



Vrije Universiteit Brussel

# Obtaining a PhD in Web Engineering: Tips and Experiences

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# Introducing... myself!

- **Professional**

- Master in Computer Science (1999)
- Research & Teaching assistant (1999 – now)
- Phd in Computer Science (2005)
- Self Re-organization in Web sites



- **Research Interests**

- Web Engineering
- Semantic Web
- Conceptual Modeling
- Adaptation & Personalization
- Aspect Orientation
- Rich Internet Applications

## **Where**

- Vrije Universiteit Brussel, Belgium
- Web & Information Systems Engineering lab



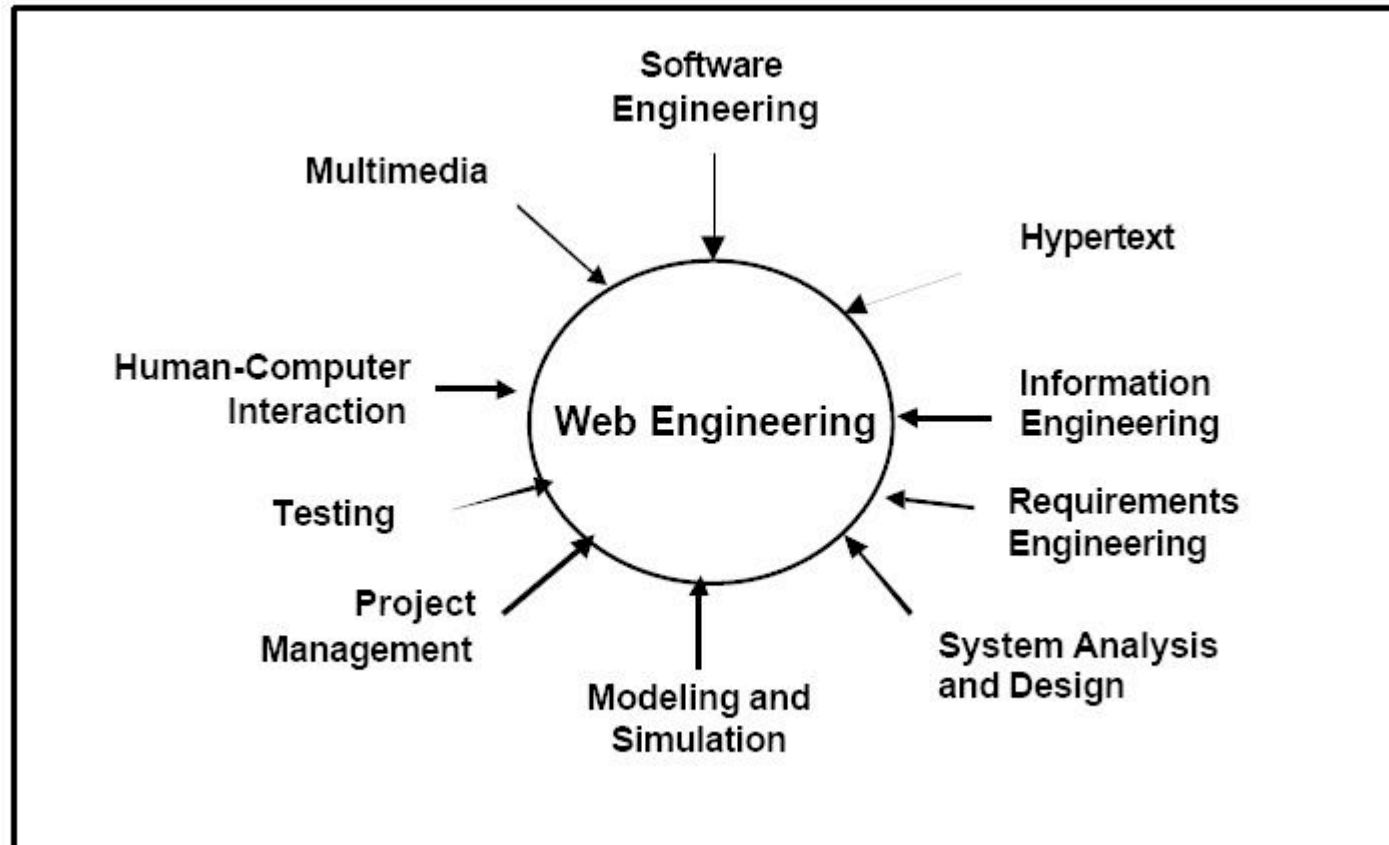
# Web Engineering

***Web Engineering is a discipline concerned with establishment and use of sound scientific, engineering and management principles and disciplined and systematic approaches to the successful development, deployment and maintenance of high quality Web-based systems and applications.***

[Murugesan et al, 2001]



# Web Engineering: a multi-disciplinary field



[Murugesan et al, 2001]



# Typical for the Web

- Requirements elicitation more difficult; heterogeneous (often anonymous) user group
- Different type of user involvement (WIKI's, tagging, ...)
- Very content-driven, document-oriented
- Explicit emphasis on navigation
- Important focus on presentational aspects
- Integration with legacy systems
- Migration
- The session-less nature of the interaction protocol (HTTP)
- Run in an environment that is difficult to control
- Mix of technologies (e.g. mark-up, scripting, multi-media, web services)



# Typical for the Web

- Increased need of **security and privacy**
- Different **delivery medium** (e.g. varying supporting software, hardware & network)
- Typically **evolutionary** in their nature
- **Maintenance** more important
- **Accessible** from **all over the world**
- A very **high time-to-market pressure**
- **Ramifications** of failure or dissatisfaction much worse



# Evolution of the Web: future directions

## Mobile Web

- Web accessible from anywhere, with any device and at any time
- taking into account environment (e.g. location)
- coping with particularities of mobile devices (e.g. small screen size)





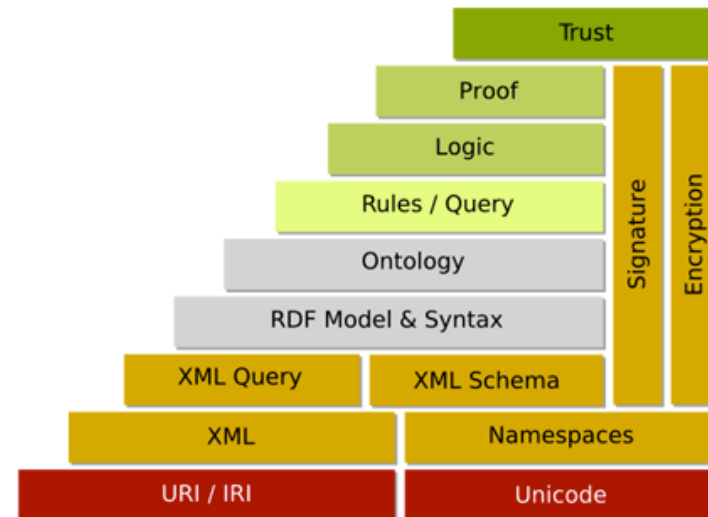




# Evolution of the Web: future directions

## Semantic Web

- Make the semantics explicit
- Strive to a machine-interpretable Web
- Use of ontologies
- Many new enabling technology

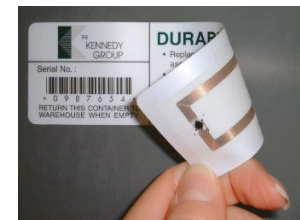
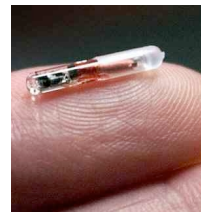
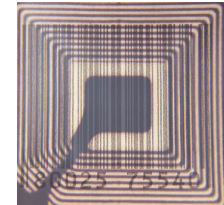
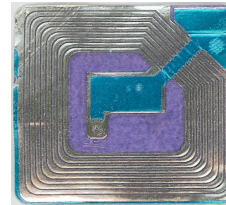




# Evolution of the Web: future directions

## Internet of Things

- RFID & NFC technology
- design of Web Applications  
*aware* of their surroundings





# Can I do a PhD?

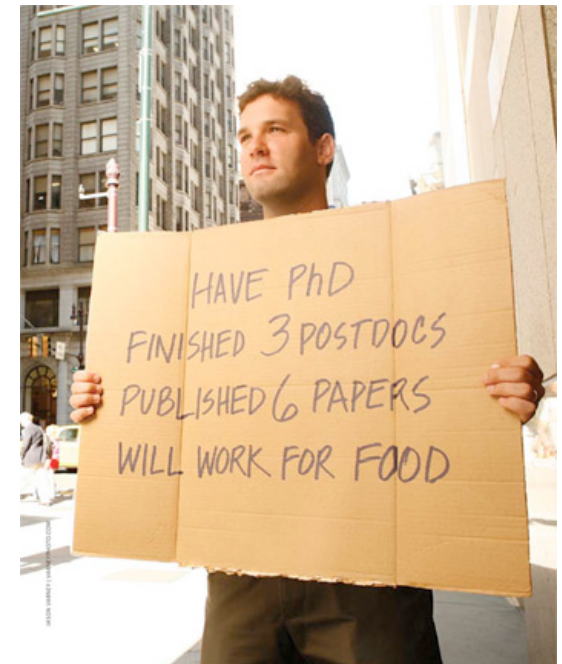
- But ... I'm not Einstein ☹️
- You don't need to be 😊
- You don't need to find another  $E = mc^2$
- A PhD is 10% inspiration, 90% transpiration
- Be willing to work **HARD**





# Do I want a PhD?

- Are you excited to help shape the scientific field & knowledge?
- Do you want to work on the technology of tomorrow, instead of applying the one of today?
- Do you want to deepen your knowledge in one particular field?
- Are you persistent, hard working?
- In the long run, you're probably aiming for a research position.
- Don't do it for the money!





# Finding a PhD topic

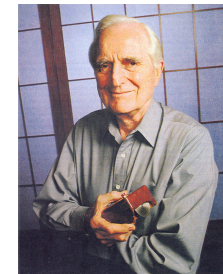
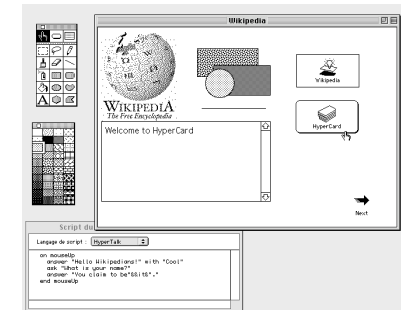
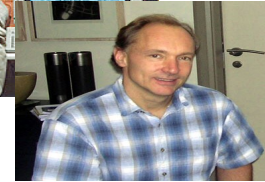


- Your advisor!
  - Should be up-to-date, have suggestions
- What's happening? -> mailing lists!
  - DBWorld, ISWorld, SEWorld, AH&H, SeWeb
- Have a look at CFP's of conferences, workshops
  - You'll find current topics and open issues
- Study toc's of recent conferences & workshops
- Try to fit your topic in the research of the group
- Think ahead
  - What will people think of your research in 10, 20 years?



# Know thy History

- Everybody knows these guys... do we?
- But, do we know these?
- If not, start reading!





# Know thy Field

- Who's the competition?
  - What exactly are they doing?
  - How are they doing it?
  - How is it different from what you're planning?
- Literature Study
  - Surveys, proceedings, DBLP, Google Scholar, ACM library, IEEE digital library, journals, etc.
  - Takes a lot of time
  - Don't forget related fields (e.g. software engineering, HCI, component-based SE, Hypertext, ...)
  - Books are probably outdated (unless they are very recent)
  - Share with colleagues!



# Know thy Field

- You will forget 90% of what you read!
  - Systematically summarize and annotate what you read
- This will be useful
  - For papers
  - For your PhD
- Write down your ideas!





# Start doing Research!

- Hard to recognize when you are doing research
- Having an argument in front of a blackboard is helpful
- Try to build a working system, implementing your ideas – conceptualize later
- Don't be afraid if your focus shifts; great scientific discoveries are made by accident or as a side effect
  - But be sure to regularly check with your advisor

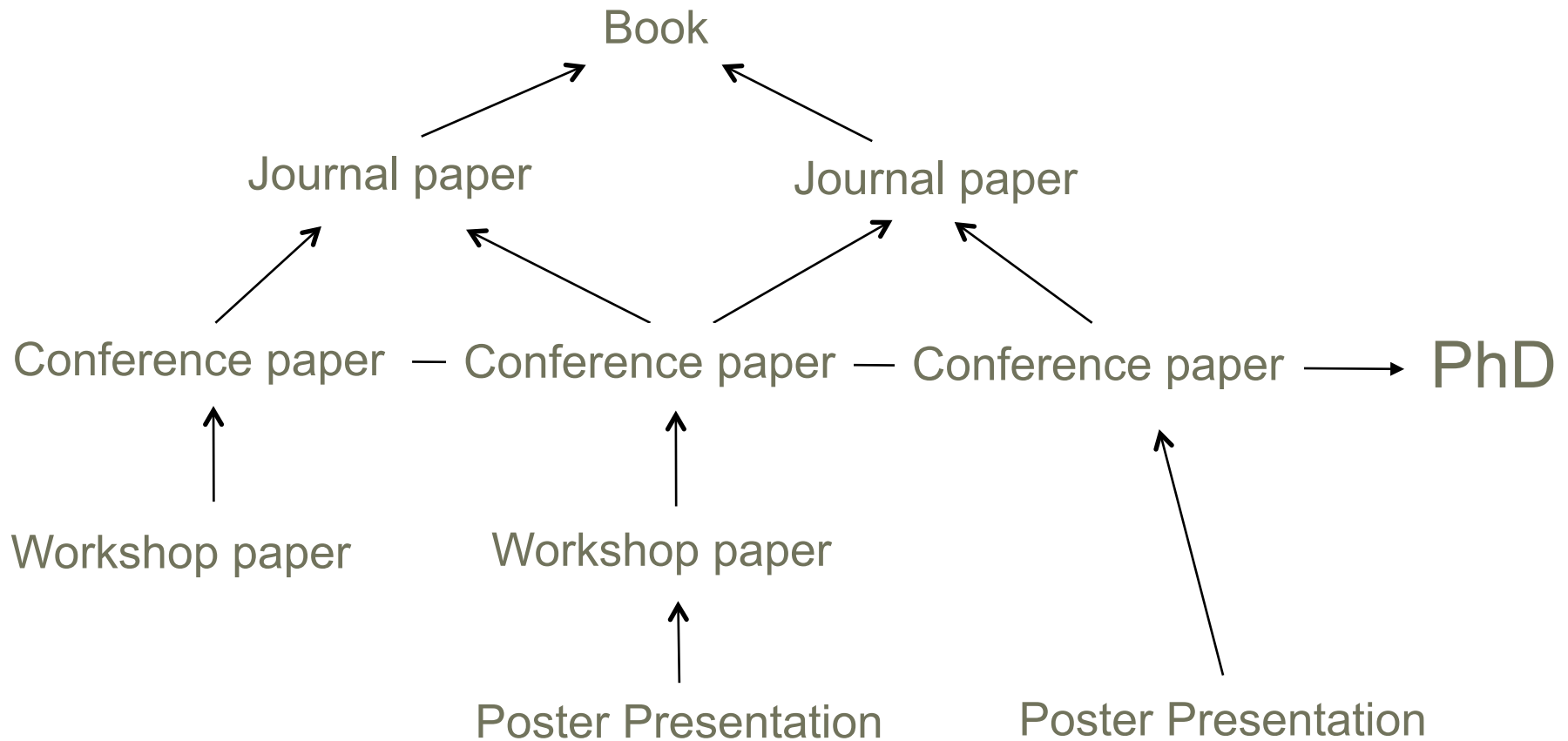


# Start doing Research!

- Regular discussions / meetings with colleagues!
  - Be hard & helpful to each other
- Keep a research notebook!
  - Summaries of talks, discussions, presentations, etc.
  - Own notes on implementation, progress, etc.
- Make a research plan
  - Salami slicing
- Once you have enough material, write it down
  - Your advisor helps you decide when
  - It helps you to better think about your results
  - Technical report, maybe a poster / workshop paper



# The Result Pyramid





# Where to publish?

- Journals:

- World Wide Web Journal
- Journal of Web Engineering
- IEEE Internet Computing
- ACM Transactions of Internet Technology
- New Review of Hypermedia and Multimedia
- International Journal of Web Engineering and Technology
- Depending on your particular interest, journals from related fields, e.g., Human Computer Interaction, Mobile Computer
- Etc.
- Some journals are considered *better* than others
  - » Impact factor, journal rankings



# Where to publish?

- Conferences:
  - World Wide Web (WWW)
  - International Conference on Web Engineering (ICWE)
  - Web and Information Systems Engineering (WISE)
  - Conference on Advanced Information Systems Engineering (CAISE)
  - Entity Relationship (ER)
  - Asian Pacific Web Conference (APWeb)
  - Etc.
- Some conferences are considered *better* than others
  - <http://www.cs-conference-ranking.org/>
  - <http://www.core.edu.au/>



# Where to publish?

- Workshops:
  - Many of them, at all important conferences
  - Choose one which topics fit your research
  - “Official” proceedings are a plus
  - Workshops at important conferences often have higher visibility
- Not only quantity, also quality (citations, h-index!)
- Publish, or Perish!

Ok, I've written a paper,  
now what?



# Ok, I've written a paper, now what?

- Continue!!
- Results take a while to get back
- Don't be discouraged by a reject
  - It literally happens to everybody!
- Be a pitbull!
  - Recycle, rework, resubmit







# Paper accepted, now what?

- Hooray!
- You should have one or two more in the pipeline
- Try conference papers
- Two or three conference papers => try a journal



# Research Community

- A group of specialists in the field
- Usually subdivided into sub-communities
- Workshops @ conferences
- Informal: people know each other
- Useful: proof read papers, PhD jury, etc.
- Be sure you belong to a research community!
- Try to collaborate!
- Are usually formed at conferences



# Getting additional help

- Your advisor / postdocs @ your lab
  - The “visionary”, the “sofa”
  - Can steer you technically, won’t do it for you
  - Pushes you: deadlines, reality checks
  - Proofreads the text
  - Helps you with composing a jury
- External Help
  - Colleagues, fellow students
  - Doctoral Consortium, summer schools (often \$ ¥ €)
  - Reviews of rejected papers
  - Input at conferences (workshop, etc.)
  - The PhD program @ local university


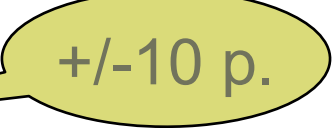
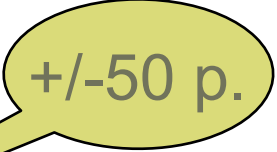
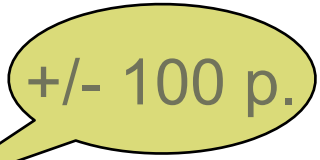
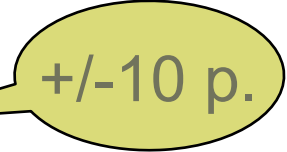


# Your PhD dissertation

- The *text*, a book: a large scientific work
- An original contribution to the field, i.e. solves a scientific problem
- Dissertation  $\neq$  system, implementation
- Only readable for a limited amount of people
- Supported by scientific publications
- Can ask more questions than it solves



# A PhD dissertation: general structure

- Abstract 
- Introduction 
  - Context, problem statement, approach, contributions, outline 
- Background, Context, Field
- Related Work, State-of-the-art 
- Body (theory, concepts, implementation)
- Validation
- Conclusion, future work 
  - Achievements, limitations, summary, future work



# A PhD dissertation: the bells and whistles

- Acknowledgement
- Chapter summaries
- List of figures, list of tables, list of abbreviations, list of acronyms, etc.
- Index
- Appendix (code, extra figures, data files, etc.)



# The final months: writing!

- You'll spend at least 3 months writing virtually day and night
- Take care of yourself
  - Eat healthy
  - Sleep enough
  - Do some exercise
- Relax before you go to sleep
  - A glass of wine? (just one)
  - A walk outside?



# The validation

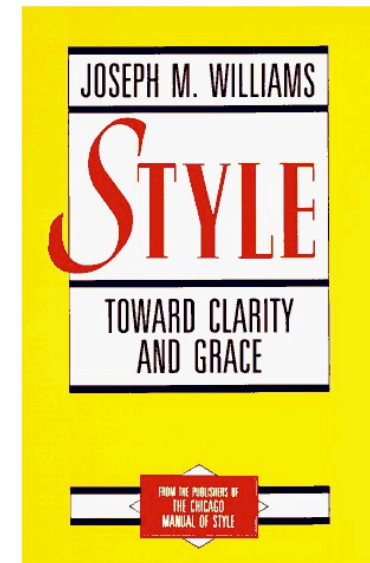
- Important for PhD (also for papers)
- To claim  $\neq$  to prove
  - “better than other systems”
  - “easier to use”
  - “more elegant solution”
  - etc.
- Often lacking ☹️
- Provide convincing evidence your work is scientifically sound!





# Writing

- You **HAVE** to become a **GOOD** writer!
  - Science = 50% communication!
  - Take English classes!
  - Work on your vocabulary, grammar & style
- PC's are harsh
  - Busy people
  - Reading  $\neq$  deciphering
  - Don't give them reasons to reject!
- Scientific writing  $\neq$  a report
- Results  $\neq$  failed attempts





# Pitfalls

- An implementation  $\neq$  a PhD
  - Don't forget the conceptualization phase!
- “It's just a stupid experiment”
  - Continue!
- Beware of re-doing old stuff “better”, or with new technology
  - Be sure you have a contribution!
- Starting too quickly
  - Insufficient or outdated background knowledge
- Starting too slowly
  - Analysis paralysis



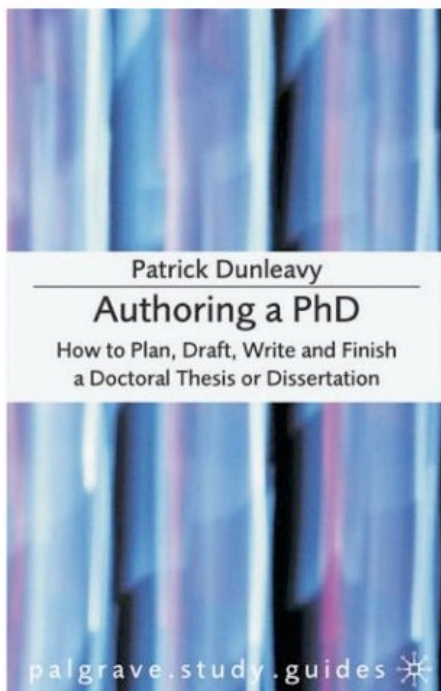
# Pitfalls

- Being afraid of people “stealing” your topic
- Trying to explain everything in one paper
  - Salami slicing!
- Chapter 1 fixation
  - Climbing a mountain starts with a first step, followed by all the others!
- Beware of “bad” supervisors
  - Yes, you work for him/her, but keep on eye on your research agenda!
  - Recognize the signs!
- Research should be fun (except for the last 3 months)

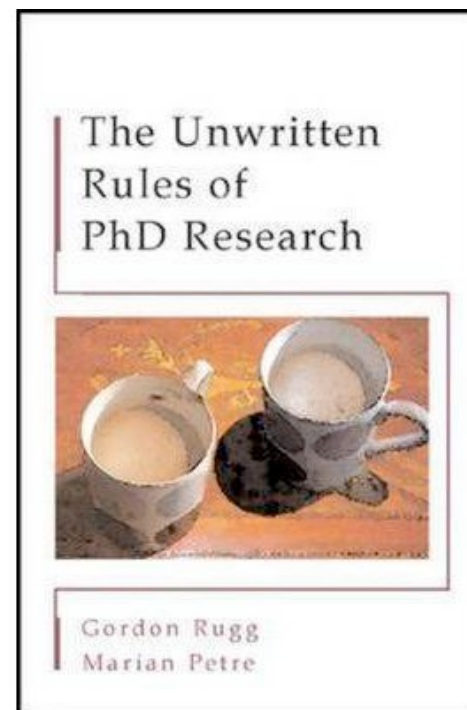


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# Thank You!



## Two useful books



# Good luck all!



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# Thank You!



## Two recent WE books



# Good luck all!



# Acknowledgements

- Information from following sources was used in this presentation:
  - Google (for most of the images;  
I also thank the original providers of the images)
  - [Murugesan et al, 2001]  
San Murugesan, Yogesh Deshpande, Steve Hansen and Athula Ginige  
“Web Engineering: A New Discipline for Development of Web-Based Systems”, Web Engineering, LNCS 2016, Springer, pp. 3-13 (2001)
- Special thanks to my colleague Wolfgang De Meuter, whose original PhD presentation provided much inspiration for this talk