



Utrecht University

Faculty of Science
Department of Information and Computing Sciences

Introduction to the course

Advanced Research Methods 2018-2019

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Agenda

1. Course overview
2. Course schedule
3. Passing the course
4. Website and material
5. Q&A
6. Scientific Research Methods: why and what?
 - Activity

Appetizer

Please provide positive feedback

- Content
- Other aspects



<https://www.youtube.com/watch?v=IMboI4cOAuQ>

Lets be curious!

But... How to start?

What is a research project?

How to transform my desire (or need) to investigate something into a research problem?

How shall I start to do research?

What are the steps to follow from the problem investigation to the implementation of new solutions?

What about my master thesis?

...?



Intuitive Research

Let's think together

Steps to provide solution to a problem

1. Investigate existing problem (curiosity!)
 2. Design a solution
 3. Evaluate if the solution is solving the problem
-
1. Specify what I want to know
 2. Design evaluation protocol
 3. Check if the evaluation protocol is appropriate
 4. Execute the protocol
 5. Analyse the results

Check the book





Learning Objectives

ILO1: Discuss prevalent (qualitative and quantitative) research methods in the field of information science, recognise its benefits and drawbacks, and identify ethical constraints.

ILO2: Write and present research papers describing interesting phenomena, providing the design of a comparative experiment to evaluate such phenomena in practice, and presenting the systematic application of design science and research protocols.

ILO3: Criticize and evaluate scientific papers for the improvement of related research

ILO4: Analyse interesting phenomena and provide strong founded evidence on that phenomena by making use of advanced statistical analysis

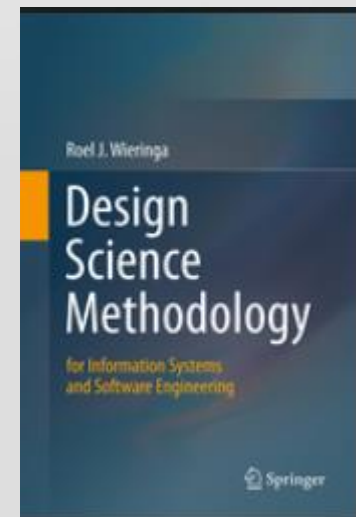
Themes of the course

Theme 1. Design Science

Design Science is the design and investigation of artefacts in context. Design Science describes a research method for in information systems and software engineering. It provides guidelines for how to structure research goals and analyse research problems into design goals and knowledge questions. For the ARM course, the students dive into the design or engineering and empirical cycles.

The contents for this theme are:

- A framework for Design Science
- The Design Cycle
- The Empirical Cycle



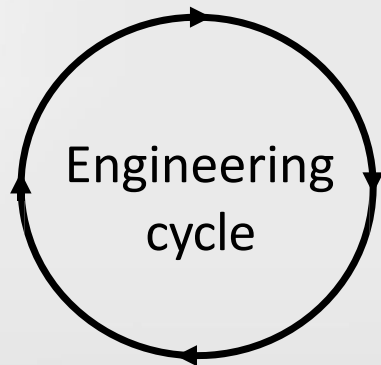


Engineering cycle

Legend:
? Knowledge questions
! Tasks

Design implementation

Choose a treatment!
Transfer to practice!



Implementation evaluation = Problem investigation

- Stakeholders? Goals?
- Phenomena? Causes, mechanisms, reasons?
- Effects? Contribution to Goals?

Treatment validation

- Context & Artifact → Effects?
- Effects satisfy Requirements?
- Trade-offs for different artifacts?
- Sensitivity for different Contexts?

About 15 minutes

Treatment design

- Specify requirements!
- Contribution to goals?
- Available treatments?
- Design new ones!



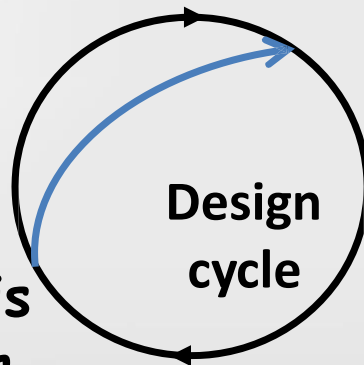
Design cycle

Legend:
? Knowledge questions
! Tasks

Design implementation

Choose a treatment!
Transfer to practice!

Real-world implementation is not part of your research project



Treatment validation

- Context & Artifact → Effects?
- Effects satisfy Requirements?
- Trade-offs for different artifacts?
- Sensitivity for different Contexts?

About 15 minutes

Implementation evaluation = Problem investigation

- Stakeholders? Goals?
- Phenomena? Causes, mechanisms, reasons?
- Effects? Contribution to Goals?

Typically in a research project you iterate over design and validation many times

Treatment design

- Specify requirements!
- Contribution to goals?
- Available treatments?
- Design new ones!



Analysis of results

- 12. Data?
- 13. Observations?
- 14. Explanations?
- 15. Generalizations?
- 16. Answers?

New research problem

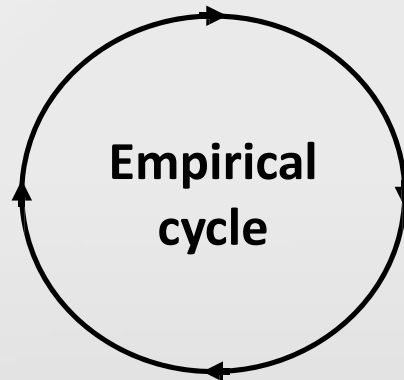


Research execution

- 11. What happened?

Research problem analysis

- 4. Conceptual framework?
- 5. Research questions?
- 6. Population?



Research design validation

- 7. Object of study justification?
- 8. Treatment specification justification?
- 9. Measurement specification justification?
- 10. Inference justification?

Research design

- 7. Object of study?
- 8. Treatment specification?
- 9. Measurement specification?
- 10. Inference?



Themes of the course

Theme 2. Empirical research methods

For the ARM course, the students discuss a set of empirical research methods to support treatment validation tasks. The main focus of this theme is on sample-based experiments. In addition, the students are instructed on the main aspects of scientific integrity and research presentation.

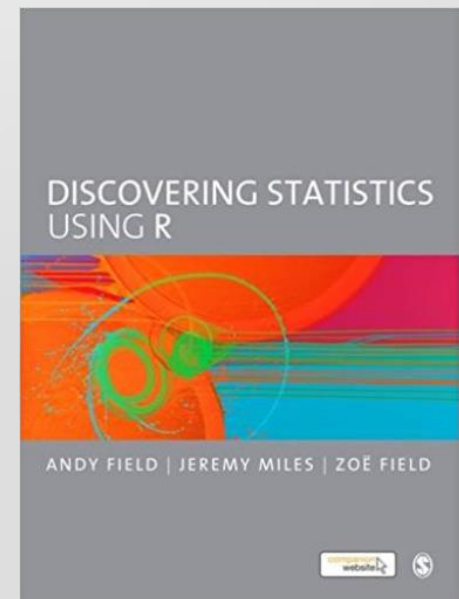
- Ethics in research
- A road map of research methods: Experiments (sample-based and case-based), technical and canonical action research, observational case study research, Systematic Literature Review (SLR).
- Presentation and package

Themes of the course

Theme 3 Advanced statistics

For this theme, the students are instructed with advanced inferential statistics for the data analysis. The contents for this theme are:

- Statistics fundamentals
- Qualitative experiments
- Advanced statistical tests





What is out of scope?

ARM is not a full course on

- Design of software products or IS artefacts
- Social science research
- Execution of empirical cycles
- Data collection
- Conducting a research project
 - PhD: 3-5 years
 - MSc: 8 months in UU
 - OZP: 20 weeks in UU
- Statistics
- R
- SPSS
- Scientific writing
- INFOWO II

For statistics courses, please refer to Data Science and Society, Data Analytics, and Big Data

This is not an online course

What does the lecturer expect from you?



- Active participation in the lectures and labs
- Positive attitude
- Professional behaviour
- Timely delivery of assignments
- Attendance of the activities
- Creativity and enthusiasm



What can you expect from the lecturer (Marcela Ruiz)?

- Interactive teaching mode
- Fast response to questions (blackboard forum and meetings)
- As-objective-as-possible grading
- Knowledge of the field
- Enthusiasm to support research ideas
- Open mind to learn (*from you*) during the course
- Keep a calm environment in the classroom (ask noisy students to leave the classroom) -> Suggested by some students

What do you expect?





The ARM team

Marcela Ruiz

Pawel Wozniak



Teaching assistants

Thomas Alflen and Lars van den Bos

Communication

- Blackboard: team<->teacher communication
- Questions about the content, exercises or research assignment: contact your teaching assistant (advisor)
- For important questions about the course: Email m.ruiz@uu.nl (The main subject must start with '[ARM]')

Lectures

I would like to make the lectures as interactive as possible, but I need your help!

Positive attitude and eagerness to learn

Bring your own devices

Software:

- Microsoft Word, PowerPoint
- Acrobat / PDF reader
- SPSS software

Use of different terminology

In the ARM course we make use of different terminology

- Text books, slides, papers, etc., make use of their own terminology
- You are master students, you are prepared to analyse the content and find relationship among different concepts
- Bring your questions to the lab sessions and tutorials

Use of LNCS template

LNCS: Lecture Notes in Computer Science

Objective:

Show flexibility to adopt different kind of templates for writing scientific papers and reports



Lab sessions

Great opportunity to practice, practice, and practice

No mandatory, but attendance is checked

- Bring your questions about the content, exercises, and assignments to the lab sessions. The TAs will manage all your questions.

Students who show great motivation and commitment will be granted with feedback and counselling opportunities. Pre-condition for the repair exam.

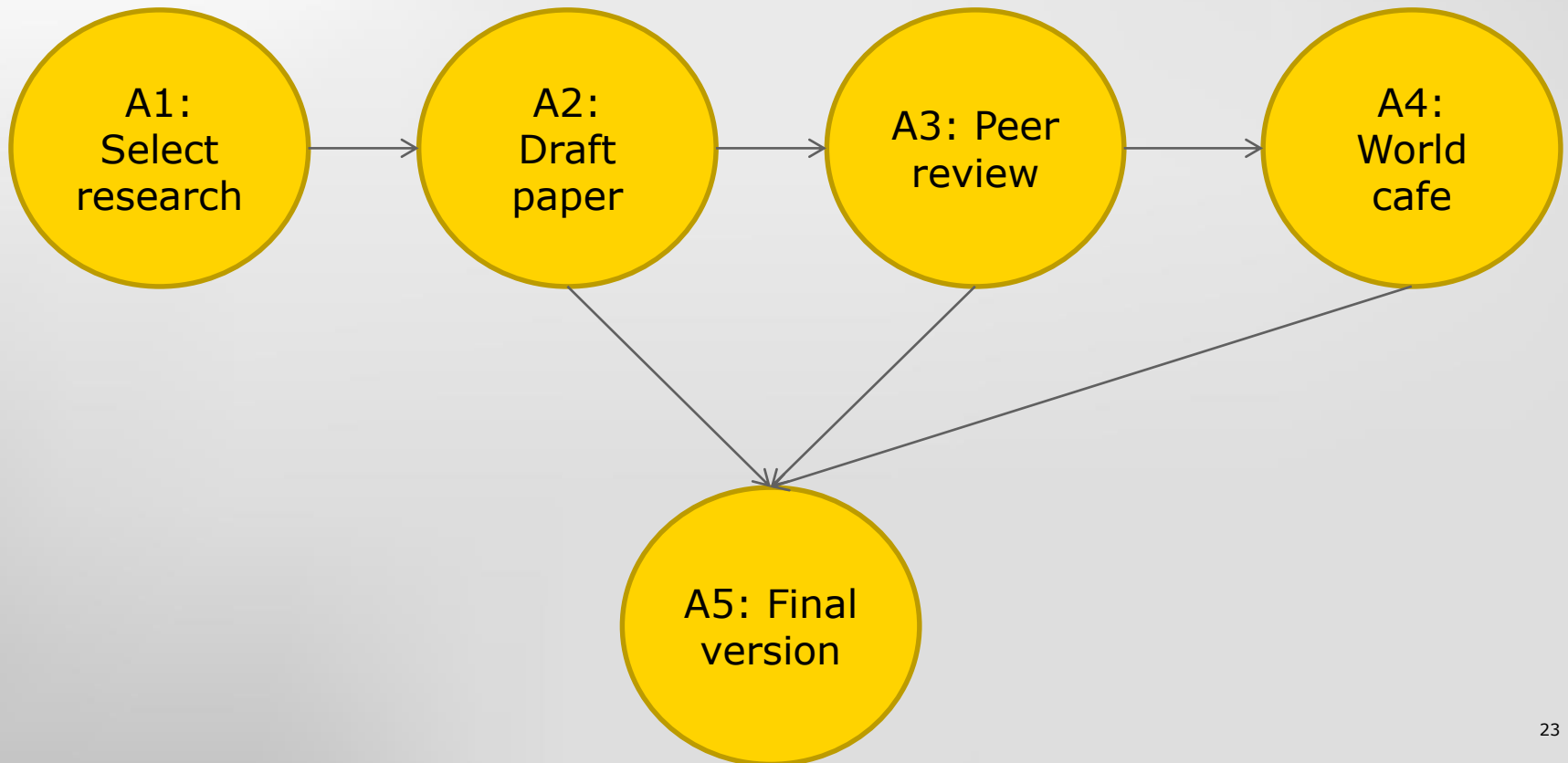


Coaching sessions



- During the coaching sessions, **students can receive feedback** on the progress of the research paper.
- The coaching sessions are not mandatory, since they are intended to be a **space for lecturers and students to work together** on solving research challenges.
- **Students are required to demonstrate an active participation in the lectures and lab sessions** to be able to participate in the coaching sessions. For this, the students should attend the lab sessions and lectures, **and bring the results of the labs** to the coaching sessions.

Research assignment





Skills lab



<https://students.uu.nl/en/student-life-and-career-orientation/workshops>



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Advanced Research
Methods
Syllabus 2018-2019



Department of Information and Computing Sciences

Departement Informatica Onderwijs

Bachelor	Informatica	Informatiekunde	Kunstmatige intelligentie	
Master	Computing Science	Game&Media Technology	Artificial Intelligence	Business Informatics

Onderwijs Informatica en Informatiekunde
Advanced research methods

Educational page



Blackboard

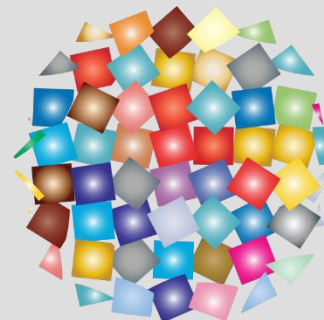


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Questions & Answers





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Activity

Warm up!

Create teams for the research assignment and register your team on Blackboard



The “angel” and “monster” post-it session

Which of the following aspects of the course cause you **excitement** and/or **insecurity**?

- Theory and skills
- Career development
- Master thesis
- Coaching
- Teamwork
- Time management
- Research topic
- Assignment
- Other topics

