



**KTH Information and
Communication Technology**

Research Methodology and Scientific Writing / II2202

2010

Communication Systems, COS

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Learning Outcomes

- The student should be able to:
 - explain and apply techniques for research methodology and scientific writing to prepare the writing of a scientific report.

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 - perform investigation using methods, explain and take position on the results as well as summarize related work.
 - apply the knowledge in scientific writing and research methodology and use the knowledge to write a scientific report.

The course

- **Goals:**
 - Design a project plan
 - Apply and discuss qualitative and quantitative methods
 - Perform data analysis on collected material
 - Communicate the work, in written and verbal form
 - Reason, discuss and argument for the work

Tasks

- Establish a project plan
- Method description
 - Perform data collection with one or several methods & describe the method(s)
 - Analyse collected material
 - Present data collection and data analysis
- Write report about selected topic
 - Present the work in a report
 - Discuss the scientific soundness
- Review a report and write opposition

Course outline

- **16 Lectures + 1 additional lecture**
- **3 Mandatory seminars:**
 - Seminar 1: Project plan
 - Seminar 2: Methods with data collection and data analysis
 - Seminar 3: Report including opposition

Research Methodology

3/9 Scientific knowledge

3/9 Hypothesis testing

8/9 Experiments

15/9 Ethics and Plagiarism

Scientific writing

31/8 Introduction to Scientific Genres - Proposal and technical reports

6/9 Effective Writing Strategies, Paragraph structure, Cohesive devices, Information structure, Conciseness

7/9 Working with Texts, Digital resources, Working with original sources, Referencing systems, Reviewing and collaboration, Learning from model texts

Scientific writing

13/9 Successful oral presentation for engineers, Content and structure, Delivery, Visual information

21/9 Research articles 1: Introduction and Methods

27/9 Research articles 2: Results, discussion, title and abstract

Quantitative and Qualitative methods

7/9 Introduction to research and data collection methods – qualitative and quantitative

10/9 Quantitative methods

16/9 Quantitative data collection methods, analysis, result

Lab - Quantitative

22/9 Qualitative methods

1/10 Qualitative data collection methods , analysis, result

Lab - Qualitative

Grading

- **Assignments – handed in material:**
 - Project plan for an investigation, P/F
 - Method for the investigation (discussion about choice of method, selection of participants) P/F
 - Report about the investigation (within computer science), A-F
 - Opposition, A-F
- **3 Mandatory seminars, P/F**

Assignment – Investigation - Part 1

- Is performed during the course – starting Now!
- Carried out in a group of 2 students
- Choose a topic that will be evaluated
- Design and present a problem (write project plan - max 600 words)
- Choose a method
- Specify the data collection process, attendees / delegates
- *Present the result at seminar 1*

Assignment – Part 2

- Find attendees that are participating in the investigation - if personal contact - decide time and place
- Observe that the method affects the number of participants - but - the investigation must be viable during the course
- Use appropriate / useful method for the investigation
- Prepare and start the investigation
- Write method description (max 1000 words)
- *Present result at seminar 2*

Assignment – Part 3

- In accordance with chosen method:
 - Create questionnaire, Interview questions, Observations or other selected data collection method
- Collect data
- Perform evaluation:
 - Analyse collect material
 - Document evaluation in a report
 - Present evaluation in report – max 1200 words
- Review other student's report (opposition) – max 600 words
- *Present result and opposition at seminar 3*

Systems for the course

- **Bilda**

http://www.kth.se/student/studok/studiedokumentation-mina-sidor-1.1938?l=en_UK

- Fetch material: OH, templates

- Hand in assignments
- Last version of the schedule
- Find out changes
- Communication

Problems: Contact Bilda, see login site

Information

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- **Daisy** (<http://daisy.ict.kth.se/login.jspa>)

- Select a group for labs and seminars
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 - **Homepage:** <http://www.ict.kth.se/courses/II2202/>

Course literature

Getting It Right: R&D Methods for Science and Engineering
by Peter Bock

Publisher: Academic Press; 1 edition (September 13, 2001)

ISBN-10: 0121088529

ISBN-13: 978-0121088521

\$78.28

The Craft of Research, 2nd edition (Chicago Guides to Writing,
Editing, and Publishing) by Wayne C. Booth, Gregory G.
Colomb, and Joseph M. Williams

Publisher: University Of Chicago Press; 1 edition (March 2003)

ISBN-10: 0226065685

ISBN-13: 978-0226065687

\$15.40

Course literature

Writing for Computer Science by Justin Zobel

Publisher: Springer; 2nd edition (April 27, 2004)

ISBN-10: 1852338024

ISBN-13: 978-1852338022

\$26.03

Scientific Writing and Communication: Papers, Proposals, and
Presentations by Angelika H. Hofmann

Publisher: Oxford University Press, USA (December 16, 2009)

ISBN-10: 0195390059

ISBN-13: 978-0195390056

\$26.69

First assignment

Think about an area for the
investigation!

Methods - Introduction

Why learn methods?

Methods - Introduction

Why learn methods?

- > Because it is necessary to interpret / understand:
 - result of investigation/research/study
 - affects of a study
 - problems with investigations

Methods - Introduction

- **Researchers have developed an algorithm that controls the data on the Internet for data centres where electricity costs are currently lower. This can reduce electricity costs by as much as 40 percent.**

[CS 20090825]

Methods - Introduction

- This means that data-intensive companies like Amazon, Microsoft and Google could save millions of dollars annually in electricity costs.

Methods - Introduction

- The Study:

The researchers, who are active at MIT, Carnegie Mellon University and Akamai network company, in their study calculates that the cost of electricity could decrease by as much as 40 percent.

Methods - Introduction

The algorithm does *not necessary* mean that the electricity consumption, by itself decreases, which means that it *does not, automatically* decreases the companies environmental impact. According to the researchers **the algorithm can be adapted** to be used even for this purpose, by passing traffic to environmentally friendly data centre.

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-> Is the algorithm useful or not?

Methods - Introduction

Why learn methods?

Who can you trust?

Methods - Introduction

Synovates väljarbarometer tabell - riksdagsvalet 2006 och framåt:
Klicka på datumet för att öppna den skriftliga rapporten

Datum	m	fp	c	kd	s	v	mp	sd	övr	osäkra	mätperiod	Intantal
090625	28,1	7,8	5,4	4,0	34,0	5,4	8,0	3,3	4,1	18,2	9-23/6	2 289
090528	29,3	6,8	6,1	4,5	33,7	7,0	6,5	3,6	2,6	21,1	7-27/5	2 441
090424	32,1	5,6	5,7	3,8	33,5	7,3	6,4	3,6	2,1	21,1	7-22/4	2 666
090328	29,3	6,8	5,7	4,2	37,5	7,0	5,1	3,3	1,1	17,1	10-25/3	2 475
090228	28,8	7,1	5,2	4,9	38,1	5,6	6,3	2,9	1,0	20,5	10-25/2	2 480
090130	26,8	5,9	6,0	4,1	40,1	6,0	6,0	3,7	1,3	18,5	13-28/1	2 686
081220	26,7	6,5	5,9	4,5	40,0	7,2	5,6	2,6	0,9	19,9	8-17/12	1 6 88

Väljarbarometrar - alla institut

För Synovates mätningar kan du klicka på datumet för att öppna en utförlig rapport

	M	Fp	C	Kd	S	V	Mp	Sd	Övr	Osäkr	Publ.	Mätperiod	Intantal
Demoskop	26,7	9,1	4,7	3,7	33,3	5,5	9,3	4,0	3,7	15,7	3/7	24/6-1/7	1 009
Synovate	28,1	7,8	5,4	4,0	34,0	5,4	8,0	3,3	4,1	18,2	26/6	9-23/6	2 289
SIFO	28,2	8,8	5,0	4,2	32,8	5,2	8,5	3,1	4,2	13,5	15/6	1-11/6	1 897
Demoskop	33,1	6,6	4,8	5,0	33,6	5,2	5,5	4,5	1,8	11,9			
Synovate	29,3	6,8	6,1	4,5	33,7	7,0	6,5	3,6	2,6	21,1	29/5	7-27/5	2 441
Skop	31,6	6,4	5,0	4,5	33,4	5,3	7,8	3,8	2,2	9	29/5	4-19/5	1 177
Novus	29,5	6,5	5,4	4,3	34,6	7,4	7,3	2,6	2,4	14,9	23/5	5-18/5	2 035
Sifo	28,8	6,4	5,8	4,1	34,8	5,8	8,1	3,0	3,3	16,2	17/5	4-14/5	1 898
Demoskop	34,5	5,4	4,3	3,7	34,2	6,1	6,6	3,4	*	*	11/5	29/4-6/5	1 007
Novus	29,6	5,2	5,4	4,5	35,0	7,3	6,7	4,4	1,9	12,5	1/5	14-27/4	1 942
Synovate	32,1	5,6	5,7	3,8	33,5	7,3	6,4	3,6	2,1	21,1	24/4	7-22/4	2 666

Methods - Introduction

- The Synovate barometer of voters for June 2009 shows that the changes are small. The *distance between blocks is increasing within the error tolerances of 2.0 percentage points.*

[Synovate Temo, 20100818]

Methods - Introduction

- The collective support for the alliance parties fall by 1.3 percentage point from 46.6 to 45.3 percent. It's total support for, and the Green Party is basically unchanged (+0.1 percentage point) and ends up at 47.3 percent. *The distance between blocks is 2.0 percentage points and is too small to say which blocks that have the strongest support.*

Methods - Introduction

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- -> Is the study significant or not?

Methods - Introduction

Sales of mobile broadband in Sweden turned strongly upward during the second quarter, following a dip of early years.

[Nytt24, 20090211]

Methods - Introduction

During the second quarter 2009, 162 790 new mobile broadband modem was sold in Sweden. It is a *distinguishable rise* compared with both last year and this years first quarter.

Methods - Introduction

The Study:

- Sales are up, almost, 20 percent higher than in the first quarter of 2009, when it sold 136 780 broadband modem in Sweden. Compared to corresponding period last year sales are *4 percent higher*.

Methods - Introduction

The Study:

The figures come from the analyst David Larsson at IT Research and is built on statistics from the *major telecommunication operators*.

Methods - Introduction

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-> What if the modems were bought from the small companies?

Methods - Introduction

Contents in articles, see:

- I do not even read the quotes after an interview. I do not care if I get misquoted in the newspaper, said Tännsjö, adding that he has no problem with someone making changes in his books and give them out again in his name.

[CS 20100828]

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[CS 20100828]

-> **Can we trust articles and books?**

Methods - Introduction

Why a Method-course?

Who can you trust?

-> Learn about methods to

- avoid being “errant” (or misled)
- not “mislead” others

Quantitative methods

- Emphasize numbers -> represents figures/numbers/values, levels on theoretic notions
- Strong evidence for how a phenomenon works, requires a large number of samples, generalising
- Study large sized populations / environments
- Study a subject/problem for a large set of people/ organisations
- What can be done in computer systems?

Qualitative methods

- Understand people - what they say / what they do / Why they do something in a certain manner
- Context dependent-> understand context for decisions, acts and motivations / explain reasons
- Study social and cultural phenomena, study one subject/problem in depth
- What can be done in computer systems?

Triangulation

- Combine a quantitative method with a qualitative method
- Study same subject/area for different perspectives -
> gives “a complete picture”
- What can be done in computer systems?

To discuss

Which quantitative methods exist?

Which qualitative methods exist?

Which situations requires either a quantitative method or a qualitative method?

-> Relate to your own experience

To consider

Take a magazine

Locate a study in the magazine

-> Think about how well the study is substantiated (performed and result reflects the study)