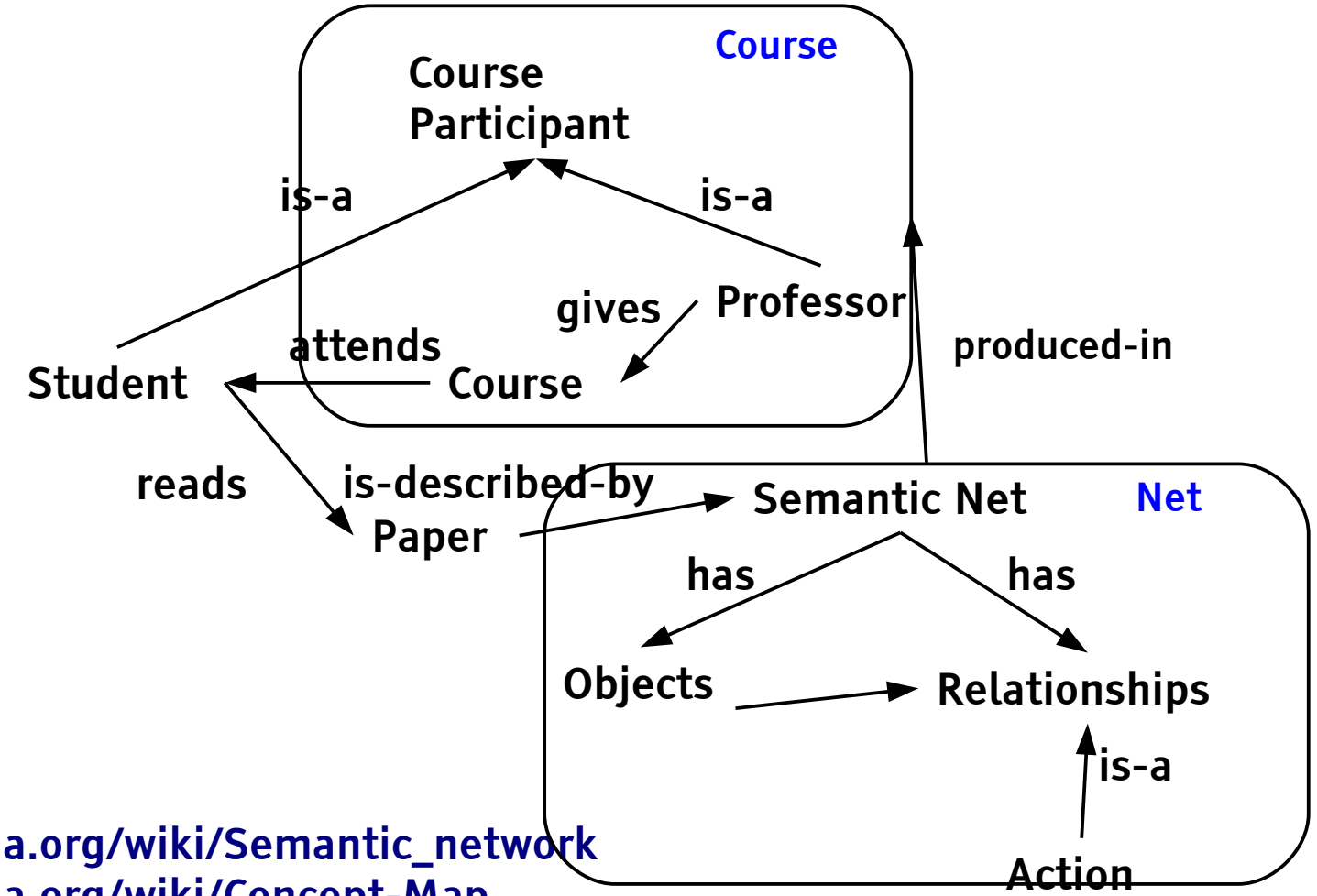
- Overview about **preexisting** knowledge
  - What do I know already about the subject? Important other related papers?
- Formulate questions **before** reading
  - Use the 7W questions to find valid good questions

Lazy Reading Process RIK

- Work yourself systematically through the text
  - Focus on most important sections
- **Mark up** central terms and paragraphs
  - Find out the main point (main thesis) of the paper
  - Mark it up, excerpt it: memory aid for later
  - Relate (by arrows) different important sections and topics
- **Formulate questions** while reading
  - Note the questions on first page of the paper
- **Record** your ideas
  - Remarks, critical comments, ideas into the bibtex-entry or citation database
  - Write the central main point on top of the paper
- **Structure** your ideas by a *semantic net or concept map*
  - finding out central concepts and their relationships

Grouping in Semantic Nets and Concept Maps

- Remember important operations to create **knowledge** from information:
- Grouping, Hierarchising, Re-drawing, Dualizing



http://en.wikipedia.org/wiki/Semantic_network
http://de.wikipedia.org/wiki/Concept-Map

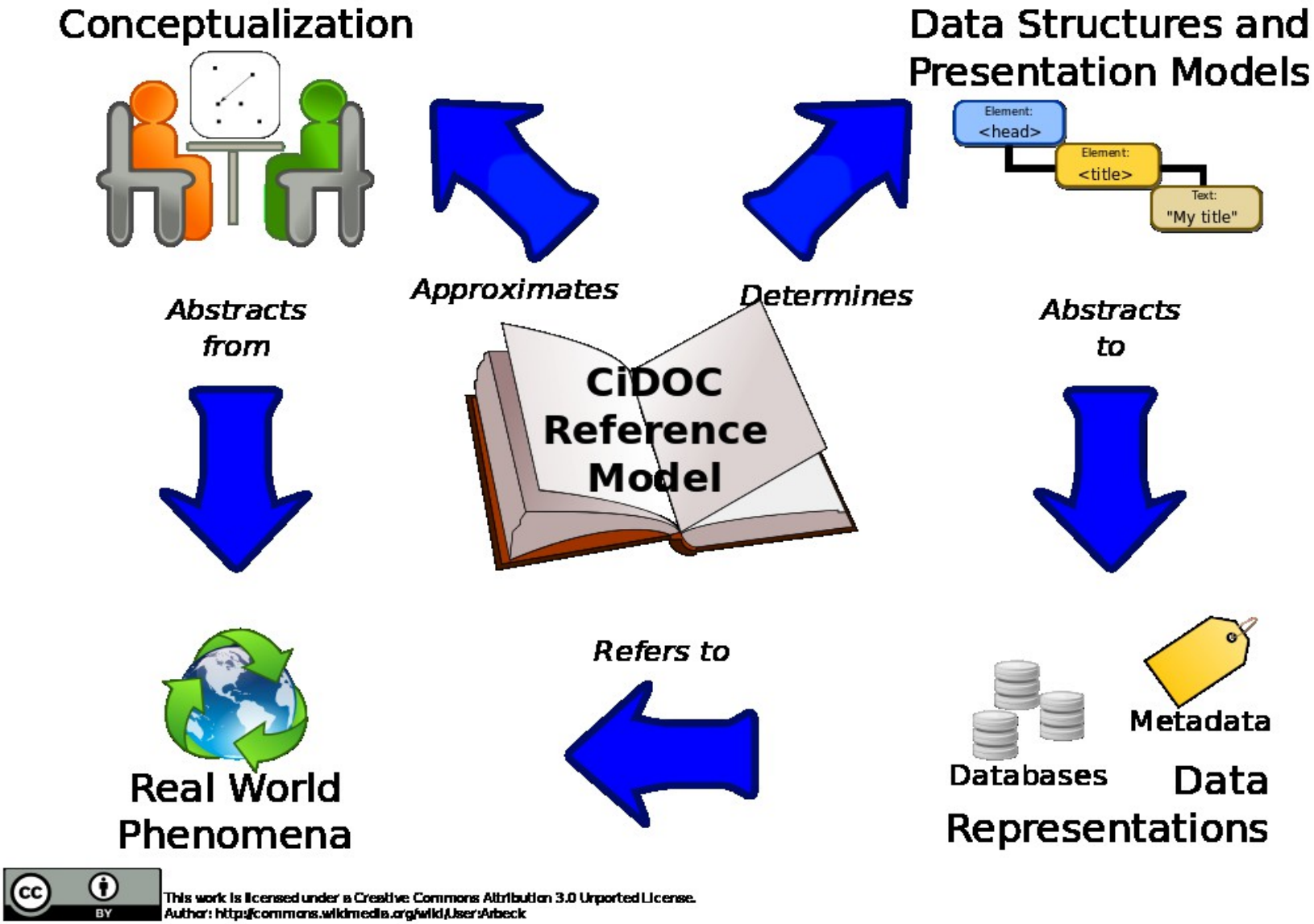
Concept Maps (Strukturbilder, Textbilder)

- A **Concept Map** enriches a Semantic Net with pictures and figures (Strukturbilder) [Novak]
  - http://www.teachsam.de/arb/visua/visua_3_2_6.htm
  - Always start the development with a **focus question** (use the Honest Men)
  - Grouping is important: group into phases, layers, regions, skeleton trees
  - Specific relations such as <implies>, <causes>, <abstracts>
- Software: http://cmap.ihmc.us/documentation-support/
- Alberto J. Cañas, Greg Hill, James Lott. Support for Constructing Knowledge Models in CmapTools. Introduction. Technical Report IHMC CmapTools 93-02. Institute for Human and Machine Cognition (IHMC)
- http://cmap.ihmc.us/Publications/WhitePapers/Support%20for%20Constructing%20Knowledge%20Models%20in%20CmapTools.pdf

http://commons.wikimedia.org/wiki/Category:Concept_maps?uselang=de

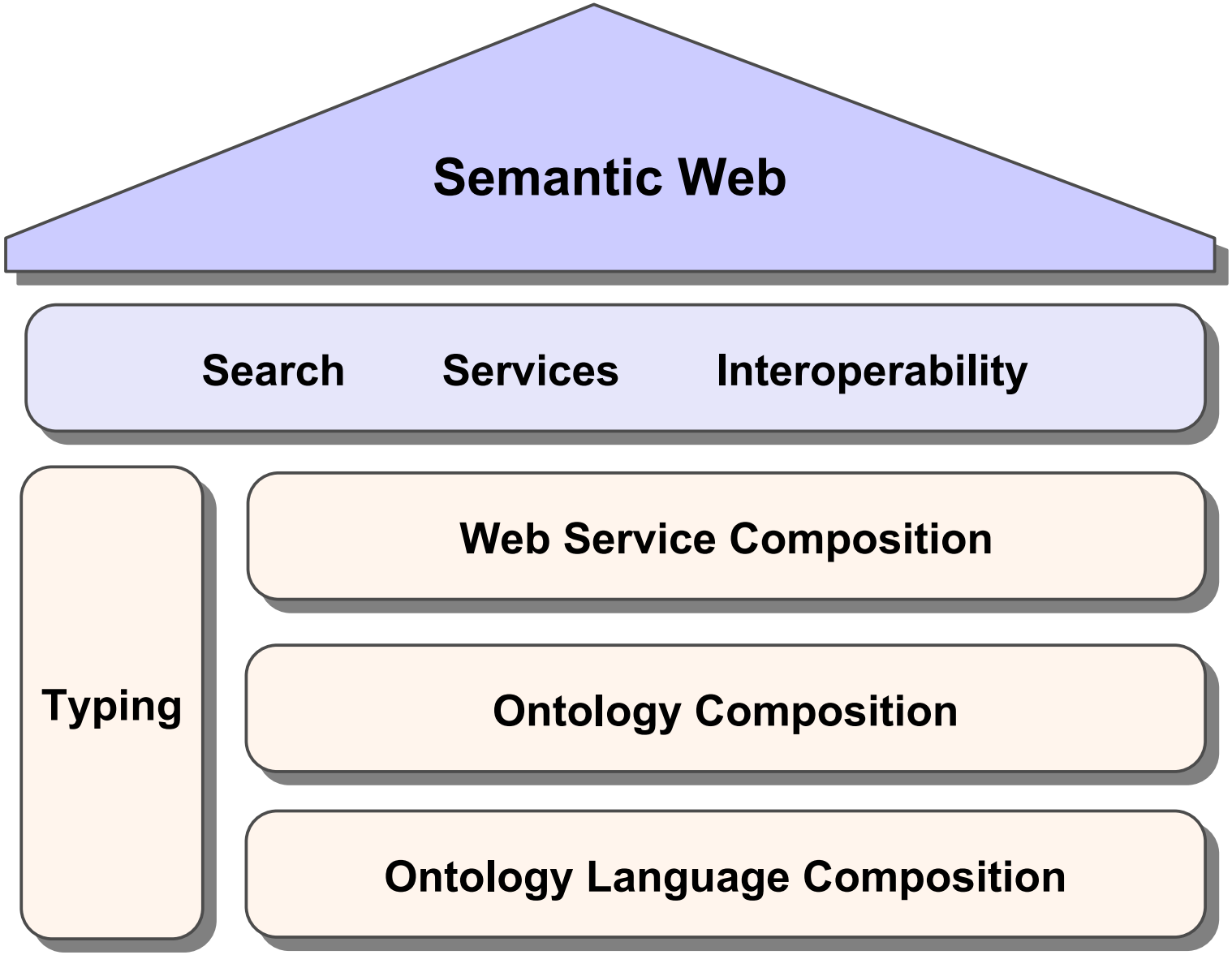
Concepts of Concept Maps

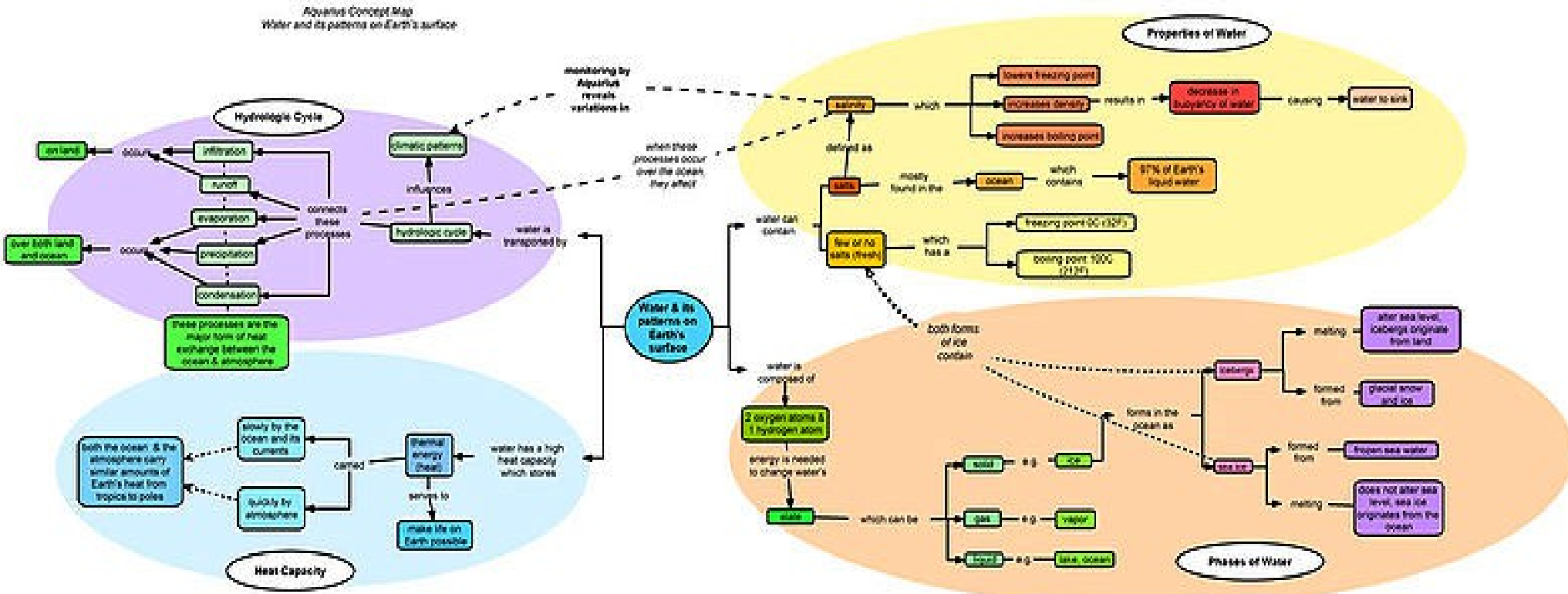
- Software: http://cmap.ihmc.us/documentation-support/
- Alberto J. Ca¶as, Greg Hill, James Lott. Support for Constructing Knowledge Models in CmapTools. Introduction. Technical Report IHMC CmapTools 93-02. Institute for Human and Machine Cognition (IHMC)
- http://cmap.ihmc.us/Publications/WhitePapers/Support%20for%20Constructing%20Knowledge%20Models%20in%20CmapTools.pdf
- **Focus question:** the question driving the development
- **Parking lot:** a reserve area for concepts to be placed and grouped on the map
- **Expert skeleton map:** a concept map template prepared by an expert, to be filled out ("scaffolded learning")
- **Visual patterns:** Interesting visual patterns for concept maps
  - House, Temple, Eiffel tower
  - Brain, Continents, Australia, Germany...
  - Iceberg, Ice shelves
  - Village, net of villages
  - Human body
  - do you have more?



By Ant Beck (Own work) [CC BY 3.0 (http://creativecommons.org/licenses/by/3.0)], via Wikimedia Commons http://commons.wikimedia.org/wiki/File%3ACiDOC_CRM_CONCEPTUALISATION_(Genesis_and_application).svg

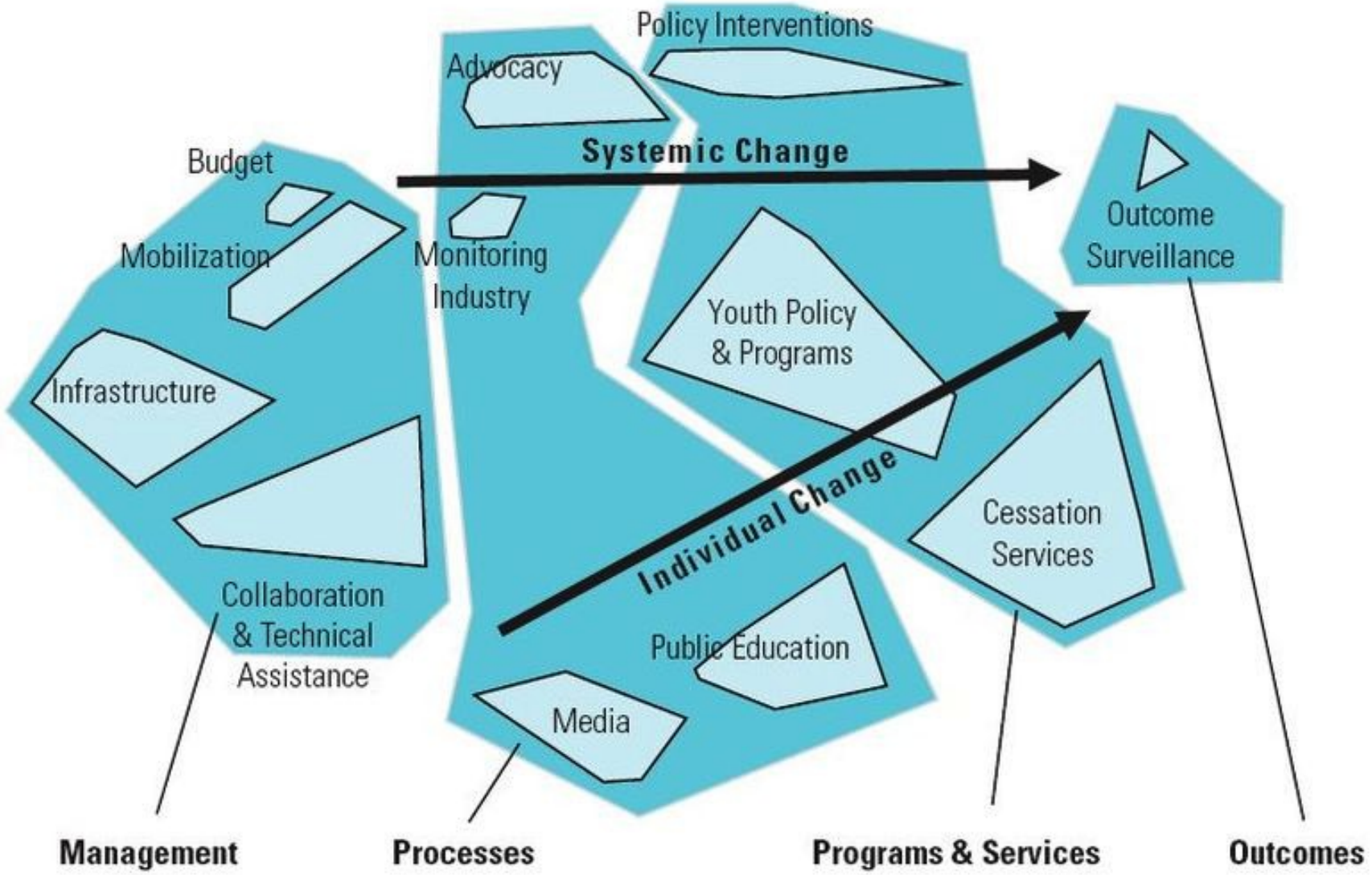
House Concept Map





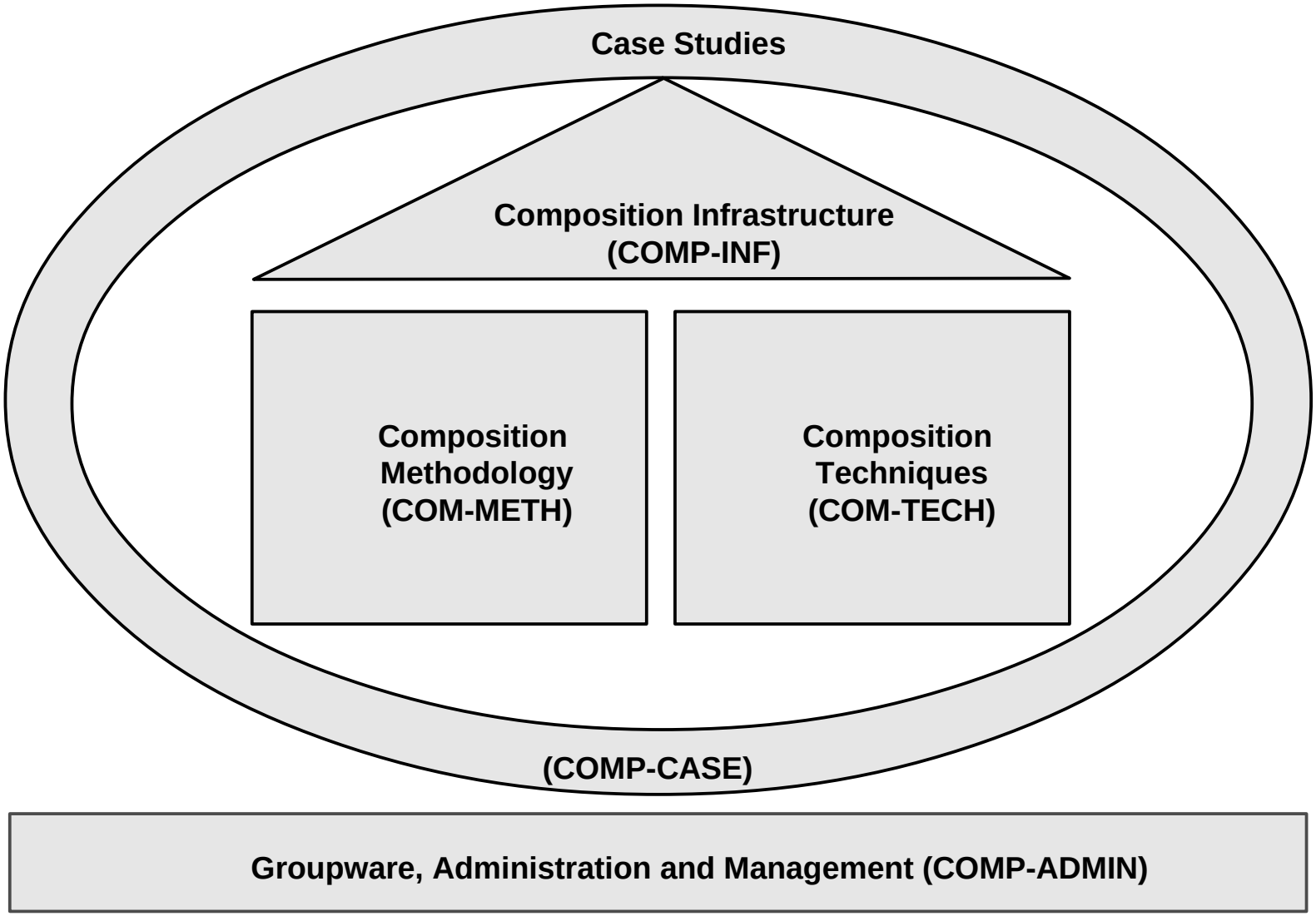
http://commons.wikimedia.org/wiki/File:Concept_map_Water_and_Its_Patterns_on_Earth%27s_Surface.jpg (public domain)

Concept Map with Clusters (Ice Shelve)



(public domain)
http://commons.wikimedia.org/wiki/File:Concept_Map_Showing_Clusters.jpg

Project Structure (Compartments)

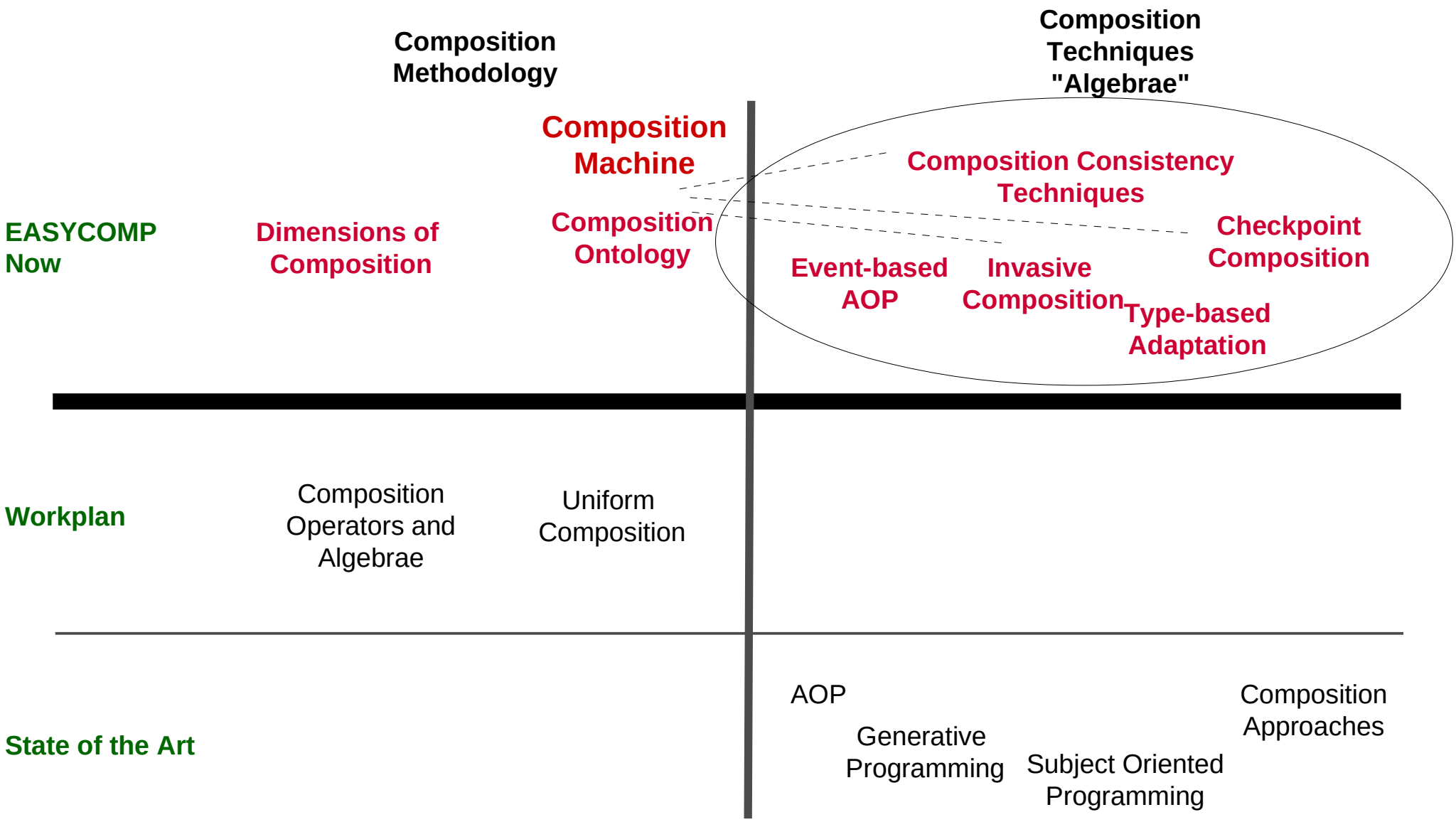


13.2.2.2 Advance Maps

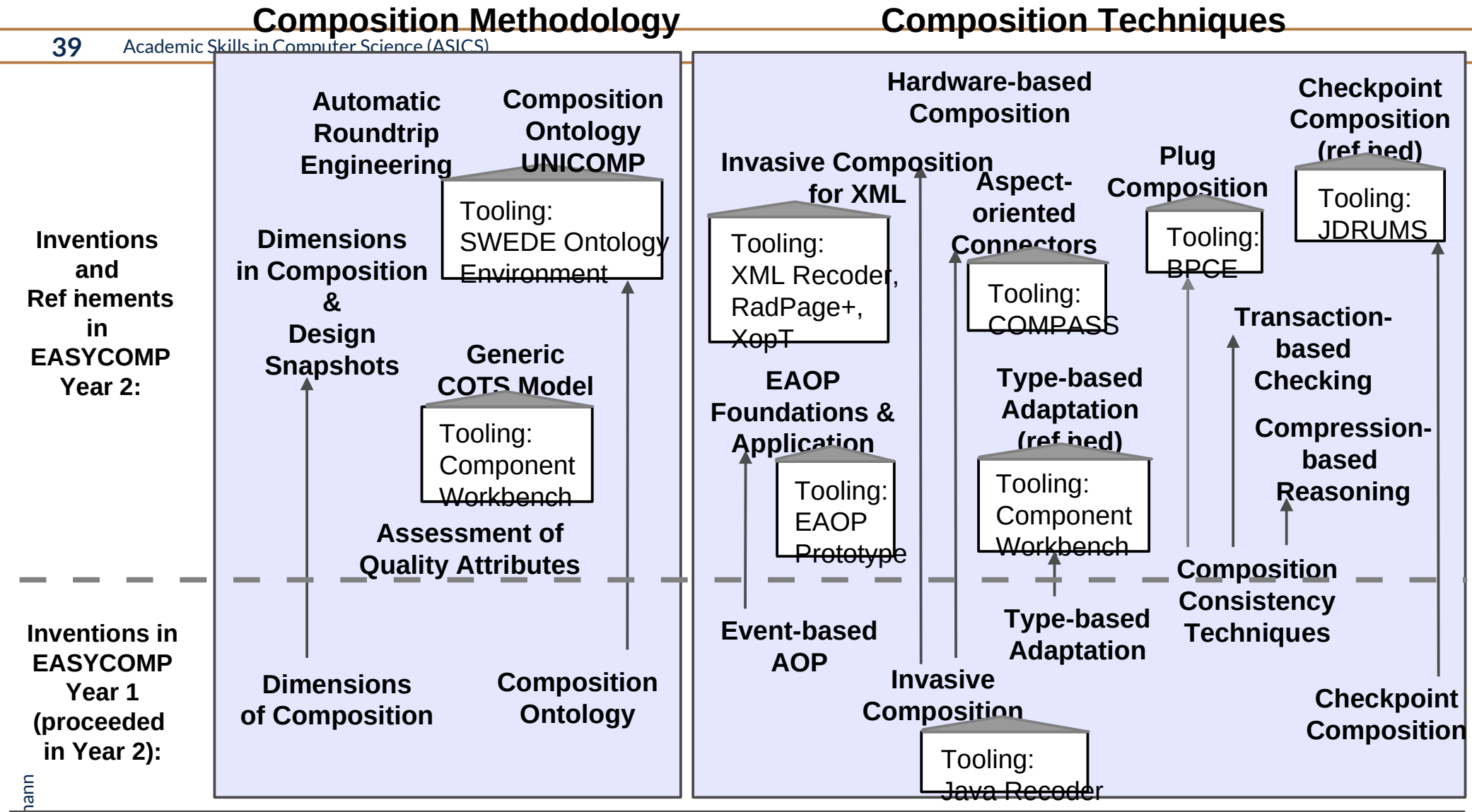
Abstract House Concept Map - Showing Own and Foreign Research Works

- An **Advance Map** is a concept map showing the advance of an approach, the gap to the state of the art, by visualizing 2 or 3 phases or layers
  - Comparing the advantage of approach B over approach A and C
- Clearly distinguished
  - Own and foreign research
  - State of the art and research agenda
  - Yesterday, today and tomorrow
- Advance maps are very useful for research papers and research proposals.

Overview of Progress of a Project (EASYCOMP)



Progress 2nd Year of Project (EASYCOMP)



Workplan: Composition Operators and Algebrae — Uniform Composition

State of the Art: AOP — Generative Programming — Subject Oriented Programming — Composition Approaches

Einfache Spezifikation | Konflikterkennung | Konfliktvermeidung

Wiss. Ziele

Regelgesteuerte Wohlgeformte Invasive Softwarekomposition

5) Strategie-gesteuerte Weber

4) RAG-definierte Strategien und -sprachen

2) Konflikterkennung mit RAG

3) Konfliktvermeidung mit RAG

1) Port-Graphersetzung zur Wohlgeformten Invasiven Softwarekomposition

Stand der Technik

Wohlgeformte Invasive Softwarekomposition

Konfliktanalyse Hyperadapt

Strategie-sprachen

Invasive Software-komposition

Referenz-Attribut-grammatiken

Graphersetzungs-gesteuerte Weber

Port-Graphersetzung

13.2.3. Knowledge Aquisition

Lazy Reading Process RIK

- **You must embed the new information into your (old) knowledge**
  - Look at your old summaries, record cards, semantic nets, mindmaps, concept maps – how to change them?
- **Write** a text summary: **Pose and answer questions**
  - What is the main thesis?
  - Rephrase the main results
  - What is the skeleton of the paper?
- **Talk** about the paper to somebody else (your mate, your wife, your colleagues...)
- Repeat Information Aquisition in details, **per section**
  - Structure tree per section, Record cards (Karteikarten)
  - Mindmap, semantic net, concept ma per section
- Relation to own previous work
  - What extends your knowledge? What contradicts your knowledge?
  - What is **interesting**?

Reciting in a Group

- .. called a “reading group” .. see later
- Build up a wiki of recitings of papers:
  - main points
  - main figures
  - summaries

Reading – the Lazy Process RIK (Rpt.)

	RIK Method
1	Relevance Check –**Survey**: Structure (table of contents, paratext) **Orientation/Preview**: Abstract, Intro, Conclusion Selective Reading
2	Questions
	Reading – headlines, main theses, bold text parts, definitions, graphics
3	Recite - mind mapping - summary writing

13.3. Other Reading Methods

Before-Reading and After-Reading Questions

Before-Reading

- What do I know already? (previous knowledge)
- What would I like to know?
- What do I know about the author?
- What is my goal?
- Apply the 6+1 honest serving men

After-Reading

Impression:

- [PMI-Method of de Bono]
- What was positive (P)?
- What was negative, minus? (M)
- What disappointed me?
- What surprised me? (I)

Content:

- What was the main thesis?
- Supporting points?

Other Reading Methods

SQ3R Method	PQ4R Method	S2QAR Method
Robinson 1961	Thomas & Robinson 1972	Smith 1977
SQ3R is reflection-oriented. Uses mindmaps, concept maps and summaries in the „recite phase“	improved SQ3R (could be called SQ4R) with additional phase „reflect“	oriented towards active answering of questions
Survey, **Q**uestions, **R**ead, **R**ecite and **R**eview	**P**review, **Q**uestions, **R**ead, **R**eflect, **R**ecite and **R**eview	**S**urvey, **S**ummary, **Q**uestions, **A**nswer and **R**eview

Comparison of Reading Methods

		SQ3R-Methode	PQ4R-Methode	S2QAR Methode (Smith)
1 R	a	Survey/Relevanzprüfung Preview/Vorprüfung/ •Paratext analysis (table of contents, Klappentext, summary) •Abstract, Introduction and Conclusion •Selective inspection of chapters	Preview/Vorprüfung/ Survey/Relevanzprüfung •Paratext analysis (table of contents, Klappentext, summary) •Abstract, Introduction and Conclusion •Selective inspection of chapters	Survey/Relevanzprüfung – do this as fast as possible
	b			Summary/Zusammenfassung – what is the content of the text? What is the point of the text? the controlling idea?
2 I	c	Questions/Fragen – Before-Reading Questions.	Questions/Fragen – Before-Reading Questions.	Questions/Fragen – Before-Reading Questions. Do not look into text
	d	Reading/Lesen – Answer questions - find main points	Reading/Lesen Answer questions - find main points	no not read!
3 K	e		Reflect/Nachdenken – Beispiele, Text auf vorhandenes Wissen über das Beschriebene beziehen	Answer/Antworten •- Do not look into text
	f	Recite/Rekapitulieren – Mindmaps per section - bullet minutes, summary writing – Explain text Answer questions	Recite/Rekapitulieren •– Mindmaps per section •- bullet minutes, summary writing •– Explain text •Answer questions	
	g	Review/Repetieren – Look at recitings again –Answer questions again	Review/Repetieren •– Look at recitings again •–Answer questions again	Reading/Überprüfung der Antworten •– Read text and answer questions again

13.4. Methods to Recite for Knowledge Aquisition

and the Sustainability of Reading

How to Recite and Summarize

- Objectives of Recite phase:
  - Personalize the information (-->data to knowledge)
  - Learn actively by reformulation
  - Abstract from unnecessary details
  - Easy way to find focused information again
- Methods for summary
  1) Underlining
  2) Margin notes
  3) Excerpting
  4) Mindmapping
  5) Structure Trees
  6) Cracking Sentences

13.4.1. Underlining

- Goals:
  - Use a personal color scheme
  - Underline for later re-reading
  - Underline for comprehension
- What:
  - Underline *main theses* of text (.. skeleton..)
  - Underline *research results*
  - Underline surprising things

- Good to read the text passage first, then underline

13.4.2. Margin Notes

- Put your own outline on the margin of the paper you read
- A. Topic outline
  - Erschließung der inhaltichen Struktur durch Randbegriffe
  - Orientierung anhand von Absätzen
- B. Logic (argumentative) outline
  - thesis statements, skeletons
  - Topic changes
  - Coherent sequences of paragraphs
  - Summaries

13.4.3. Excerpting

- Bottum-up process
- Excerpting can have a *specific* or *global* question in mind
- Step 1: Orientation
  - Overview to understand the structure of the paper
- Step 2: Excerpting all paragraphs
  - What are the topics? theses?
- Step 3: Excerpt all sections
  - Do summaries for sections
- Step 4: Excerpt a summary sentence for whole text

Use Mindmapping, Structure Trees, ...

13.5 Information Gathering

Search Machines

- Google scholar http://scholar.google.de
- bib search engine http://liinwww.ira.uka.de/bibliography/index.html
- DBLP at Trier University
  - http://www.informatik.uni-trier.de/~ley/db/index.html
- Springer LNCS
- ACM Digital Library www.acm.org/dl
  - ACM Journals
  - ACM Conferences
- IEEE explore
- Research Gate

Who tried what already? Experiences?

ERCIM Magazine

- http://ercim-news.ercim.eu/
- Augmented Reality (AR)
- http://ercim-news.ercim.eu/en103/special/augmented-reality-intruduction-to-the-special-theme
- About the IoT
  - http://ercim-news.ercim.eu/en101?view=featured
  - http://ercim-news.ercim.eu/en101/special/compose-an-open-source-cloud-based-scalable-iot-services-platform
  - http://ercim-news.ercim.eu/en101/special/3d-web-visualization-for-real-time-maintenance-of-smart-buildings
- Fraunhofer Magazin:
  - https://www.fraunhofer.de/de/publikationen/fraunhofer-magazin/archiv.html

(Collaborative) Literature Management and Search Tools

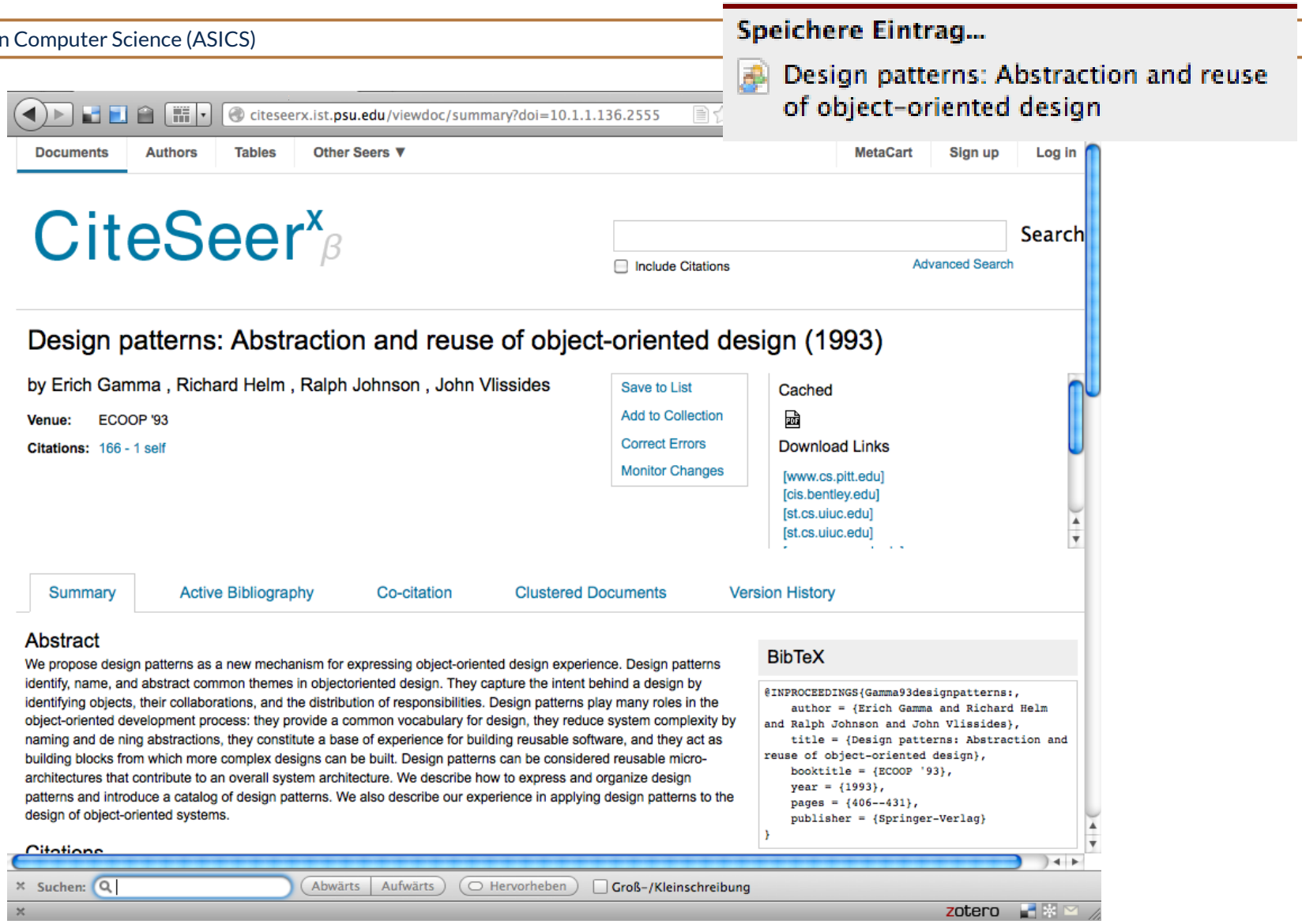
- Saving Bibliographic Meta-Data
  - From structured sources (BibTex)
  - From webpages (collaborative parsers for important sites: CiteSeer, GoogleScholar, ACM, SLUB Dresden ...)
- Organizing your References
  - Tags, Folders
- Sharing References with others
- Adding Notes
- Exporting BibTex (e.g. for LaTeX)

- Examples...

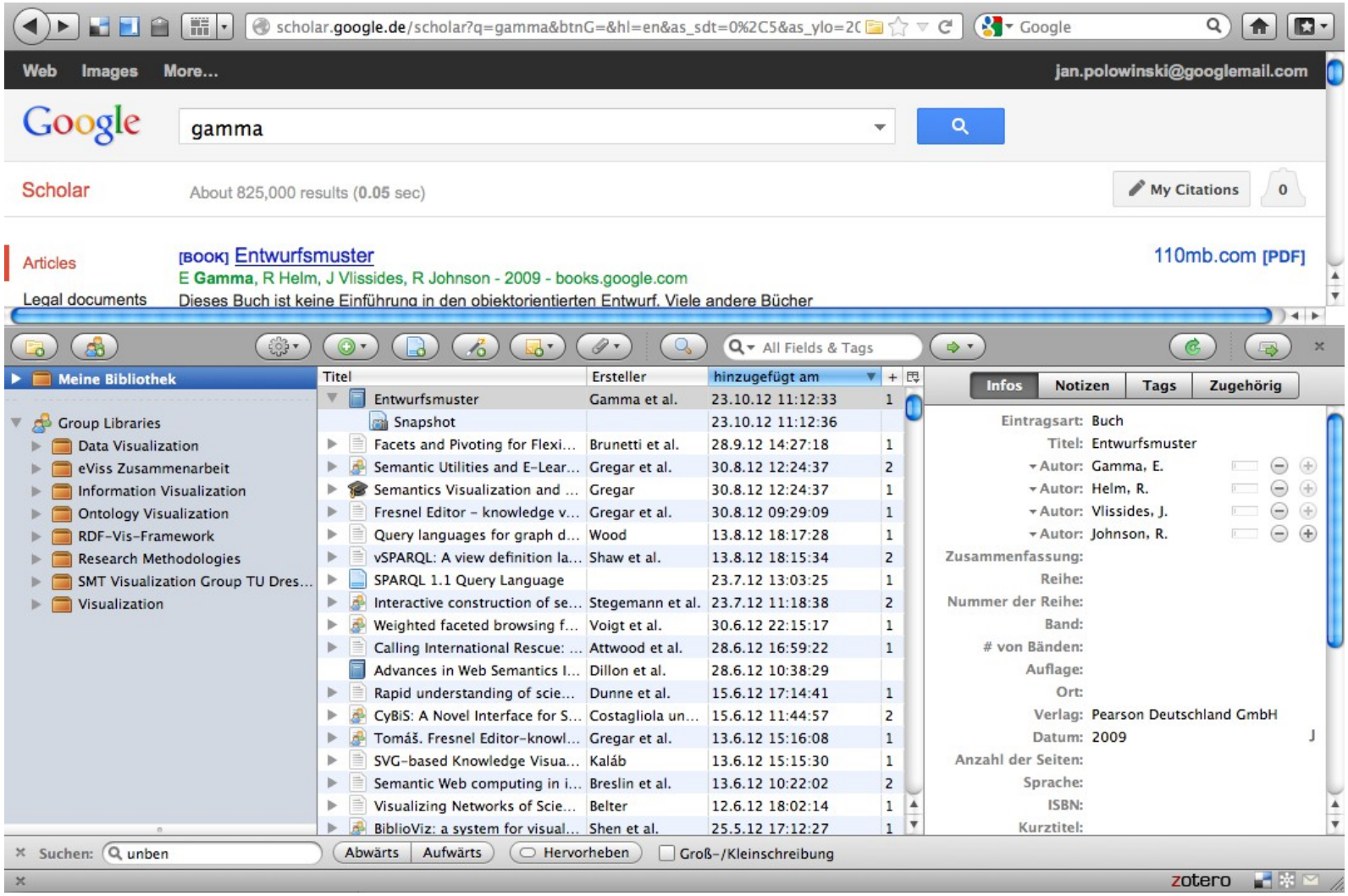
zotero RefWorks MENDELEY

Zotero

- Free to use (but limited free storage)
- Firefox Add-On/Standalone/Web-based
- OpenSource
- http://www.zotero.org/



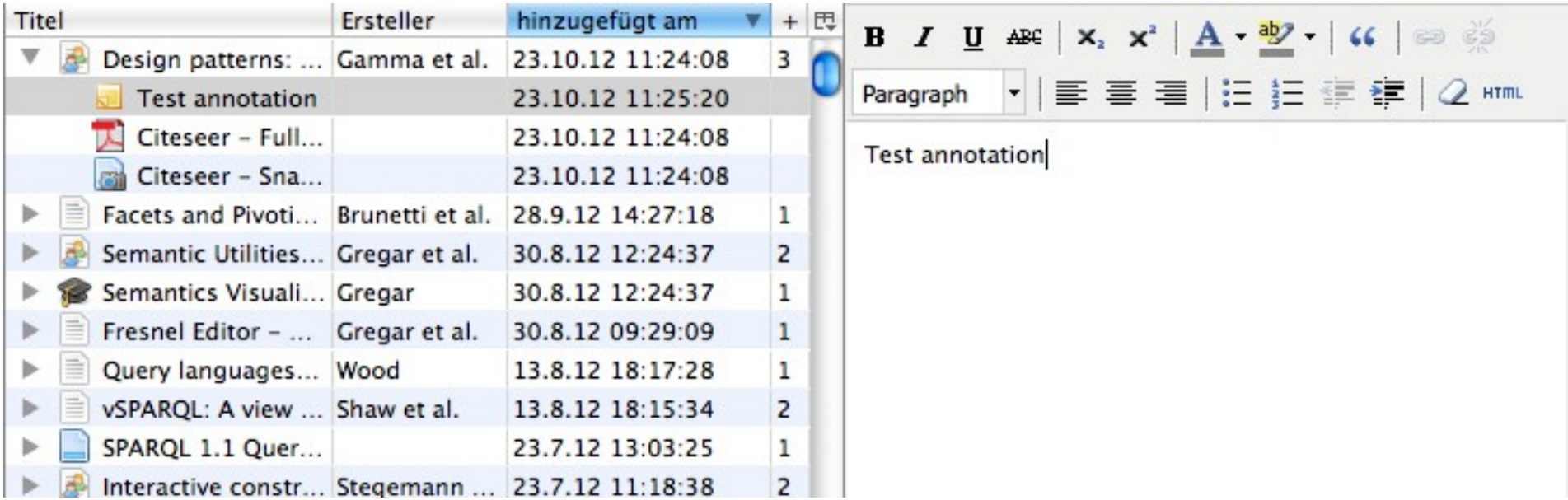
Saving entries is simple



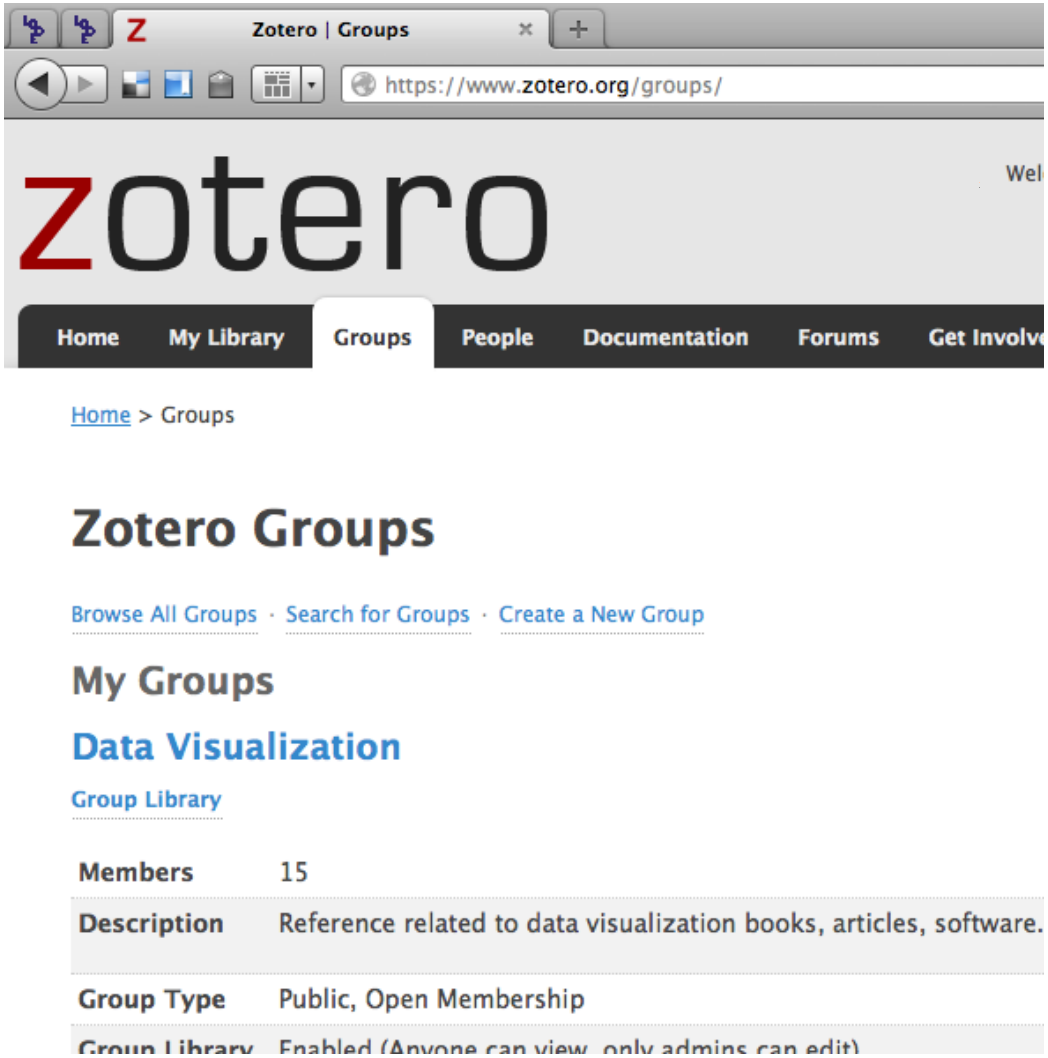
Library view in Firefox for organizing references

Zotero (Firefox Add-On)

Making Annotations



Zotero (Web)



Groups and discussions on the web

Commercial Tools

RefWorks

- Commercial
- Desktop application
- TU Dresden recommends it and has a liscense:
  - http://www.slub-dresden.de/service/schreiben-publiz
- (We recommend Zotero)
- http://www.refworks-cos.com/refworks/

MENDELEY

- Commercial, Closed source, but API
- Desktop/Web
- http://www.mendeley.com/
- Often used (good advertising)

Dagstuhl Workshos

- http://www.dagstuhl.de/
- Schloss Dagstuhl is the German meeting centre for computer scientists.
- It organizes very interesting seminars on diverse topics in software engineering
  - All abstracts and many papers are online
- Extremely valuable to understand the State of the Art in an area!
- List of 2014:
  - http://www.dagstuhl.de/de/programm/kalender/?dag_type=12&dag_year=2014
- Unifying Product and Software Configuration
  - http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=14172
- The Future of Refactoring
  - http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=14211
- Scientific Visualization
  - http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=14231

Information Gathering (Recherche)

- Most often, literature is found today on the internet.
  - Google scholar
  - Research gate
  - bib-Server in Karlsruhe
  - dblp search engine
- Use the SLUB license to find papers with Springer, ACM, IEEE.
- For non-licensed papers, use the SLUB search engine
  - http://www.slub-dresden.de/
  - Go and lend a paper copy
- Saxony stores most of its Master's thesis and PhD theses on “Quality Content of Saxony”, our permanent pdf server
  - http://www.qucosa.de/
  - Here you can find most of the Master's theses of the chair of Software Engineering.

What to Cite

- Distinguish primary from secondary sources
  - Read and cite primary sources!
  - If you found a good pedagogic overview article interesting for others, too, you may also cite this secondary source

- Important journals in Software Engineering
  - ACM Transactions on Software Engineering and Methodology (TOSEM)
  - ACM Transactions on Programming Languages and System (TOPLAS)
  - IEEE Software
  - Springer Software and Systems Journal (SoSym)
- Overview journals or bibliographies for certain topics
  - ACM Computing Surveys

Homework: Look for interesting Journals and Conferences in Software Engineering

- Surf ACM, IEEE, Elsevier, Wiley, Springer

Screening the World

- Screening analyzes trends to find interesting subjects for research.
- Internal screening group: everybody presents something cool
  - Motivation: Discovering disruptive technologies early is very important
  - Track important web sites
  - Collect new ideas for demonstrators
  - Collect interesting labcast videos and web sites on an inspiration site
- Research Blog
- Paper reading group

Fix Interesting Web Sites for News

- Finding the newest news is very important for research.
- Interesting addresses:
  - Www.mozillalabs.com
  - Google labs
  - MIT media labs
  - Microsoft research
  - Berkeley CPS lab
  - Golem.de
  - Technology Review
- Newsletters
  - ERCIM news http://ercim-news.ercim.eu/ has many articles from the leading IT research organizations in Europe
  - Heise Newsticker
  - EAPLS www.eapls.org is the European union of programming language researchers
  - EASST is the European union of software technology researchers
  - http://journal.ub.tu-berlin.de/eceasst/

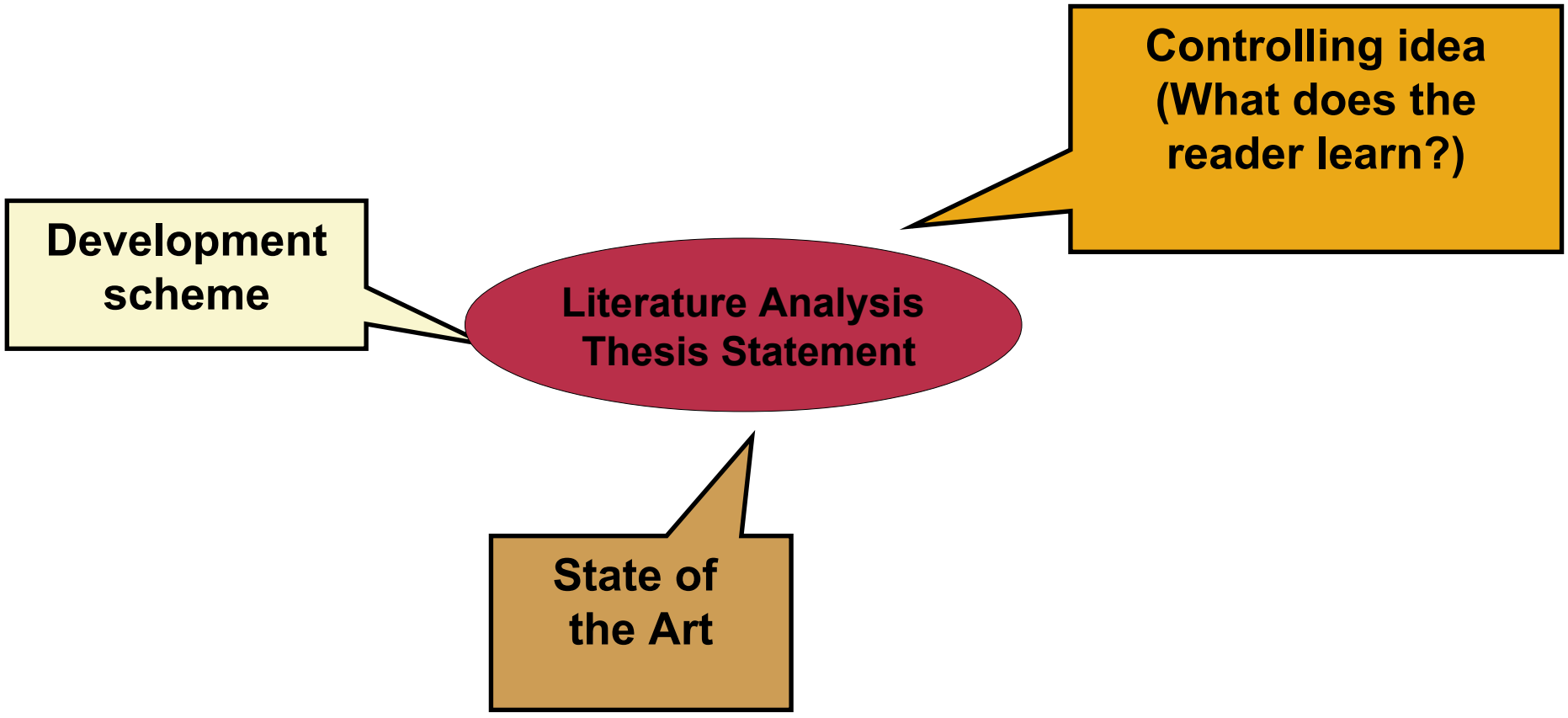
13.6 Writing Literature Analysis Papers

Literature analysis papers can be written:

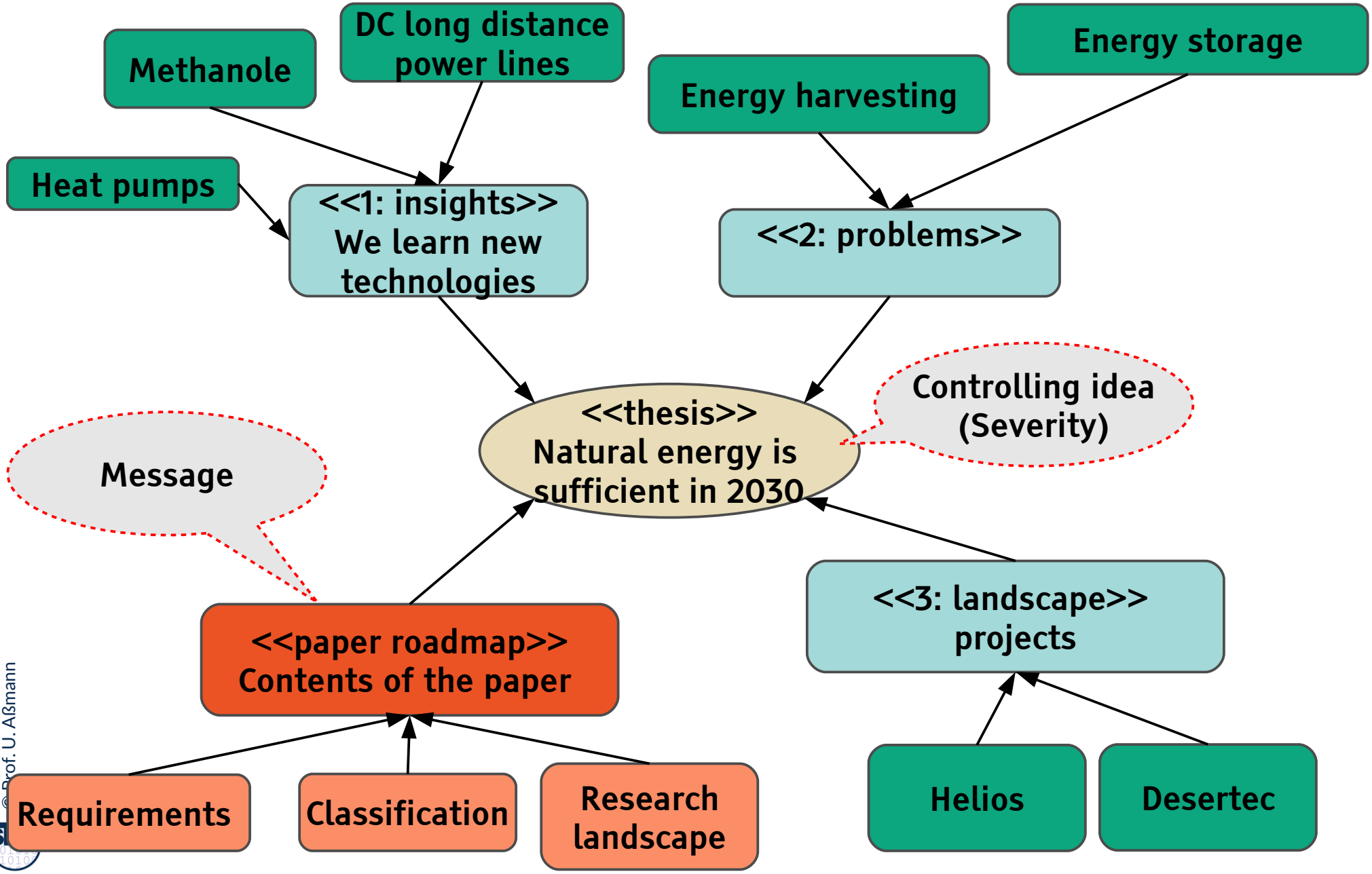
- standalone for overview journals such as ACM computing surveys
- as a basis for your PhD "Statusvortrag"
- as Background chapter for your Master or PhD thesis

Thesis Statements about Literature Analysis

- A **literature analysis thesis statement** is a thesis statement showing the state of the art of the literature with regard to a certain area o k nowledge.
- **Classification Thesis: State-of-the-Art-in-Area + Controlling idea (what does the reader learn?) + Development Scheme**

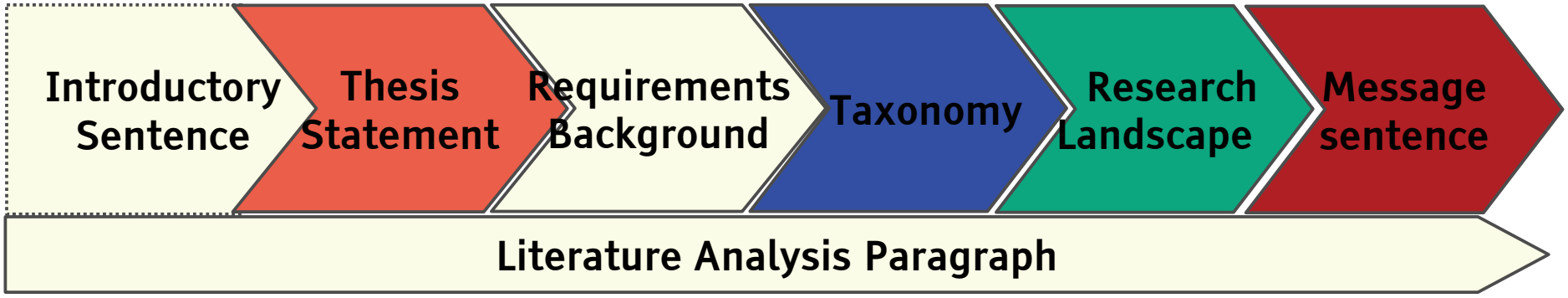


Example: Mindmap for Introductory Paragraph of Literature Analysis Paper



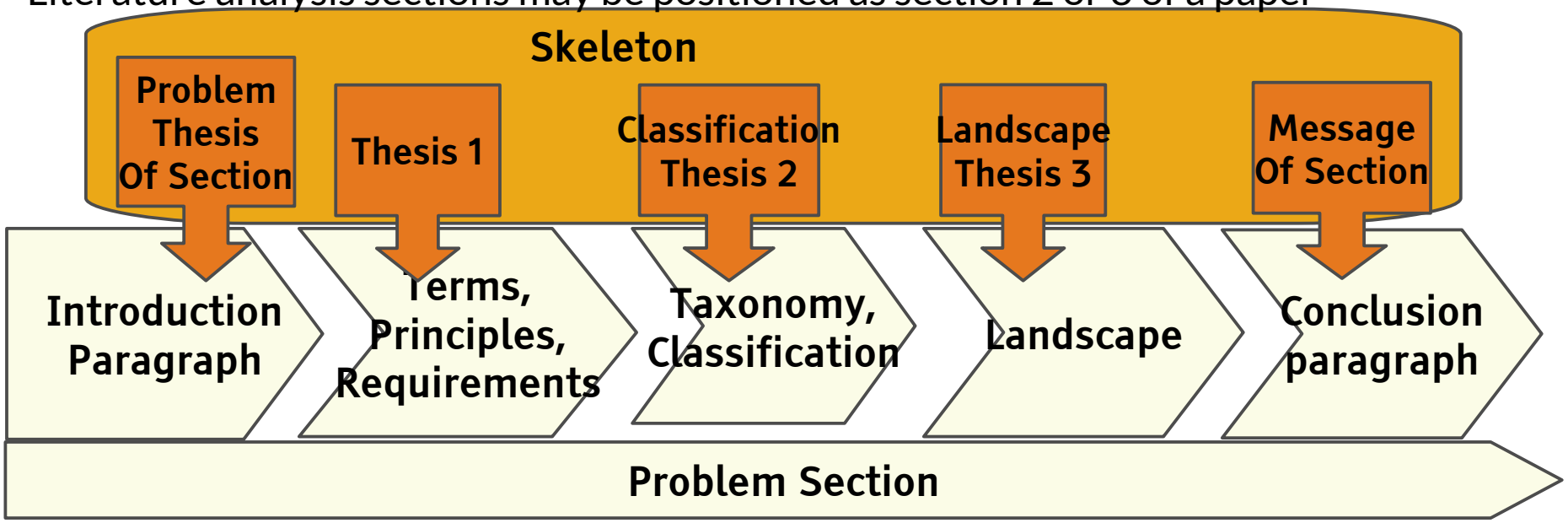
Literature Analysis Paragraphs in 1-3-1 Structure (May be as an introduction to a paper)

- We live in interesting times.
- As recent works show, technical progress in harvesting energy is so fast that we might be able to earn all our energy demands from natural sources in 2030.
- We are learning at the moment how to store wind energy in methane gas and methanole, we have a political union with countries like Greece who do not have a stable economy, and could buy their natural energy and transport it by long-distance DC-powerlines to central and northern Europe. And since recently, we can build cheap and efficient multi-stage heat pumps to even heat old houses with natural energy.
- All these techniques must solve two problems: energy harvesting and energy storage. The former techniques are usually based on solar, wind, and heat harvesting. The latter show different degrees of efficiency; storing energy with power2gas methods seems to be most profitable.
- Large projects such as Desertec (D) and Helios (GB) develop challenging agendas for changing our economy from an oil-based to one based on natural energy.
- This paper will give an overview on requirements for the natural energy economy, will classify the energy techniques, and will show the research landscape of projects in Europe. May also you know that we live in interesting times.



Skeletons of Literature Analysis Paper

- The **skeleton** of a literature analysis paper (or section) is the sequence of all thesis statements of all paragraphs. [Salehie] suggests:
  - Terms, principles, requirements
  - Taxonomy, facet classification, multi-criteria comparison
  - Landscape (projects, papers, areas), with concept maps, portfolios and Kiviat graphs
- Additional elements: Advance map, discussion of major approaches, past-present-future
- Literature analysis sections may be positioned as section 2 or 3 of a paper



Why Do We Need Literature Analysis and Information Gathering

- Research has to bring **novelty**, and novelty must be demarcated to the state of the art in the literature
- Know where you stand! (know your competitors)
  - remember nABC analysis

The End - Homework

- Many slides are courtesy to Dr. Birgit Grammel, Dr. Birgit Demuth, Jan Polowinski

- Write a literature analysis according to the Salehie scheme for your topic of choice.
  - download 10 papers
  - try to group and classify them
  - find a research landscape map
  - compare them according to comparison criteria
- Design your skeletons
  - write the sections, fill the skeleton with flesh.

Rept.: Analyzing Overview Papers (Homework)

- An **overview paper** is a paper analyzing the state of the art in a field, or the literature. Every thesis has to have at least one overview chapter, similar in structure.
- To prepare, we should analyze several overview papers:
  - Steve Vinoski. An overview of middleware. In Albert Llamosí and Alfred Strohmeier, editors, Reliable Software Technologies - Ada-Europe 2004, volume 3063 of Lecture Notes in Computer Science, pages 35-51. Springer. Berlin / Heidelberg, 2004. 10.1007/978-3-540-24841-5_3.
  - Tim Sheard. Accomplishments and research challenges in meta-programming. In Walid Taha, editor, Semantics, Applications, and Implementation of Program Generation, volume 2196 of Lecture Notes in Computer Science, pages 2-44. Springer Berlin / Heidelberg, 2001. 10.1007/3-540-44806-3_2.
  - Mazeiar Salehie and Ladan Tahvildari. Self-adaptive software: Landscape and research challenges. ACM Trans. Auton. Adapt. Syst., 4(2):14:1-14:42, May 2009.
- Questions to answer:
  - Find the papers on the web
  - Compare their table of contents
  - Can you find a pattern for a structure of an overview paper?
  - Read the paper with the most important structure with the RIK process
  - Decide on a structure for your paper in your group.

Homework – The Weekly Schmidt

- Write an outline of an essay - **“Why the Euro should not be given up”.**
  - Background: European debt crisis, Greeks almost bankrupt etc.
- Read first Helmut Schmidt's essay “Sechs Gründe, warum der Euro nicht scheitern darf” from “Einmischungen”, S. 169.
  - http://www.zeit.de/1997/25/euro.txt.19970613.xml
- Apply PQ4R.
  - Write down questions
  - Summarize the article with a mind-map or structure tree
  - Recite it loud to your friend
- Try to find one other article on the web sites of FAZ, Süddeutsche, Zeit or similar, on the subject, and select some of your arguments from the material. Read with PQ4R.
- For the outline, use your recited material.
- After you have written a clear argumentative outline, write an introduction and a conclusion.

Homework – The Weekly Churchill

- Write an outline of an essay - **“Why Germany should belong to Europe”**.
- Read first Winston Churchill's speech “Council of Europe”. Apply PQ4R.
  - https://www.winstonchurchill.org/learn/speeches/speeches-of-winston-churchill/1946-1963-elder-statesman/111-the-council-of-europe
  - Write down questions
  - Summarize the article with a mind-map or structure tree
  - Recite it loud to your friend
- Try to find one other article on the web sites of FAZ, Süddeutsche, Zeit or similar, on the subject, and select some of your arguments from the material. Read with PQ4R.
- For the outline, use your recited material.
- After you have written a clear argumentative outline, write an introduction and a conclusion.