CHALMERS |  UNIVERSITY OF GOTHENBURG

DIT045 H17 Requirements and User Experience

Course Introduction

Jennifer Horkoff
(contact through GUL)

Outline

- Part 1: Content Introduction
  - Motivating Examples
  - What is RE (Requirements Engineering)?
  - Why is RE important?
  - Overview of topics
  - What is UX (User Experience)?
  - Why is UX important?
  - Overview of topics
- Part 2: Practicalities
  - Schedule
  - Assignments
  - Exams
  - Grading Scheme
  - Group work
  - Literature
  - TAs
  - GUL
  - Communication Policies

Requirements Engineering: Examples in the Small

RE Example 1: Network Security

- Example: Secure Network
- Requirement R: "The network shall only be accessible by authorized personnel"
- Domain Properties D:
  - Authorized personnel have passwords
  - Passwords are never shared with non-authorized personnel
- Specification S:
  - Access to the network shall only be granted after the user types an authorized password

- Is the network secure?

(Easterbrook & Campbell)

RE Example 1: Network Security

RE Example 2: Reverse Thrust

- Example: Aircraft
- Requirement R: "Reverse thrust shall only be enabled when the aircraft is moving on the runway"
- Domain Properties D:
  - Wheel pulse sensors on if and only if wheels turning
  - Wheels turning if and only if moving on runway
- Specification S:
  - Reverse thrust enabled if and only if wheel pulse sensors on

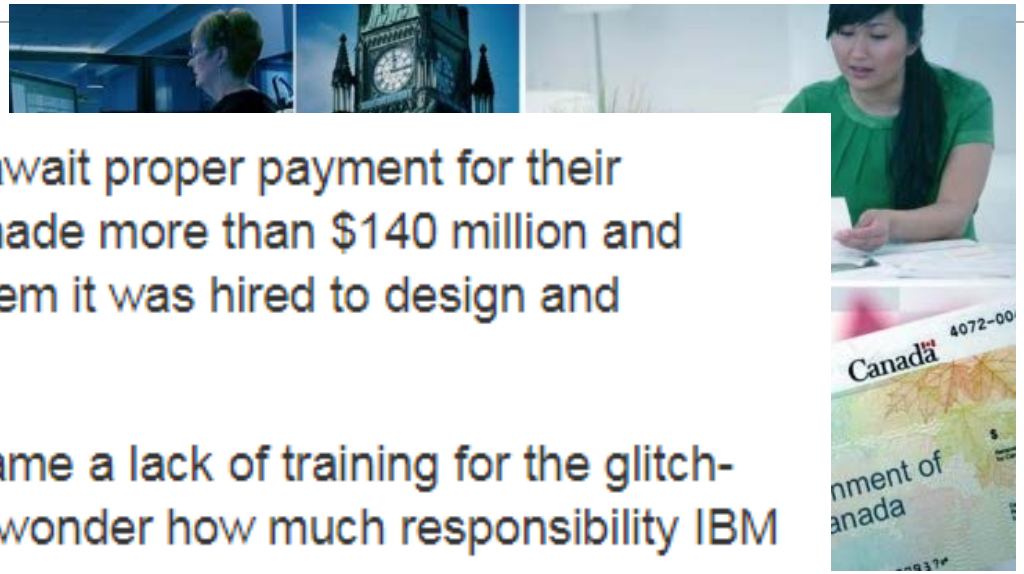
- Why did the plane crash?

(Easterbrook & Campbell)

RE Example 2: Reverse Thrust

Requirements Engineering: Examples in the Large

RE Example 3: Pheonix



While thousands of public servants await proper payment for their government jobs, IBM has already made more than $140 million and counting on the Phoenix payroll system it was hired to design and implement.

High-level government managers blame a lack of training for the glitch-riddled system, but some observers wonder how much responsibility IBM should shoulder.

"One of my favourite quotes is good IT is expensive and bad IT is even more expensive," said Alex Beraskow, a management consultant with 30 years experience, both implementing and reviewing huge, multi-million dollar IT projects for the Canadian government.

The company was tasked with creating a new PeopleSoft-based payroll system for the government's more than 100 departments and agencies.

http://www.cbc.ca/news/canada/ottawa/phoenix-payroll-problems-ibm-1.3770947

RE Example 3: Phoenix (cont.)

LeVasseur said the Phoenix problems are a reminder that contracts with big IT providers need to be properly drafted to anticipate potential glitches.

"You know that they're going to happen so you have to draft the agreement and the obligations accordingly," he said.

"These guys are not accountable under the legal terms of the agreement and they have all these escape clauses that allow them to have a justification or an excuse to not provide the end result we're expecting from them."

Beraskow said there will be many lessons learned out of Phoenix.

"A large part of the take away is making sure that the government, the users, the buyers know exactly what they want, that the procurement processes work and that the process is competitive at all times so that industry can build up their capacity as well to deliver on these projects."

http://www.cbc.ca/news/canada/ottawa/phoenix-payroll-problems-ibm-1.3770947

RE Example 4: Denver Airport

- "The Denver International Airport tried to build a very sophisticated version of such a system (Baggage Handling System) several years ago. The system used PCs, thousands of remote controlled carts, and a 21-mile-long track. Carts moved along the track carrying luggage from check-in counters to sorting areas and then straight to the flights waiting at airport gates. After spending $230 milling (USD) over 10 years the project was cancelled. Much of the failure can be attributed to requirements engineering mistakes."
- Issues:
  - Poor performance
  - Poor reliability
  - Poor understanding of complexity, novelty

- De Neufville, Richard. "The baggage system at Denver: prospects and lessons." *Journal of Air Transport Management* 1.4 (1994): 229-236.
- http://www.denverpost.com/2014/12/31/united-express-has-major-baggage-issues-at-denver-airport/

(Laplante)

Further (older) RE-related Examples

- Wessex Regional Information Systems Plan (RISP). Abaondoned in 1990 after spending 43 million (GBP). Major problems included 'lack of a clear definition of the scope of RISP' (Flowers, 1991)
- London Stock Exchange TAURUS project. Cancelled in 1993 after spending 75 million (total costs of failure estimated at up to 480 million (GBP)). Many problems originated in failures to reconcile conflicting requirements.
- London Ambulance Service dispatch system. Closed down in 1992 after two days operation. Sutcliffe writes of 'poor requirements analysis within the social domain' (Sutcliffe, 1998)

Bray, Flowers

More examples?

- Can you think of examples of system failures due to poor understanding of requirements/user needs/scope?

System Failures

- Solution 1:
  - Build and deploy system incrementally
  - Heavy user involvement
  - Prototype
  - (a more Agile method)

Even this solution involves RE methods and tools!

- Solution 2:
  - Spent more time upfront understanding the problem, domain, users, environment, existing systems…
  - Focus on scoping
  - Capture knowledge in a structured and understandable way
  - Verify knowledge
  - (a more traditional Requirements Engineering method)

- Both can be good or bad depending on the type of system, size of system, size of team, nature of domain…
- Best solution can be in between

What is Requirements Engineering (RE)? (1)

- "Requirements Engineering can be defined as the systematic process of developing requirements through an iterative co-operative process of analyzing the problem, documenting the resulting observations in a variety of representation formats and checking the accuracy of the understanding gained." (Pohl, 1993)

- Systematic
- Iterative
- Co-operative
- Representations
- Checking accuracy (validation)

What is Requirements Engineering (RE)? (2)

- "Requirements Engineering (RE) is a set of activities concerned with identifying and communicating the purpose of a software-intensive system, and the contexts in which it will be used. Hence, RE acts as the bridge between the real-world needs of users, customers, and other constituencies affected by a software system, and the capabilities and opportunities afforded by software-intensive technologies."

  (Easterbrook)

- RE is a bridge between technology and the world

Why is RE important?

- Requirements form the basis for:
  - Project planning
  - Risk management
  - Trade off
  - Acceptance testing
  - Change control

(Dick et al.)

- Avoid system failures (see previous examples)
- Organizational memory
- Liability

What does RE include?

- One view (IREB):
  - System and system context (Domain)
  - Elicitation
  - Requirements Documentation
    - Text, Models
  - Validation and Negotiation
  - Management
  - Tool Support
- Another view (Easterbrook):
  - Risk, Ethics, Feasibility
  - Stakeholders, goals, boundaries, scoping
  - Elicitation
  - Modeling
  - Non-functional Requirements
  - Verification and Validation
  - Prioritizing Requirements
  - Software Evolution
- Another (Nuseibeh & Easterbrook):
  - Context and groundwork
  - Eliciting requirements
  - Modeling and analyzing requirements
  - Agreeing requirements
  - Evolving Requirements
- Another (Cheng & Atlee)
  - Elicitation
  - Modeling
  - Requirements Analysis
  - Verification & Validation
  - Requirements Management

Learning Objectives (RE subset)

- *Knowledge and understanding*
  - describe the process of requirements elicitation, evaluation and prioritization,
  - documentation, validation and development of software requirements,
  - state techniques to acquire and model user demands,

- *Skills and abilities*
  - identify and specify requirements by means of, for instance, scenario-based techniques or goal-oriented techniques,
  - apply techniques to identify personas, scenarios and user stories,

- *Judgement and approach*
  - choose and motivate appropriate methods for involving users in the design process.

User Experience: Examples

UX Example 1

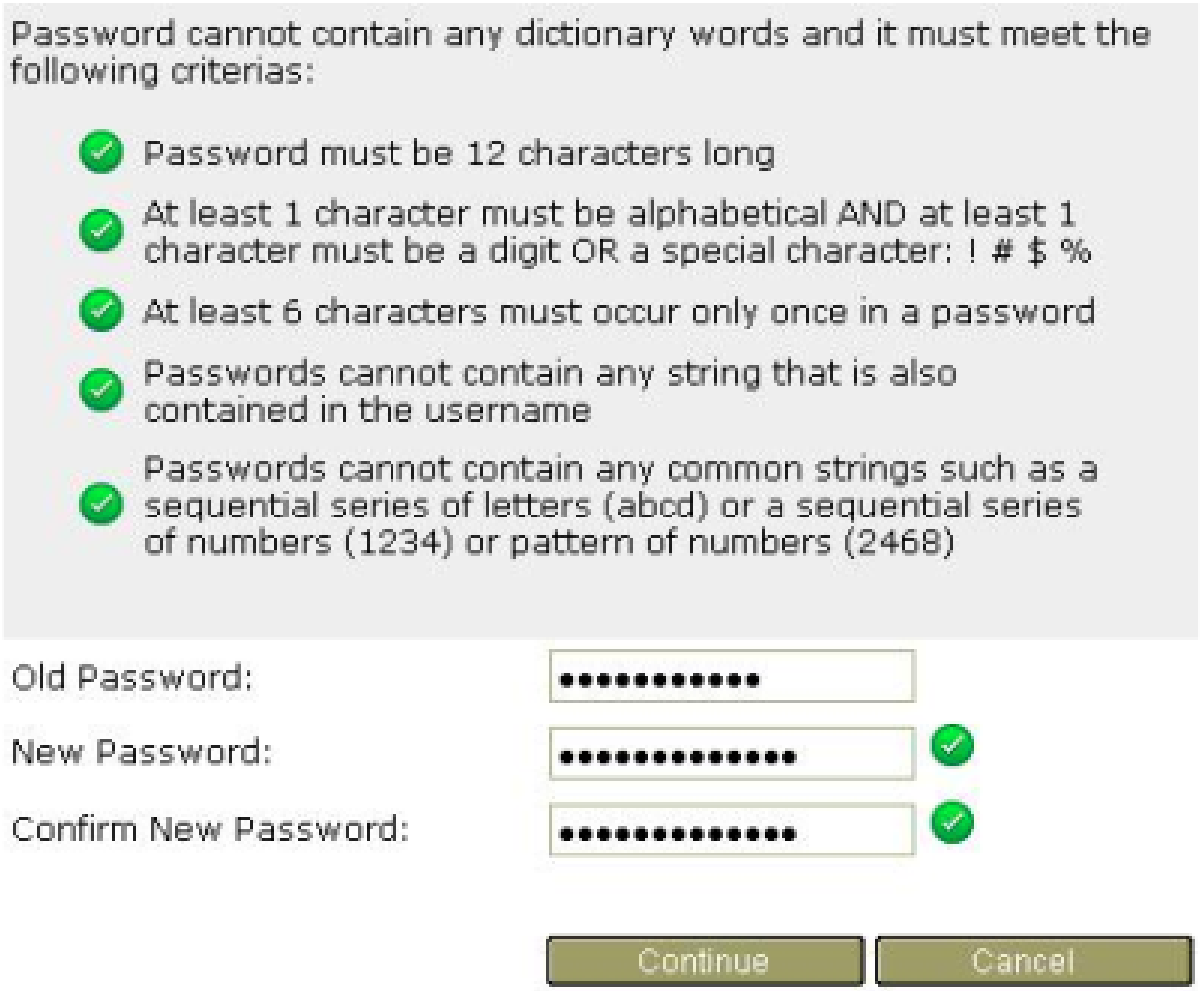
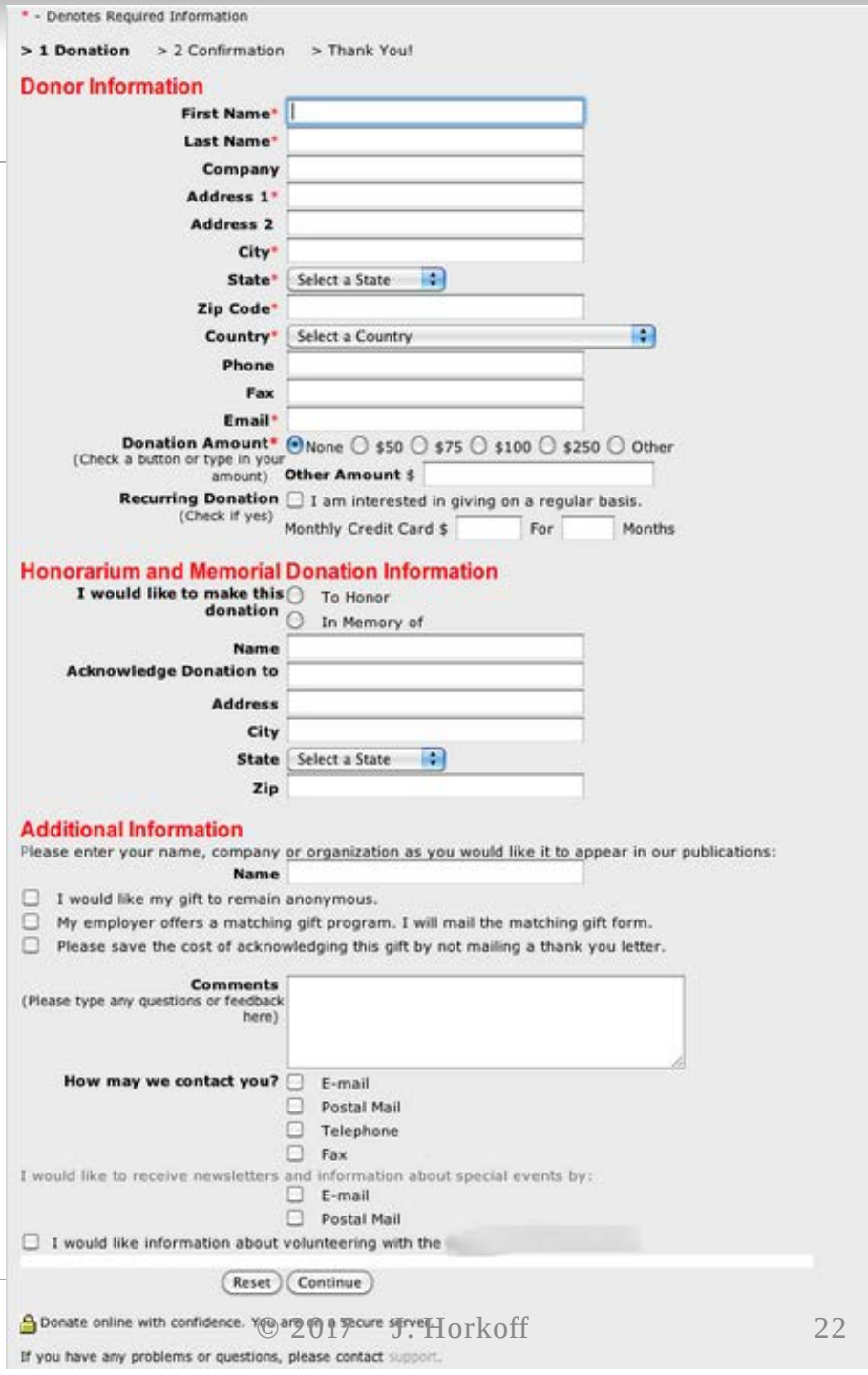


Photo credit: [US Census Bureau]

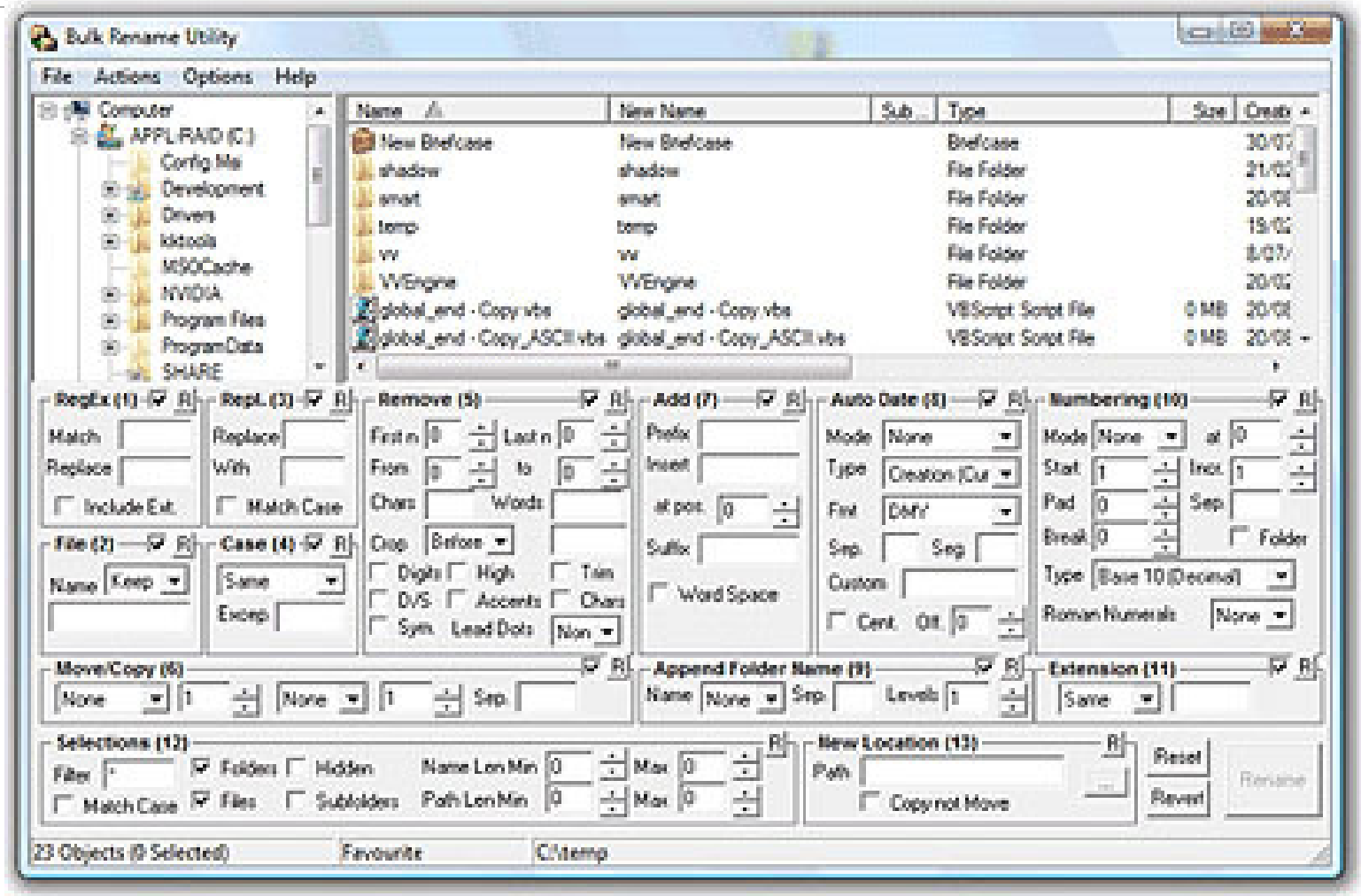
https://thenextweb.com/dd/2015/09/29/6-examples-of-awful-ux-design/

UX Example 2

https://thenextweb.com/dd/2015/09/29/6-examples-of-awful-ux-design/

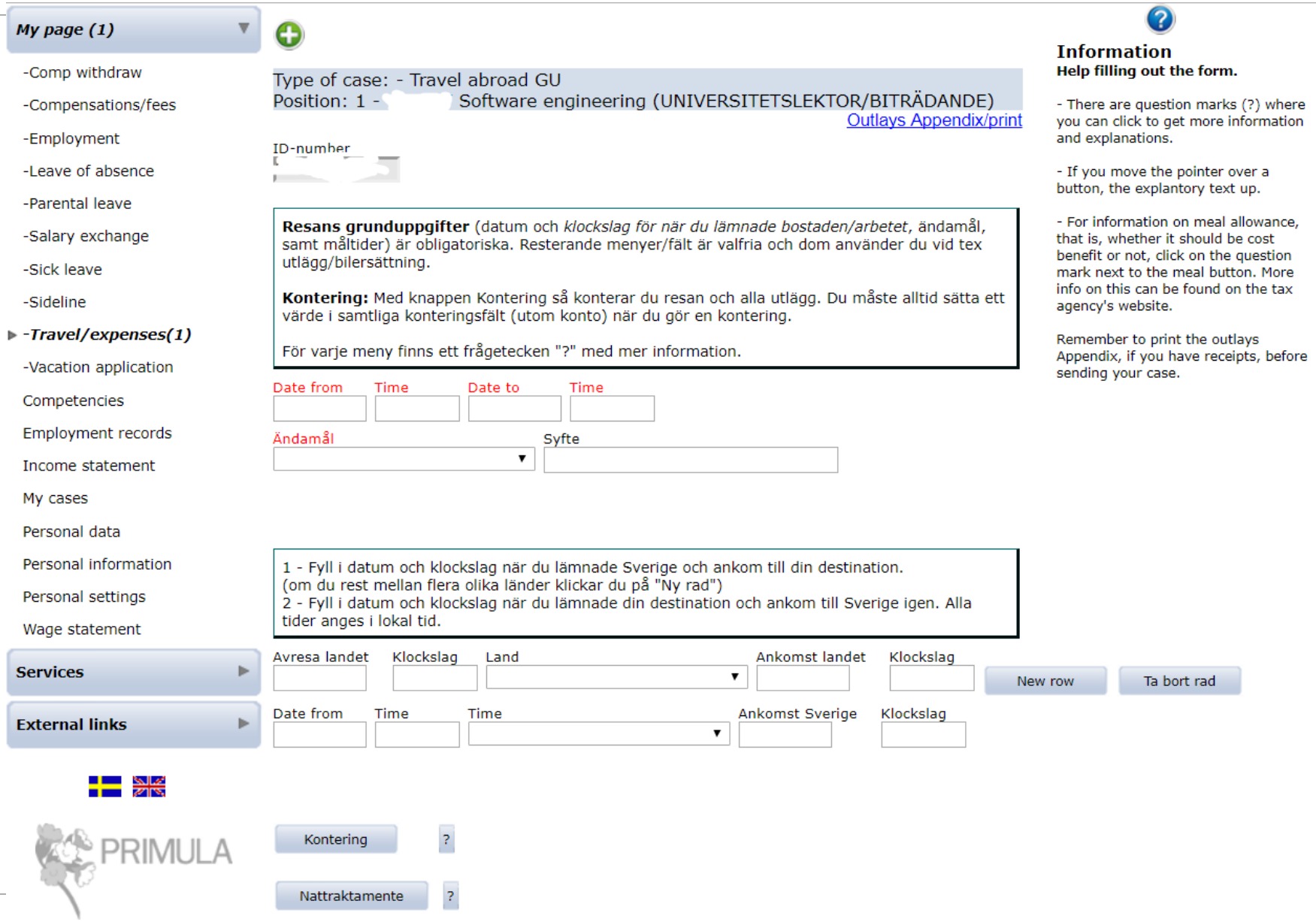


UX Example 3

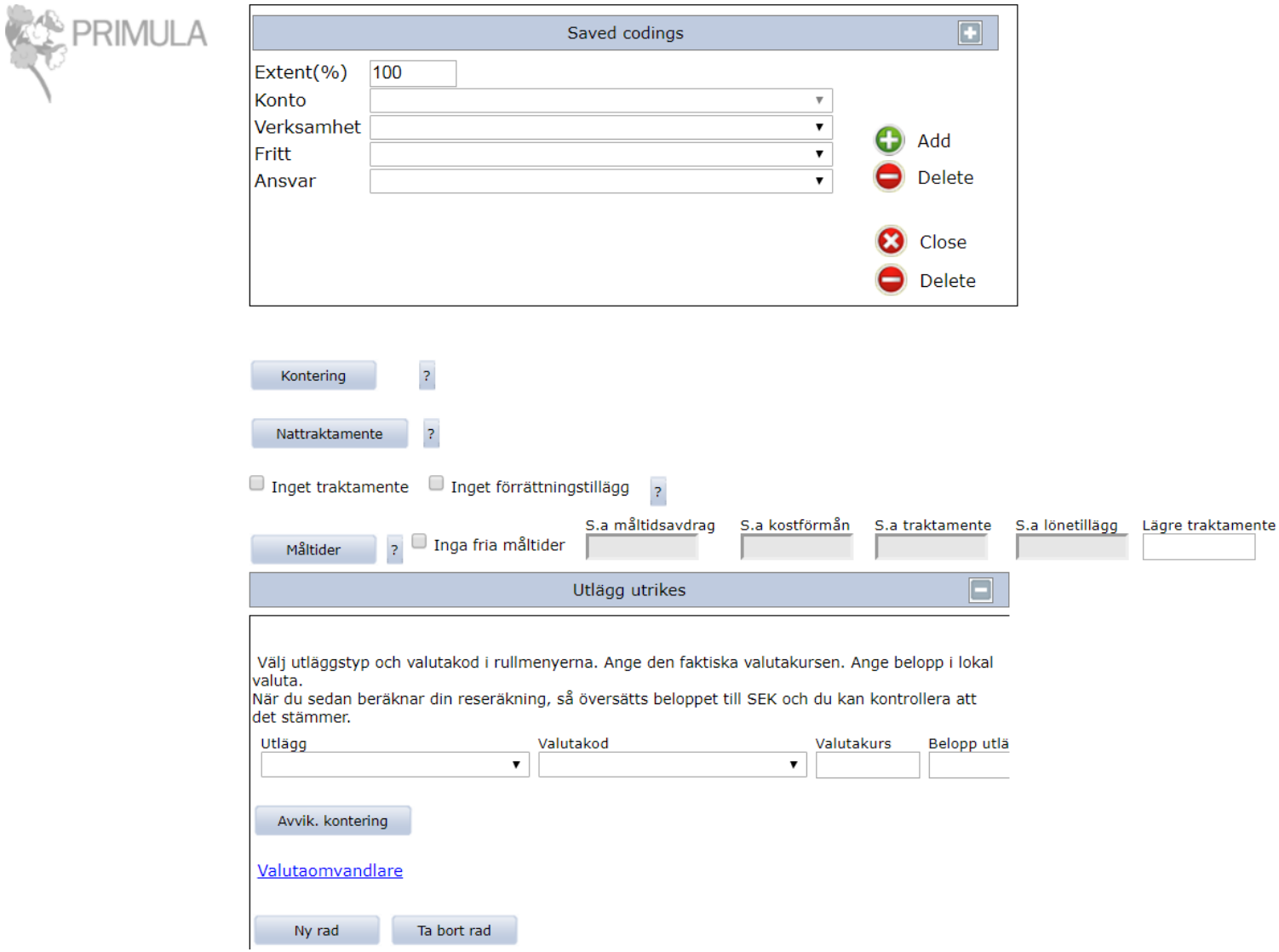


https://digitaljuan.wordpress.com/2012/02/24/the-principles-of-user-interface-designs-and/

UX Example 4 ☹


My page (1)
-Comp withdraw
-Compensations/fees
-Employment
-Leave of absence
-Parental leave
-Salary exchange
-Sick leave
-Sideline
-Travel/expenses(1)
-Vacation application
Competencies
Employment records
Income statement
My cases
Personal data
Personal information
Personal settings
Wage statement
Services
External links
PRIMULA
Type of case: - Travel abroad GU
Position: 1 - Software engineering (UNIVERSITETSLEKTOR/BITRÄDANDE)
Outlays Appendix/print
ID-number
Resans grunduppgifter (datum och klockslag för när du lämnade bostaden/arbetet, ändamål, samt måltider) är obligatoriska. Resterande menyer/fält är valfria och dom använder du vid tex utlägg/bilersättning.
Kontering: Med knappen Kontering så konterar du resan och alla utlägg. Du måste alltid sätta ett värde i samtliga konteringsfält (utom konto) när du gör en kontering.
För varje meny finns ett frågetecken "?" med mer information.
Date from
Time
Date to
Time
Ändamål
Syfte
1 - Fyll i datum och klockslag när du lämnade Sverige och ankom till din destination.
(om du rest mellan flera olika länder klickar du på "Ny rad")
2 - Fyll i datum och klockslag när du lämnade din destination och ankom till Sverige igen. Alla tider anges i lokal tid.
Avresa landet
Klockslag
Land
Ankomst landet
Klockslag
New row
Ta bort rad
Date from
Time
Time
Ankomst Sverige
Klockslag
Kontering
?
Nattraktamente
?
Information
Help filling out the form.
- There are question marks (?) where you can click to get more information and explanations.
- If you move the pointer over a button, the explantory text up.
- For information on meal allowance, that is, whether it should be cost benefit or not, click on the question mark next to the meal button. More info on this can be found on the tax agency's website.
Remember to print the outlays Appendix, if you have receipts, before sending your case.

UX Example 4 (cont.)



UX Example 5

- Your bad day...
  - Wake up to full sunlight, clock says 3:43 am... you have 10 minutes to get to school!
  - Turn on the coffee maker... no coffee ☹
  - Drive to school... car needs gas! Gas station pump takes credit cards, but won't take yours. Must wait in line at the cashier, takes forever!
  - Driving detour due to accident...
  - Late for school! And no coffee..

- What does this have to do with UX? It's just bad luck?

(Garrett)

UX Example 5 (cont.)

- What does this have to do with UX? It's just bad luck?
  - Accident: the driver took his eyes off the road to turn the radio down, it was impossible to identify the volume button from touch alone
  - Register: the line moved slowly because the cash register was complex and confusing. The clerk would make a mistake and have to start all over again
  - Pump: You turned the card the wrong way to swipe it, but nothing on the pump indicated this, and you didn't notice
  - Coffee: you didn't push the power button all the way! No lights to tell you whether or not it has been turned on.
  - Clock: your cat stepped on the clock in the middle of the night and reset the time, a slightly different button configuration would have made the alarm cat proof!

(Garrett)

UX Example 6

Monday, July 31, 2017 14:46:10 (Eastern Time)
If this is not correct, contact us.

Manage CRA security options

Change CRA user ID

Change CRA password

Change CRA security questions and answers

Update additional security feature preference

Revoke CRA user ID

View the Terms and conditions of use

View recent CRA login history

☐ **Do not show me this page again today.**

Selecting "Do not show me this page again today" will hide this page for the rest of the day. This means that the **Manage CRA security options** will only be available to you after midnight Eastern Time.

If you do not select "Do not show me this page again today", this page will be displayed to you each time you login.

Next

CMS.31

Date modified: 2017-02-13

Terms and conditions

More examples?

- Can you think of examples of poor UX design?

What is User Experience?

- "Know they users, for they are not you!"
- Step 1: figure out what users are trying to accomplish
  - E.g., no one wants to fill out a form for the sake of filling a form
- Step 2: design, make familiar by using patterns

(Tidwell)

- User experience: the experience the product creates for the people who use it in the real world
- "UX is not about the inner workings of a product or service. User experience is about how it works on the outside, where a person comes into contact with it. When someone asks what it's like to use a product or service, they're asking about the user experience. Is it hard to do simple things? Is it easy to figure out? How does it feel to interact with the product?"

(Garrett)

Why is UX Important?

- Efficiency, Time
- User satisfaction
- Sales, attracting and keeping customers
- Safety
- Sanity

What does UX include?

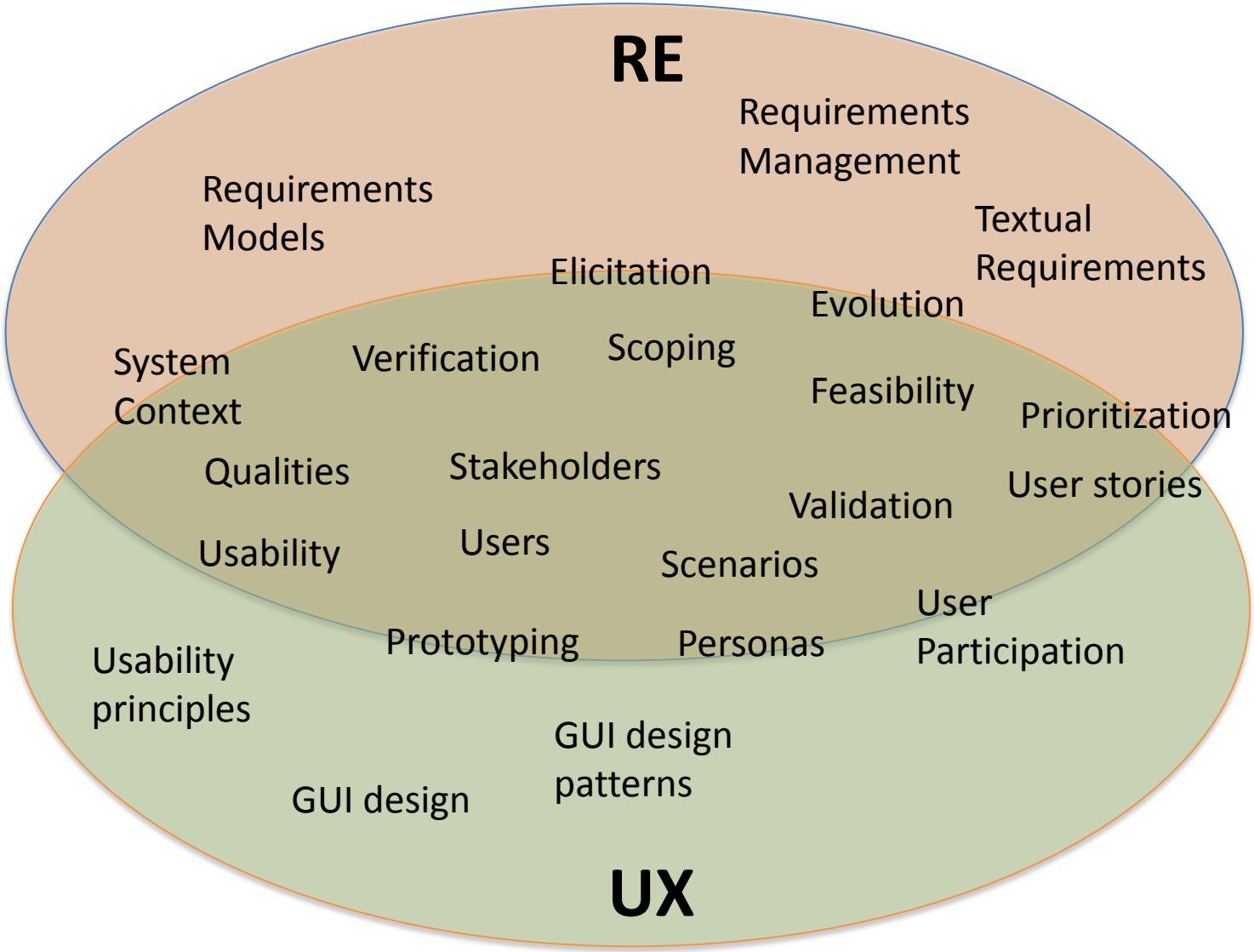
- One view (Tidwell, textbook)
  - User Research
    - Direct observation
    - Case studies
    - Surveys
    - Personas
  - User patterns & design

- Another (Garrett)
  - Product objectives and user needs
  - Functional specifications and content requirements
  - Interaction design and information architecture
  - Navigation
  - Sensory Design

Learning Objectives (UX subset)

- *Knowledge and understanding*
  - explain key techniques to account for usability in software products,
- *Skills and abilities*
  - apply techniques to identify personas, scenarios and user stories,
  - design and implement graphical user interfaces according to usability principles,
- *Judgement and approach*
  - choose an appropriate technique to evaluate the usability of a software product,
  - choose and motivate appropriate methods for involving users in the design process.

How do UX and RE relate?



Summary

- Many example of system failures, in the small and in the large
- Failures can be avoided/mitigated by:
  - Incremental development and/or
  - Attention to requirements engineering

- Many examples of poor UX
- Keep design principles and patterns in mind

- RE and UX have quite a lot of overlap

Questions?

Part 2: Course Practicalites

Outline

- Part 1: Content Introduction
  - Motivating Examples
  - What is RE (Requirements Engineering)?
  - Why is RE important?
  - Overview of topics
  - What is UX (User Experience)?
  - Why is UX important?
  - Overview of topics
- Part 2: Practicalities
  - Schedule
  - Assignments
  - Exams
  - Grading Scheme
  - Group work
  - Literature
  - TAs
  - GUL
  - Communication Policies

Schedule

- Monday: Lecture: 10-11:45 Alfons
- Wednesday: Lecture 10:11:35 Alfons
  - Supervision/Exercise: 1:15 to 3 pm Mållgan

- Course starts: today! October 30th
- Course ends: the room is booked until Jan 13th (!)
  - Last lecture: December 13th (Wed)

- Final assignment due: December 22nd (electronically)

- Optional review lectures: December 20th and/or Jan 6th (if sufficient interest)

Schedule Table Version

Week	Date	Type	Topic
44	Oct. 30th, 2017	Lecture	Introduction to RE and UX, Practicalities
	Nov. 1st, 2017	Lecture	RE: Requirements & Concepts
	Nov.1st, 2017	Supervision	Group Formation
45	Nov. 6th, 2017	Lecture	RE: Documentation & Quality
	Nov. 8th, 2017	Lecture	RE: Agile and RE
	Nov. 8th, 2017	Exercise	RE Exercise
46	Nov. 13th, 2017	Lecture	RE: Requirements Modeling, Use Cases
	Nov.15th, 2017	Lecture	RE: Elicitation & Creativity
	Nov. 15th, 2017	Supervision	Group Supervision for A1
	Nov. 17th, 2017	Assignment	A1: RE Specification & Modeling
47	Nov. 20th, 2017	Lecture	RE: Scenarios, Personas & Prioritization
	Nov. 22nd, 2017	Lecture	UX: Introduction to UX, Concepts & Cognition
	Nov. 22nd, 2017	Exercise	UI Pattern Exercise
48	Nov. 27th, 2017	Lecture	UX: Patterns
	Nov. 29th, 2017	Lecture	UX: Patterns & Prototyping
	Nov. 29th, 2017	Supervision	Group Supervision for A2
	Dec. 1st, 2017	Assignment	A2: RE Specification & UI Design
49	Dec. 4th, 2017	Lecture	UX: Usability Principles
	Dec. 7th, 2017	Lecture	UX: Usability Evaluation & User Studies
	Dec. 7th, 2017	Supervision	UI Evaluation Exercise
50	Dec. 11th, 2017	Lecture	RE & UX: Verification & Validation
	Dec. 13th, 2017	Review	Course Summary
	Dec. 13th, 2017	Supervision	Group Supervision for A3
51	Dec. 18th, 2017	Review	(Optional) Exam Preparation
	Dec. 22nd, 2017	Assignment	A3: UI Design & UX Evaluation
1	Jan. 3rd, 2018	Review	(Optional) Exam Preparation
2	TBD	Exam	Final Exam

Assignments

- "**Assignments** *(Inlämningsuppgifter)*, 3 higher education credits Grading scale: Pass (G) and Fail (U)"

- Three assignments
- The assignment part of the course is worth 3 credits, so 1 credit per assignments.
- You will be given a grade on assignments in %
- Final 3-credit assignment course is pass/fail only ☹
- Will average the grade for all three assignments, each weighted equally.

Exam

- **"Written exam** *(Tentamen)*, 4.5 higher education credits Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)"

- Probably the 2nd week of January
  - Check with the schedule/student office!

Grading Scheme

- For assignments:

% Grade	GU Grading Scale
0-59%	Fail (U)
60-100%	Pass (G)

  - (if you are in Chalmers)

% Grade	Chalmers Grading Scale
0-59%	Fail
60-69%	3
70-79%	4
80-100%	5

- For exams:

% Grade	GU Grading Scale
0-49%	Fail (U)
50-75%	Pass (G)
75-100%	Pass with Distinction (VG)

  - (if you are in Chalmers)

% Grade	Chalmers Grading Scale
0-49%	Fail
50-64%	3
65-79%	4
80-100%	5

Group Work

- Assignments are performed in groups of 2-3.
- Should be the same group throughout the course.
- Can or cannot be related to the group in Bjorn's course.
  - Maybe a good opportunity to work with new people?

- "Students are required to complete written self- and peer-assessment forms during the course which will be part of the assessment of the student's individual contribution to the project."
- For each assignment hand in team-assessment.
- I may ask to meet with you.
- You are graded as individuals (!) so I can change the grade of individuals on an assignment based on reported contribution.

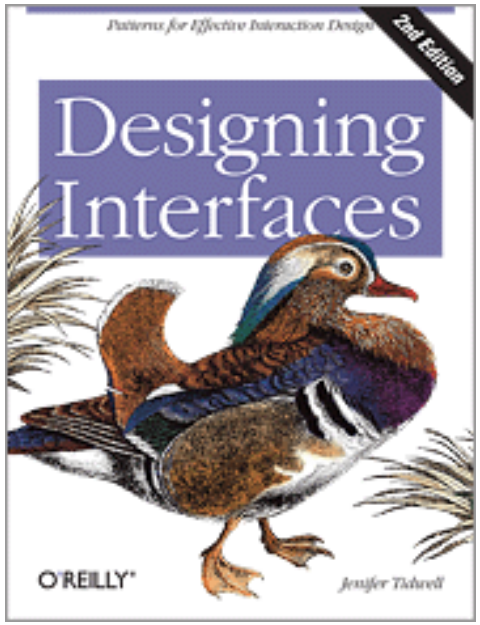
Group Work

- If you want, you can make your own groups
- If you don't have a group, we'll assign you groups on the Wed, supervision session, Nov. 1, 13:15.
- Fill out a form to report to me your groups.
  - Group name: (something short and simple)
  - Group members: name, email
  - Form can be found on GUL
- Do this by the end of Friday, Nov. 3rd, A0 on GUL
  - (This is not for marks, but I can't give you marks for the other assignments unless you are in a group of 2-3)

Literature

- RE: Various papers/handouts – see GUL

- UX:
- Course book: Jenny Tidwell's “Designing Interfaces: Patterns for Effective Interaction Design. 2nd Edition”



TAs

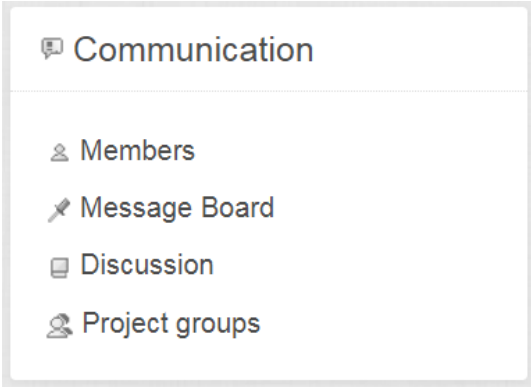
- We have 3, will mostly mark assignments/exams
- Will help with some exercises

- Laiz Heckmann Barballho de Figueroa
- Raphael Puccinella de Oliveira
- Chiara Lucatello

GUL

- We have to use it...

- Use the Discussion and Message board features
- Message Board: I give announcements, e.g., on assignments, lectures, etc.
- Discussion: You ask me questions about the assignment, lectures, exams, I answer so all can read the answer.



Communication Policies

- All emails about the course should be sent to me through GUL
  - In GUL: Members -> Trainers -> click on the speech bullet near my name to send me a PIM.

- Note: if you are asking a general question that concerns the lectures, assignments, exam, etc. please use the discussion forum, so everyone can see the question and response.

- Blackout policy: I make no guarantee to answer questions about assignments in the 24 hours before they are due.
  - E.g., assignment is due Friday at 6 pm. I stop answering questions Thursday at 6 pm.
  - Be prepared!

Course Representatives

- I need volunteers
- This course is new, so it's quite important

- 5 from Chalmers

- 2-3 from GU

Questions?

- (Obligatory Dilbert)

Lecture Sources

- IREB (International Requirements Engineering Board)
  - https://www.ireb.org/en/downloads/
- Requirements Engineering (CSC340) S. Easterbrook, J. Campbell
  - http://www.cs.toronto.edu/~sme/CSC340F/
- Requirements Engineering for Software and Systems, Second Edition, By Phillip A. Laplante Kilicay-Ergin, Nil, and Phillip A. Laplante. "An online graduate requirements engineering course." *IEEE Transactions on Education* 56.2 (2013): 208-216.
- Dick, Jeremy, Elizabeth Hull, and Ken Jackson. *Requirements engineering*. Springer, 2017.
- "What is Requirements Engineering?" the draft chapter 1 and "What are Requirements?" the draft chapter 2 of Fundamentals of Requirements Engineering (FoRE), S. Easterbrook, 2004.
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Lecture Sources

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Lecture Sources

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