UNIVERSITAT POMPEU FABRA

Research Methods

How to formulate research questions

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Program

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- Reality and consensus
- Information sources
- How to formulate research questions
- How to answer research questions
- Writing and presenting research work
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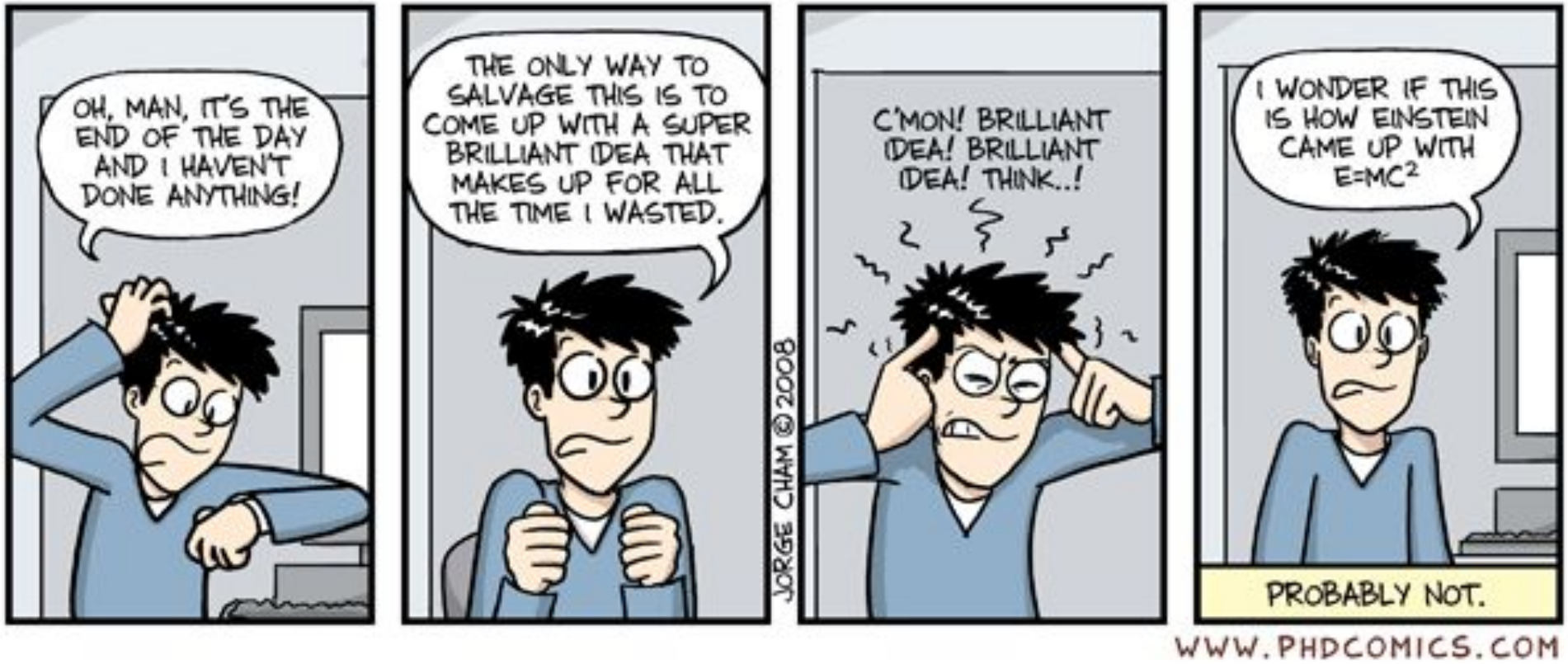
- The tasks of professional researchers

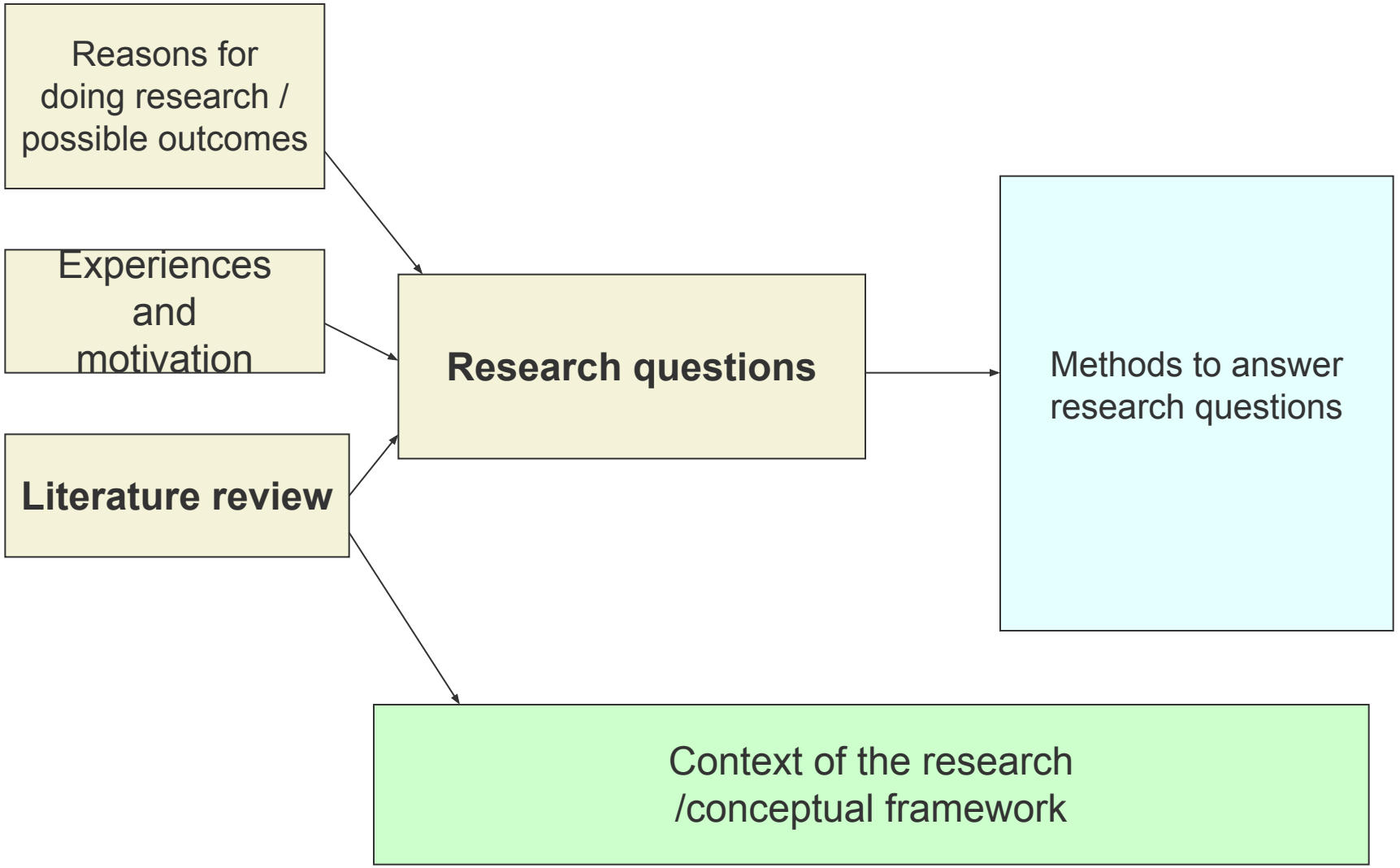
Content

- Reasons for doing research
- Possible outcomes of research
- Finding research topics
- Writing a literature review

- References / readings


OH, MAN, IT'S THE END OF THE DAY AND I HAVEN'T DONE ANYTHING!
THE ONLY WAY TO SALVAGE THIS IS TO COME UP WITH A SUPER BRILLIANT IDEA THAT MAKES UP FOR ALL THE TIME I WASTED.
JORGE CHAM © 2008
C'MON! BRILLIANT IDEA! BRILLIANT IDEA! THINK..!
I WONDER IF THIS IS HOW EINSTEIN CAME UP WITH E=MC²
PROBABLY NOT.
WWW.PHDCOMICS.COM

Overview


Reasons for doing research / possible outcomes
Experiences and motivation
Literature review
Research questions
Methods to answer research questions
Context of the research /conceptual framework

Reasons for doing research (I)

- To add to the body of knowledge
  - Add to what is known about your field and it does not matter whether the new knowledge has any practical implication
  - All researchers are expected to add to the body of knowledge, but *only for a few of them it is the only reason*

Reasons for doing research (II)

- To solve a problem
  - E.g., *Is it possible to develop a computer-based technique to do X?*
    If you are developing a technique to do something in a *new (better) way*, then it is research
  - Be careful: if the problem is seemed as a personal challenge, you should be able to *discuss how your work could be of relevance to others*

Reasons for doing research (III)

- To find out what happens
  - E.g., *What happens when a new computer system (or a new development process approach) is put into real-world use?*
  - Beyond description of prototype systems, interaction between the social and technical spheres, the effects, etc. becoming increasingly important…

Reasons for doing research (IV)

- To find the evidence to inform practice
  - E.g., *How do we develop computer systems? How should we? Can we come up with better ways?* Provide evidence that would inform developers about which ideas should be taken up and which not.

- To develop a greater understanding of people and their world
  - Simple curiosity vs. findings with practical applications
  - E.g., *if we know about how people use PCs at home, that might help companies who want to design software for home PCs*

Reasons for doing research (V)

- To predict, plan and control
  - E.g., *computer-based systems to help people predict the amount and effect of global warming*
    Look at what systems are needed to help with prediction, planning and controlling, develop such systems, or investigate their use
- To contribute to other people's well-being
  - E.g., *can we research and design better user interfaces so some people, such as older people or disable people, do not have to struggle when using a computer?*

Reasons for doing research (VI)

- To test or disprove a theory
  - In ICT there are many theories that could be tested

    E.g., *Many parents worry that computer games are harmful to the development of their children… Others argue that they are beneficial because they hone perception and motor skills and reaction times. Can we test these theories?*

- To come up with a better way
  - Sometimes a research question appears to have been answered, but another researcher wants to suggest a better answer *(a better algorithm, a better method…)*

- … (other reasons are possible)

Possible outcomes of research (I)

- A new theory
- A re-interpretation of an existing theory
  - New computing technologies → new uses become possible; there is room for many more theories about how to analyse, build and use computer-based products

Possible outcomes of research (II)

- An exploration of a topic, area or field
  - A literature-based survey of the state of knowledge in a particular area with a special contribution (ordering the material, comparing and contrasting different views, identifying areas of controversy or requiring investigation…)

Possible outcomes of research (III)

- A new or improved model or perspective
  - Suggest that we look at something in a new way
    E.g., *Chen in 1976 proposed that we should view the world in terms of entities and relationships, leading to the entity-relationships diagrams used in database design*
- A new or improved algorithm
- An in-depth study of a particular situation
  - Study of new uses of ICT in depth in context that have not been studied before
    E.g., *a case study of a particular system development that decides to move from its existing method to a new approach…*

Possible outcomes of research (IV)

- A critical analysis
  - E.g., *examination of a systems development method: its features, its omissions…*
  - E.g., *critical analysis of government policy concerning the development of a national ICT infrastructure and its implications for the digital divide still found in most societies…*
- Unanticipated outcomes
  - Emerging knowledge!
- …

Finding research topics: getting started

- Sometimes they (or the motivation) emerge out of:
  - Personal circumstances and opportunities
    - E.g., *a disable person might be frustrated by the poor accessibility of many websites, and then realise that she could turn accessibility into a research topic*
  - Unexpected, serendipitous opportunities for research ideas (conversation at a party, interesting magazine article or a news event)
- (and! or normally…) follow a structured approach to look for ideas (**gap spotting**, **problematization…**)
  - Look at what for others have done, or suggested, and what seems to be happening in your research community and the world

Strategies to formulate research questions (I)

- Variants of *gap spotting*:
  - ***Confusion spotting***: Looks for areas where previous research on the topic exists, but the available evidence is contradictory
  - ***Neglect spotting***: Looks for something that has not yet been considered in existing literature (not at all or not "appropriately")
  - ***Application spotting***: Looks for areas where there is not sufficient theory, or there are certain problems, and suggest to apply a specific theory, a specific theoretical framework, or a specific method to remedy the state of affairs
  - ..

Strategies to formulate research questions (II)

- "Problematization"
  - Influential theories and widely cited papers use problematization as the main strategy
  - In problematization, the reproduction and continuation of an institutionalized line of reasoning is disrupted
  - It is about taking something that is commonly seen as good or natural, and turning it into something problematic

Finding research topics: sources of ideas (I)

- Suggestions from staff in your department (research topics, project ideas)
- Past research students' work (supervisor suggests recent good examples of student theses)
- Recent conference and journal papers, especially the sections discussing where further research is needed
- Current events reported in the media (sometimes a phenomenon is notice in the popular culture before taken up by researchers)

Finding research topics: sources of ideas (II)

- Needs expressed by potential clients (be careful and make sure you can identify an academic research aspect to such work)
- Calls for conference papers or special issues of journals on a particular theme (can tell you what topics are currently "hot", often list the kind of research questions that need to be addressed)
- People making assumptions with little supporting evidence. Could you carry out research to find evidence to support or refute them? (E.g., computer-based teaching means the end of universities as we know them)

Finding research topics: brainstorming

- Helpful to discuss ideas with a group of colleagues, perhaps using *brainstorming* and *clustering* techniques
  - Explain the group your background, interests, subjects you like (and you dislike…), strengths (and weaknesses)
  - Whiteboard/piece of paper… all the group members write down keywords, ideas… (though they seem unfeasible or silly…)
  - Examine the ideas, group them… Does the clustering suggest a topic area for research or can be turned into potential research questions?

Finding research topics: selecting a topic (I)

- Formulate each potential topic as a single research question (using unambiguous terms)
- The topic should meet two main criteria:
  - Enjoyability (for you)
    (help keep you going through some frustrating times…)

  - Feasibility (as a piece of research)

Finding research topics: selecting a topic (II)

- Think about the feasibility:
  - Is the research **relevant**? Is it likely to offer something new for your target users?
    (see reasons for research and potential outcomes)
  - Will your potential outcome be of **value**?
    (interesting, useful and worth further investigation)
  - Will the research **contribute** something to knowledge, even if you do not complete all of the "technical product" in the time available?

Finding research topics: selecting a topic (III)

- Think about the feasibility (cont.):
  - Is there a theory (or set of ideas) that will help you structure your approach, at least in the beginning?
  - Is the research and its outcomes likely to be of sufficient **scope** to meet your target assignment? (4 week research project vs. PhD)
  - Can the research be carried out in the **time available**?
  - Does the research topic fit in with your own **motivations, strengths**, etc.?

Finding research topics: selecting a topic (IV)

- Think about the feasibility (cont.):
  - Does the research meet your own learning objectives?
  - Do you have the necessary resources?
  - Can you approach the topic without too much bias?
  - Will the research be safe and ethical?

Finding research topics: write them!

- Write as much as possible:
  - As soon as you have ideas, write them down.
  - With the thoughts about whether they will be enjoyable, feasible; viable topic for you
  - In research, the art of writing helps to clarify your ideas, discover what you really think…
  - Means of communication with your supervisor… (easier to understand than verbally)
  - Reusable for the thesis…
  - …

Writing a literature review (I)

- All researchers have to review the literature in their field (domain / area of study), *see "information sources" presentation of last week, and the credibility/value/relevance for your research issues previously discussed…*
- By studying the literature you can find out what has been done before, and what topics remain to be addressed (helps to decide upon viable research questions)
  - crucial questions of the community
  - gap that has not been previously identified or addressed
- Once a topic is chosen, the literature review carries on throughout the remainder of the research time

Writing a literature review (II)

- The aim is **to present evidence to support your claim that:**
  - The topic is worthwhile
  - The research does not merely repeat the work of others (or there is a deliberate reason for doing it)
  - The researcher has created new knowledge that was not known before
- The review is a discussion on *only* the material you have read that is directly relevant to your research

Writing a literature review (III)

- Critically evaluate previous work, and look for themes that link different authors' work together
  - Point to strengths, weaknesses, omissions or bias in previous work
- Identify theories, methods, algorithms to incorporate in the research; as well as research methods to use…
- Synthesize it into a coherent text that justifies your own research and places it in a context *(of what has been already been published)*, foundation of your research
- Be careful about plagiarism: careful cite other authors
  - *using quotation marks of short text…*
  - *or writing with your own words what they say (this is better because it denotes that you understood what …)*
  - then you cannot be accused of plagiarism and demonstrate you are aware of related work…

Context of the research / conceptual framework

- The literature review should help provide and justify the context of the research / conceptual framework for your research:
  - Makes explicit how you structure your thinking about your research topic and the methods undertaken…
    - Factors that comprise your topic
    - Way of thinking about the topic *(via a particular theory or technology for example)*
    - Way of tackling your research questions (methods)
    - Approach to analyze the data
    - …

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