



Utrecht University

Faculty of Science
Department of Information and Computing
Sciences

Presentation and Package

Advanced Research Methods 2018-2019

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December 20, 2018

Recapitulation

In previous classes we have looked at a variety of topics associated with the different aspects of **quantitative** and **qualitative** research methods

Each of those stands alone, yet we must also **integrate them** in a holistic research design

Research Planning and Writing

Although planning and writing are two different activities, they are closely linked – so we will look at them together

- Each is critical
 - To a good research design
 - To a successful research outcome

Structure of the research paper (From the syllabus)

Advanced Research Methods
Syllabus 2018-2019

- There are scientific publications with a clear presentation of the design of the technique, method, or framework within the topic that you have selected
- There are publications presenting examples of the application of the technique, method, or framework. If there are no examples available, they should be derivable.
- There is a clear need to do research in the topic you have selected. There is related work or similar designs to the technique, method, or framework you have selected.
- There is a clear need for conducting empirical evaluations for the technique, method, or framework you have selected. There is a clear need to investigate the selected technique, method, or framework in a certain context.

The motivation document consists of the following parts (1 to 2 pages)

- Student names and numbers
- Selected topic
- One to two paragraphs with the motivation. Why are you interested to do research about the selected artefact/topic? Can you identify a possible technological impact?
- What kind of variables could be validated? Please identify qualitative and quantitative variables.
- One to two paragraphs with the expectations of the team. What do you expect to learn when designing this research project? Which grade do you want to get for the research assignment? What is your plan to maximise the chances to receive the desired grade? What do you need to achieve your goal?

Create a PDF document with the parts presented above and submit your assignment in [DeasGrade](#). In case you are in doubt, please contact the student assistant or lecturer.

Before the deadline you have to submit the assignment in [DeasGrade](#). Failing to finalise Assignment A1 on time will result in the deduction of one point per day from your own final paper grade (assignment A5), starting on the date of the deadline. You can find further details about the deadlines in Section 5.

6.2 Assignment A2: Draft paper

This is the first major deliverable for which you receive feedback. In this assignment you create the draft of your research paper. This draft paper consists of the work you have done in the previous lab sessions and tutorials (lab 1-3 and tutorial 1-3). The draft of the research paper must include the parts described in Table 5.

Table 5. Structure for the research paper

Section	Content
Title, authorship	<ul style="list-style-type: none"> Give a catchy title to your paper. Indicate the authors in alphabetical order, or in order of who worked the hardest.
Structured abstract	Summarise the paper under headings of background or context, objectives or aims, method, results, and conclusions.
Keywords	

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	<ul style="list-style-type: none"> Write a structure abstract. Tip: check the guidelines for structured abstracts presented in the lectures and the book. Present at least 8 keywords.
1. Introduction	<p>Set the scope of the work and encourages readers to read the rest of the paper:</p> <ul style="list-style-type: none"> Research context in a nutshell. Write a summary of the research field you are investigating, methods, artefacts, languages, etc. that you are evaluating. Report what the problem is; where it occurs, and who observes it. Indicate the main contribution of your research to the state of the art. Remember, you are evaluating, you are not building a new artefact. Research method. Use the design science method to describe all the steps and tasks of your research
2. Related work	<p>How current study relates to other research</p> <ul style="list-style-type: none"> Write down a related work section. Present at least 15 references to related research. These references are intended to support your arguments in the introduction, measurement model, and research design and analysis sections. A list of references with a short summary related to each reference is not enough. Create clusters of papers, and reflect about the evidence and research presented in the selected papers. <p>Tip: Read the related work sections of research papers of your interest.</p>
3. Experimental design	<p>Describe the outcome of the experimental planning stage:</p> <ul style="list-style-type: none"> Goals, hypotheses and variables. Describe the experiment using the formalized style used in GQM. Presents the refined research objectives. Present the main goal, knowledge goals, variables, and hypotheses. <ul style="list-style-type: none"> The design should include at least 1 independent variable and 5 dependent variables (2-3 for qualitative analysis and 2-3 for quantitative analysis). Design. Describe the type of experimental design Subjects. Describe the methods for subject sampling and group allocation. Describe the sample characteristics and subjects background Context. Report environmental factors such as settings and locations Objects. Describe the experimental objects or cases for data collection. <ul style="list-style-type: none"> A full description of the experimental objects should be included in the appendix. Instrumentation for experimental tasks. Describe the measurement instruments to collect data (exercises, questionnaires, cases, etc.). Describe the experimental tasks with the full set of guidelines to be used for experimentation. Include the instructions for the experimental subjects. The instrumentation should be ready for execution and involve the experimental objects. <ul style="list-style-type: none"> Attach the material for the experimental tasks as an appendix to your paper. Since this is a comparative

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	<p>experiment, it is expected to find the instruments to measure the variables for each artefact.</p> <ul style="list-style-type: none"> Data collection procedure. Describe the experimental schedule, timing and data collection procedures (how the data should be collected)
4. Analysis and execution	<p>Describe the data analysis phase</p> <ul style="list-style-type: none"> Describe the type of descriptive statistics that should be used to summarise the data Describe the different types of statistical tests that can be applied to analyse the data after the execution of the experimental tasks. Explain why the tests are adequate for the data analysis of your experiment. Provide a trade-off analysis that could help for the selecting the best test.
5. Interpretation	<p>Interprets the findings from the previous sections</p> <ul style="list-style-type: none"> Limitations of study. Discuss threats to validity. Identify main limitations of approach i.e. circumstances when the expected benefits will not be delivered Inferences. Explain if the findings could be generalised. Take into account the limitations of the study. Can you apply this experimental design to similar artefacts? Lessons learnt. Descriptions of what went well and what did not during the phase of the experimental design.
6. Conclusions and future work	<p>Presents a summary of the design of the experiment</p> <ul style="list-style-type: none"> Summary of the design of the experiment. Present a short summary of the design of the experiment. Indicate the main contribution of your research to the state of the art. Relation to existing evidence. Describe the contribution of the experimental design in the context of earlier (or related) experiments Future work. Suggest other experiments to further investigate the selected artefact. Describe potential design cycles to be conducted after the execution of this empirical cycle. Identify the most important findings in relation to the research field. Describe the impact of your study
Acknowledgements	Add a short text to acknowledge any contributors who do not fulfil authorship criteria (i.e., subjects, colleagues, etc.)
References	Include all cited literature
Appendices	<ul style="list-style-type: none"> Include the experimental tasks for each of the artefacts to be compared during (instruments and experimental objects) Include tables, raw data and/or detailed analyses which might help others to use the results Attach a table with the project dedication of each team member in terms of hours. In addition, indicate the percentage of participation of each team member in the project.

Requirements for assignment A2

- The style of the research paper must follow the UNCIS Springer template (you can download the template for MS Word or [LaTeX](#) from this [link](#)).

Introduction

Within the first page of the Introduction, you must **sell the research to a reviewer**

- Ideally, the motivation has both practical and theoretical components
- Ideally, it is **not** just about filling a knowledge gap
- The motivation should be intrinsically interesting
- It needs to be precise, concise and accessible to a general reader – not an expert

Experimental design

Research Questions

They have to follow and be linked to the motivation

- They need to be expressed very clearly
- Later on, you will need to explain how
 - you have collected the right data from the right people
 - you have analysed that data
- In order to answer the questions
 - And report on those answers in the conclusions



Experimental design

Selection of Methods

Exactly describe the methods you used – and why?

- The justification for the choice of method is very important.
- It can't be because you know that method better – or even because other people used the same method in a similar study.
- You need to say why this is the most appropriate method for this study.

Experimental design

Selection of Theory

There maybe many suitable or possible theories, yet whichever one you pick, there has to be a good justification

- Is it that the theory offers a new lens through which to view the phenomenon?
- Does the theory enable, empower or enslave?

You may have multiple theories

- Exploratory, explanatory, predictive...

Analysis and execution

Source(s) of Data

Explain: Where is the data coming from?

- It is easy to miss this, but if you can't identify the source of data at the planning stage, perhaps, later on, you will not be able to collect data at all!
- Teams, triads, dyads, individuals, or...?
- Junior staff, middle managers?
- Connected or disconnected people?
- Organisations – documents, archives, reports?
- Secondary sources?

Analysis and execution

Type(s) of Data

Present the data in an appropriate way

- Data from quantitative analysis
- Interviews and conversations
- Diaries
- Focus groups
- Participant observations (ethnography)
- Non-participant observations (case study)
- User generated texts



Analysis and execution

Type(s) of Data Analysis

How do you expect to analyse the data?

Which statistical test?

Which techniques?

- Patterns

Which constraints?

Which software might you need to help you?

- Is it available? Can you get it?

Contribution

What kind of contribution do you hope to be able to make?

- This relates to the research questions, the motivation, and the way you tackled the research
- Ideally, there are theoretical and practical contributions

Research Paper Writing

Is it just about doing all the things that you planned – and writing up?

Or,...?

One key issue is integration

The text needs to be well integrated

The story needs to flow from start to finish

You need to use references appropriately

- Not heaps of references, but enough to show that you do understand the literature
- Recent references (last 5 years to present)?

Writing a research a paper is about to tell a story!

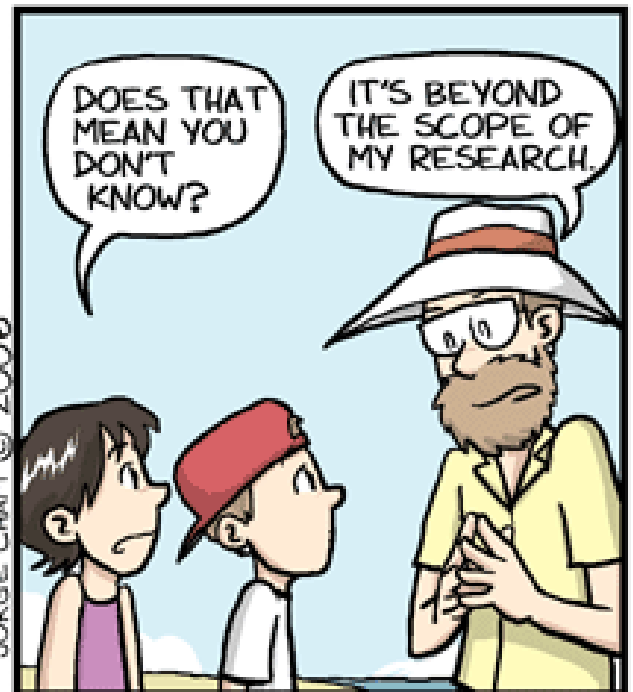
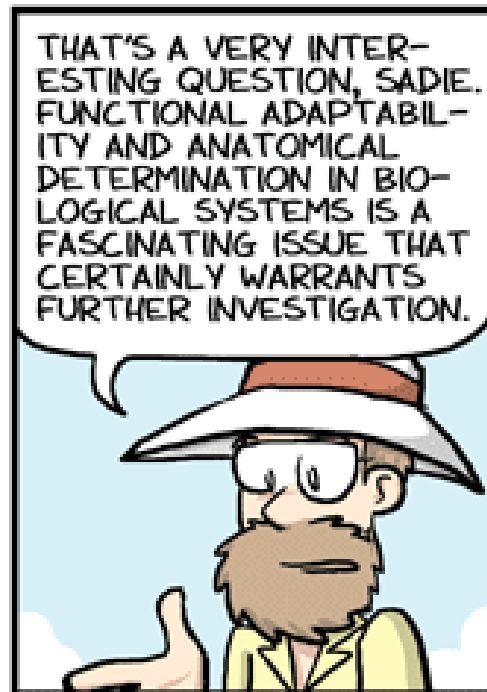
Tell a story!

The starfish case

Problem investigation
✓ Research question
Curiosity!

Treatment/Research design
✓ Identification of the research field, main research gap

Treatment validation
✓ ?

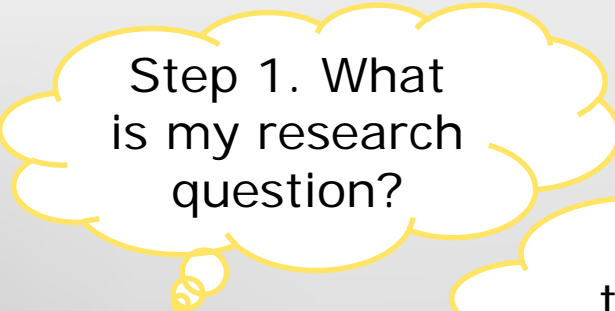


JORGE CHAM © 2006

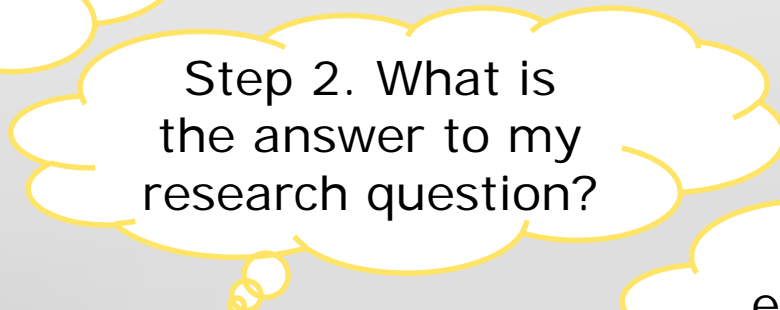
Organising the paper's content

Choosing a (catchy) title

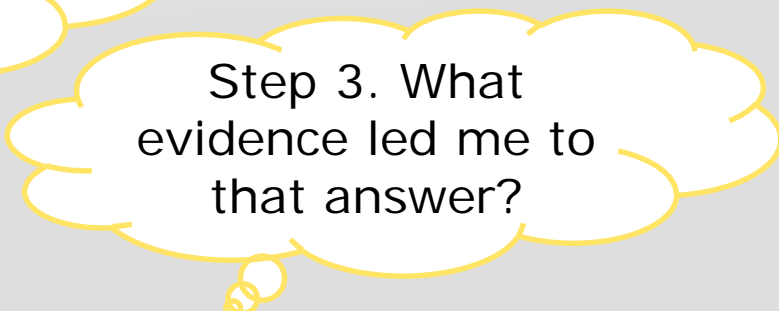
Tell a clear story



Step 1. What is my research question?



Step 2. What is the answer to my research question?



Step 3. What evidence led me to that answer?

Two minutes of a research story

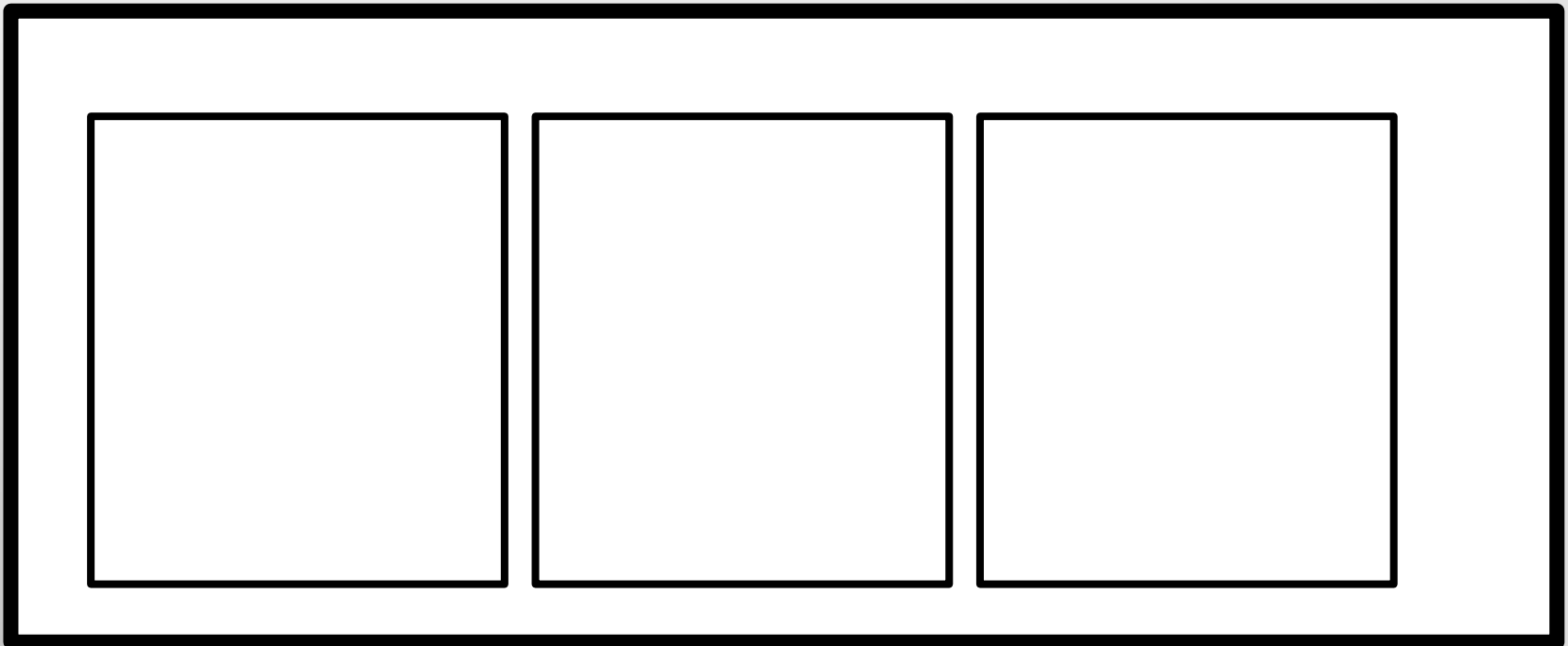


http://phdcomics.com/tv/?v=tp4y-_VoXdA

Draft your research paper in a comic strip

10 minutes to think

10 minutes discussion



Writing – Sequence 1

- It is sensible not to leave the writing to the end of the research
- But you may not be able to write the introduction first – and the abstract should be written last
- The literature review and methods sections can be written earlier

And they may change

Writing – Sequence 2

- When you have results and can analyse them, then write them up and start to think about the analysis
- The introduction and conclusion may be the penultimate sections
- The references need to be written continuously
 - As you cite (or just read) something, note it down
 - It is much harder to locate reference details later
 - Keep complete reference details – and ideally organise them

Writing - Consistency

- It is critical that you are consistent in your writing and referencing style.
- It is very irritating to read a paper that has an inconsistent style.
- If you irritate a reviewer, you are asking to be rejected.
- Perhaps you think it a small thing, but you are not the reviewer!

Consistency

Consistency includes

- Font – style and size,
 - e.g. Times Roman 12
- Line and character spacing,
 - e.g. single or 1.5 or double; full justification or ragged
- Reference style,
 - e.g. [11] or Davison et al. (2010)
- US or UK spelling
 - Use a single dictionary (set language) for the whole paper
 - Use the appropriate dictionary for the journal style
- Margins
 - 1 inch all round or ...?
 - Gutter or even.

Use of the main concepts!

Identification

- Most journals expect that you do not identify yourself openly as the author in the paper
- So be careful when citing your own papers
- Some journals are happy for you to say “I” not “We” – especially if it is a single authored paper

Authorship

- It is a good idea to agree author sequence at the same time as you plan the paper
 - Who is the first/lead author?
 - Who is second, third, etc.
- This avoids arguments later!
- You might need to add an author later
 - All authors should agree on this
- Each author should make an *intellectual contribution* to the paper

Authorship Problems

Some people like to add lots of authors, especially
famous colleagues or supervisors

- These famous people may not realise
- They may not agree with the content of the research
(yet their name is associated with it)

Should a Research Assistant be an author – or an
acknowledgement?

The issue of contribution is paramount.

Authorship Problems

The case of a rejection

- The paper had
 - 4 authors
 - 1 student, 1 supervisor and 2 famous people
- The reject letter went to all 4
- The famous people were surprised & unhappy
 - They did not realise that they were authors
- Later, the student author demanded to change the decision
 - “How can you reject this paper authored by these famous people?”!
- What to do?

Multiple Authors

If there are too many authors, people wonder who did what and who did nothing!

How many is too many?

- 200
- 3
- ?

Authorship and You

- When you graduate, assuming you stay in academia, a hiring committee will look at your publications
- How many single authored papers?
- How many first author on multi-author papers?
- How many with/without your supervisor?
- You need to prove that you can work alone, as well as with others.



PRESENTING AND REVIEWING

Getting started with writing

- Finish the writing session on a high point
- Get friends/colleagues to read your work



Presenting and Reviewing

These also may seem to be quite different topics, but actually they are closely linked

- Presenting relates to how you present the research at a conference
- Reviewing is how others evaluate what you present – written or spoken

Presenting

- Presentation of a written paper means that you have to ensure it is well written, well argued, well justified and pleasant to read
- You have to write for the audience – and meet their expectations (more or less)
- You have to use language that they understand – not too much jargon
- If you present well, then reviewers can at least understand your message

Presenting at Conferences

- This is both harder and easier
- You have much less time – typically 10-20 minutes; perhaps an hour in a seminar.
- So you have to miss out much of the detailed content – and focus on what's really interesting – for the audience
- You also have to answer questions – which may be quite difficult

Presenting Layout (10 mins)

1. Title, authors, affiliations
2. Introduction and Background
3. Literature
5. Method
6. Discussion of results
9. Future research

No conclusion or references. They are in the full paper.

Dealing with Questions

If you know the answer, that's great.

But often you don't.

So, either you make something up (risky).

- Or you deflect the question, like a good politician!
- You could say something that is related.
- Or, you say "that's a great question" and ask the questioner what s/he thinks!
- Or ask for input from the rest of the audience
 - Usually there is at least one person with a *lot* to say who will be keen to help out!
 - It is unlikely that you are the first to be in this state – you can learn from others' prior experiences.

Dealing with Discussants

- A discussant is a person who has the task of reading and commenting on all 2, 3, 4 papers in a session at a conference and saying something intelligent about all of them.
- It is not an easy task – and discussants sometimes try to present their own research
- They also ask you questions.
- Instead of replying directly, you can try to develop a “conversation” with the discussant

Time

- Conference time is limited, so you must not overrun your time allocation
- If you do, you may be cut off with many slides not yet presented
- The audience then focuses on the next paper and forgets you.
- You must budget for time very carefully.
- I suggest a maximum of 1 slide per minute

Presenting Qualitative Research

- Qualitative research is more about words and observations, so you need to use that kind of evidence in the presentation
- It is nice to cite what people said as evidence to support your findings
- But make the cites short and precise
- 2-3 lines at most, ideally less.
- You could include a diagram, photograph or other media to make a point
- Examples from your own observations are nice
- You can easily expand on them if the audience is interested
- They can be the entry to a conversation – with audience or discussant



POSTER GUIDELINES



Learning objective

Present research results in an organized poster session

Design posters to captivate the attention of attendees

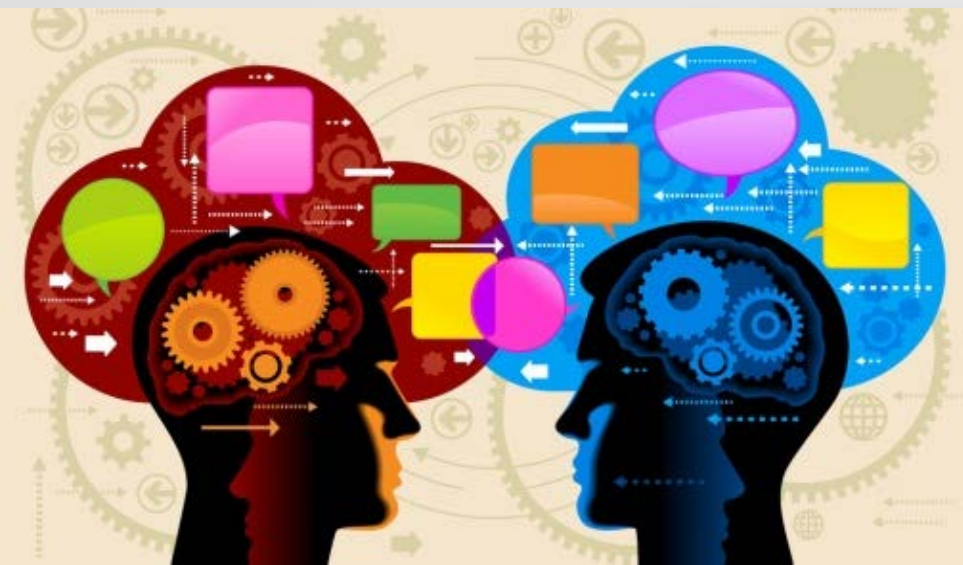


General aim

- A poster is a **graphically based approach** for presenting research. In presenting your research with a poster, you should aim to use the poster as a means for generating active discussion of the research.
- **Limit** the text to about **one-fourth of the poster space**, and use "visuals" (graphs, photographs, schematics, maps, etc.) to tell your "story."

Motivation

Posters are ideal for presenting **speculative**, late-breaking **results** or for presenting new and **innovative work** (in its earliest stage), or **position statements**.



The goal of a poster is to encourage and facilitate small groups of individuals interested about the topic to join into a discussion.



POSTER SESSION IN ACTION!

A model-driven reengineering framework to support organisational improvement



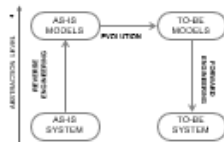
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An overview

Motivation

- Enterprise systems need to evolve to be adapted with changes in their contexts.
- Business processes should also be transformed to support the involvement of new goals in the organisation.
- Some external drivers for changing software are **innovation**, **cost reduction** and **regulation**.
 - They have to be supported by **techniques**, **tools** and **methods**.
- Reengineering has been widely used in software maintenance and organisational evolution.
 - "horseshoe" metaphor: a generic model of reengineering.



The open challenge

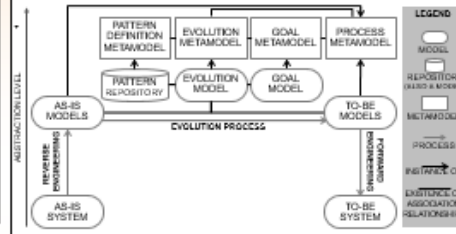
Full support by means of methods and tools for the software reengineering process.

Main goal

Provide a **model-driven reengineering framework** in order to support **organisational evolution** and information system maintenance.

The proposal

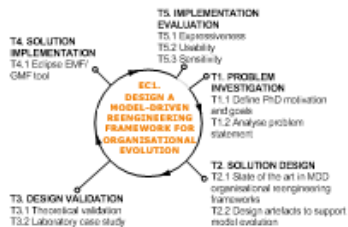
- We focus on developing specific artefacts to evolve business process models.
- Carrying the horseshoe metaphor to the MDD field.
- Aligning process and goal perspectives.
- Applying model-driven and pattern based approach to guide model evolution.
- Proposing a pattern definition metamodel to specify common behaviour.
- Proposing an evolution metamodel to:
 - 1) Relate patterns with the models that are being evolved
 - 2) Relate the evolution process with the organisational goal
 - 3) Establish traceability among models



Research questions

- RQ1** Which are the **current reengineering frameworks** to support evolution in information systems domains?
- RQ2** Which are the **concepts and terminology** involved in the reengineering process and its artefacts?
- RQ3** Which **MDD methods**, tools and technologies exist that can be effectively used to **follow a horseshoe model aware within the organisational domain**?
- RQ4** What are the **artefacts, guidelines and tools** to support model-driven evolution in the organisational domain?
- RQ5** How can the **MDD reengineering framework** be validated as a framework to support organisational improvement?

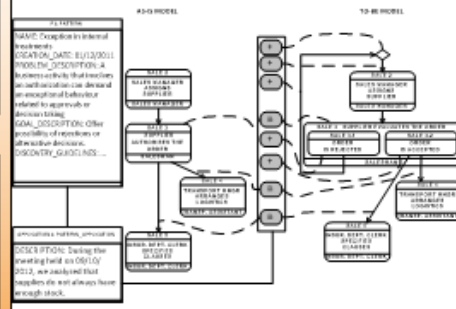
Research methodology



R. Wieringa, "Design Science as Iterative Problem Solving," presented at the 4th International Conference on Design Science Research in Information Systems and Technology (DISRIST'09), Houston, TX, USA, 2009

Illustrative example

- An authorization business activity can demand an exceptional behaviour related to approvals or decision making.
 - Exception in internal treatments
- Steps:
- 1) Analyse the pattern repository
 - 2) Apply the pattern



Acknowledgments

I acknowledge to my supervisors **Sergio Expanso** and **Oscar l'astor** for their invaluable support and advice to lead my thesis.

I acknowledge the support of the Spanish Ministry of Science and Innovation project PRO3 (2010-15-18130-GB-I3), the Generalitat Valenciana project GR2010-008183 (2010-01-01), the Spanish Ministry of Science and Innovation project PRO3 (2010-15-18130-GB-I3), and the FEDER.

It can improve!



Design and layout

Some recommendations

- Make it obvious to the viewer how to progressively view the poster: from left to right, and up to bottom
- Create individual panels to arrange the information that you want to present
- Number the panels or connect them with arrows
- Leave some open space in the design
- Use a minimum font size of 18 points, the text should be readable from five feet away
- Use all capital letters for the title, font size of 70 points

Figures

Some recommendations

- Present numerical data in the form of graphs rather than tables
- Remove unnecessary details
- Use color to enhance comprehension, not to decorate the poster
- Text and figures should be integrated
- Each figure should have a brief title

Text

Some recommendations

- Keep the text brief. Blocks of text should not exceed three paragraphs. Use the text to
 - Introduce the study (what hypothesis was tested or what problem was investigated? Why was the study worth doing?)
 - Explain graphs and direct viewers attention to significant data trends
 - State and explain the interpretations that follow from the data
 - Conclude, you can use a bullet-point list
- Include sections on future research plans or questions for discussion
- Acknowledgements or important references



What do you think about this poster?

The Severity of Undetected Ambiguity in Software Engineering Requirements

Cristina Ribeiro, Daniel Berry, (cribeiro, dberry)@uwaterloo.ca

1. RESEARCH PROBLEM

- Requirements specifications (RSs) must be unambiguous so that different stakeholders don't interpret them differently.
- RSs are written mostly in natural language (NL).
- NLs are inherently ambiguous.
- So all RSs must be disambiguated by stakeholders.
- For many ambiguities, just all the stakeholders' talking about the RS disambiguates them.
- But there is subconscious disambiguation (SD) and some ambiguities in an RS will survive analysis, only to show up later when the running program surprises the customer.
- The incorrect software can cause **EXPENSIVE** damage.
- But not all ambiguities are subconsciously disambiguated incorrectly.
- Since fixing bugs late is **EXPENSIVE**, it is important to try to find ALL wrongly disambiguated ambiguities **EARLY**.
- BUT** finding ambiguities is **EXPENSIVE** involving multiple focused inspections.

2. RESEARCH QUESTION

Which is more **EXPENSIVE**?

- Letting subconsciously disambiguated ambiguities cause their damage and then be fixed late.
- OR**
- Doing enough focused inspections on the RS to find the ambiguities early before development starts.

3. RELATED WORK

de Bruijn [1], attempted to answer the same question.

de Bruijn logged all ambiguities in a random sampling of sentences in the RS for one failed project.

I am logging only all occurrences of types of ambiguities likely to suffer SD in the RSs for at least 3 successful projects.

4. METHOD

- Get early RSs for already completed implementations.
- Remain ignorant of their later histories.
- For each RS:
 - Using checklist of ambiguity types that are most likely to be subject to SD, find as many of them as possible in RS.
 - Examine history of development from this RS to determine which of the found ambiguities were:
 - found during development and were fixed and at what cost.
 - not found during the development and are latent in the code.

For each ambiguity in class 2:

 - Determine by talking with developers
 - which ambiguities could lead to damage and
 - get estimate of cost of potential damage and cost to fix code to avoid damage.


Note that developers should be happy (-:-) to learn of potential problems before they happen.
- With these data, answer the RQ for these RSs.

5. REFERENCES

[1] de Bruijn, R., and Dekkers, H.: 'Ambiguity in Natural Language Software Requirements: A Case Study', Requirements Engineering: Foundation for Software Quality, pp. 233-247.




And... what about this poster?



Interested in improving your requirements engineering process?

Try Requirement Patterns!



www.tudor.lu

Xavier Franch¹, Cindy Guerlain², Cristina Palomares¹, Carme Quer¹, Samuel Renault²

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"When specifying a system, it is quite usual that a significant proportion of requirements is recurrent and belongs to a relatively small number of categories, especially in the case of non-functional requirements (NFR)."

Requirement Patterns!

- ★ **Faster Elicitation**
- ★ **Better Quality & Consistency**
- ★ **Improved Reqs. Management**

What are Requirement Patterns?

The solution should **start** if **data close to their capacity**.

In case of a **network or server disk crash**, the solution should **fail** immediately.

The system should **start** if the administrator of the **resources (physical or logical)** **close to their capacity**.

↓ Requirement Template

The system shall trigger alerts in case of **failuresSet** failures.

❗ **failuresSet**: set of possible failures
- possible values: server crash / disk crash ...

Req. Pattern: Failure Alerts

Goal: Alerting system users about system failures

Patterns can have different forms, hence capture different contexts for the same pattern.

Does the client need a specific type of alert when a specific type of failure occur?

NO

Homogeneous Failure Alerts Form

- The system shall trigger an alert in case of failure
- The system shall trigger alertSet alerts in case of failure
- The system shall trigger alerts in case of failuresSet failures


YES

Heterogeneous Failure Alerts Form


- The system shall trigger different types of alerts depending on the type of failure
- The system shall trigger alertSet alerts in case of failuresSet failures

PABRE System: A Patterns Based Requirements Elicitation System

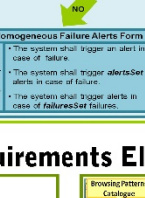
NFR Patterns Catalogue



General Overview




PABRE-Pro



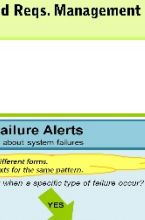
Free Experimentation

If you want to explore our framework




Guided Experimentation

If you want to use our framework in a specific project without any modification



Assets Customization

If you want to customize our assets for your specific context



Hypothalamic-pituitary-adrenal axis regulation differs between fall and spring migration

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Wintering grounds

Spring migrants fly faster, have higher refueling rates, and are more likely to encounter inclement weather than fall migrants

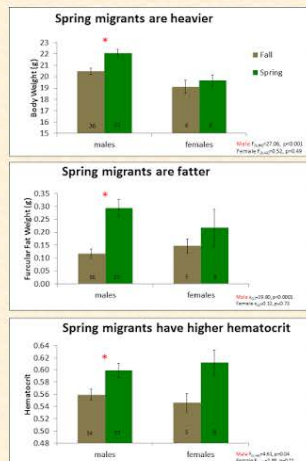


Breeding grounds

As the HPA-axis helps vertebrates respond appropriately to environmental challenges and stressors, ***we hypothesized that HPA-axis activity would be greater during spring migration compared to fall.***

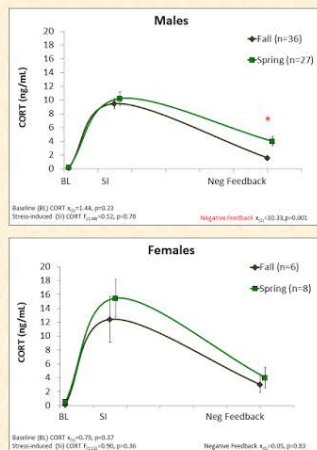
We measured body condition and corticosterone (CORT) profiles of dark-eyed juncos (*Junco hyemalis*) during their fall (2015) and spring (2016) stopovers in Fargo, ND.

Body Condition



Suggests migrants need more fuel stores and higher oxygen delivery capacity during spring.

HPA-axis



Weaker negative feedback in spring may suggest heightened sensitivity to stress upon arrival to breeding grounds (CORT-Flexibility Hypothesis). Alternatively, weaker negative feedback could help keep CORT levels high during flight. Lack of differences in baseline and stress-induced CORT may suggest CORT doesn't play a large role in hyperphagia and lipogenesis during stopovers.

We thank W. Huesers, C. Le, K. Needham, and A. Pearson for their assistance. C.M.B. was funded by ND EPSCoR and T.J.G. was funded by NSF Grant IOS-1257527.

Suggestions

- **Simplicity** is the KEY
- Before to design the poster, **create a list of the graphs you want to use**. Write the text after you have created the list of graphs
- Before the poster session, rehearse a brief summary of your project. Many viewers will be in a hurry and will want a quick “**guided tour**” of your poster
- **Do not be afraid** to show the weak points of your work, you can get valuable feedback!

Our poster session! The world café at ARM

30 posters in
two sessions



Our poster session

- Be very creative! At the end of the poster session we will announce the “best poster award” selected by the audience. The winners will be happily rewarded 😊
- To promote a nice environment, the teams are encouraged to bring something small to share with the attendees

References

Davison, R.M. (2003) Discussants and the Quality of Interaction at Conferences, *Communications of the AIS*, **11**, 7, 128-136.

Davison, R.M., Vreede, G.J. de and Briggs, R.O. (2005) On Peer Review Standards for the Information Systems Literature, *Communications of the AIS*, **16**, 49, 967-980.