INFO2222

Computing 2
Usability & Security

Lecture 2: Users I

Presented by

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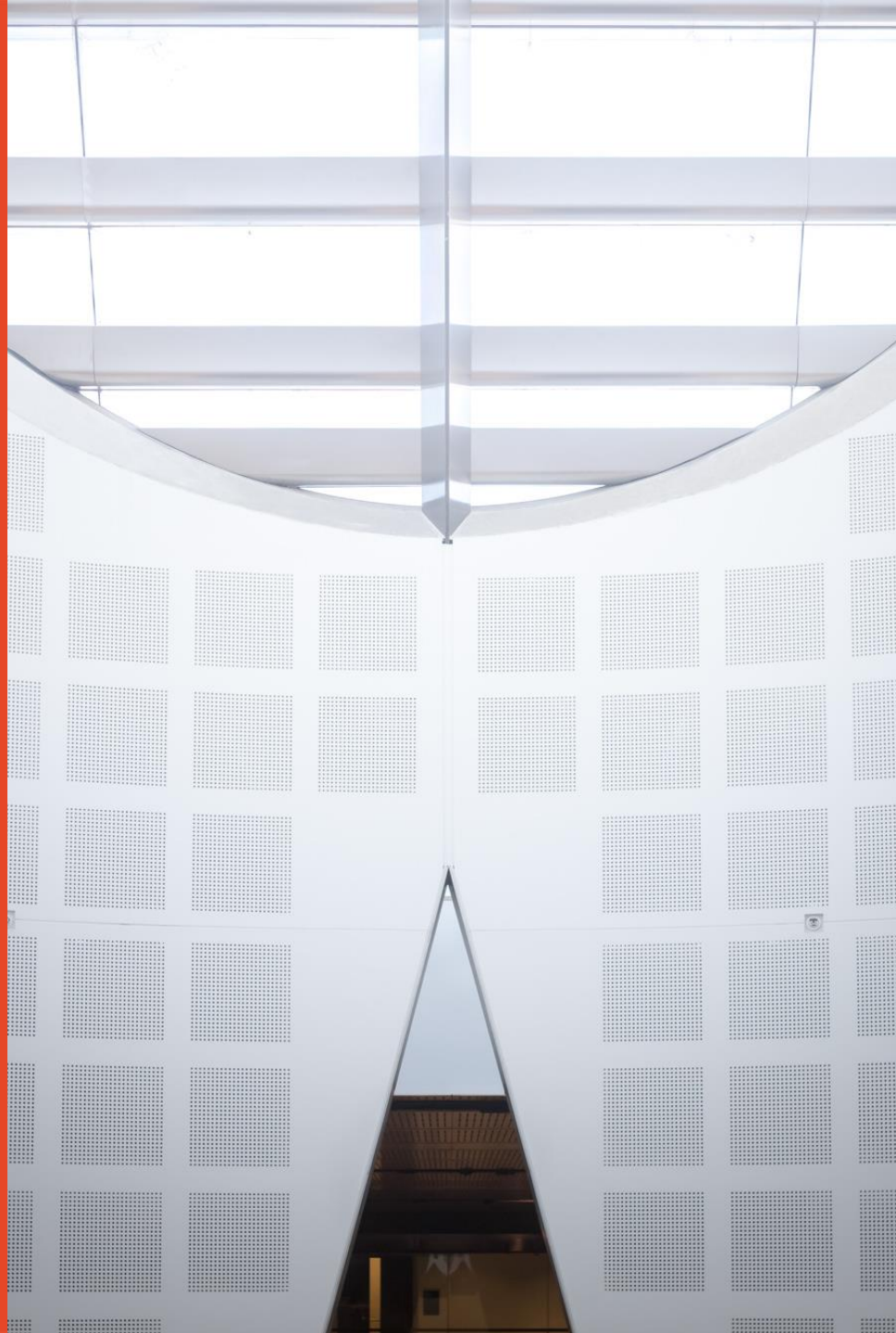


Users I – Feedback

- The system image & the communication model of usability (24 people)
- LMEES
- Therac-25 (we will come back to this briefly, but for the non-usability issues and details please see the report linked)
- Programming and exam content coverage (8 people)
- How do I do 'x' – will hopefully be answered with tutorial skills as the unit progresses

Users I – Feedback

- How does error prevention & recovery help usability?
- Is usability a small part of UX?
- What is an example of good usability?
- What is the purpose of this course?
- Why are we having slides like 6 slides in 1 page?
- How to conform with user's mental model while still being unique (not too similar to other products)
- What is the air speed velocity of an unladen swallow?

Users I – Feedback

- How to build a more usable system regardless of focusing on the user's model?
- Other usability models and theories
  - Nielsen's 10 heuristics
  - PACT
  - FOUUX
  - Hierarchy of User Experience Needs
  - The UX Honeycomb
  - The Elements of User Experience

Users I – Recap (Lecture)

What is "usability"?

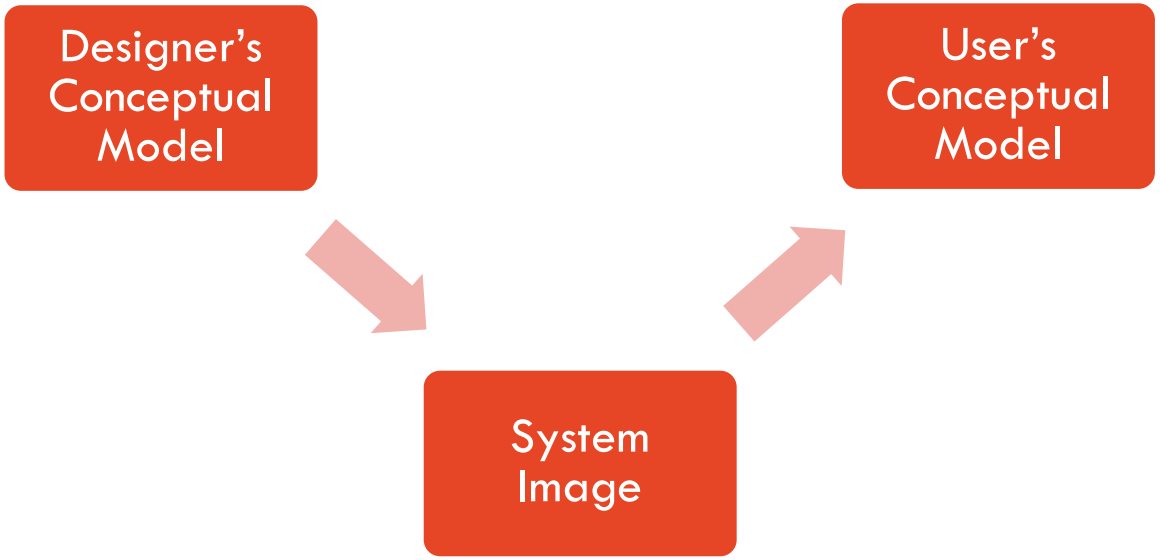
- **Learnability**: On ***first use, how easy*** is it for users to successfully do core tasks?
- **Memorability**: How easy to do this when ***returning from a break?***
- **Efficiency:** Once users have moved beyond the learning stage – how ***quickly*** can they do tasks?
- **Errors:** ***How many*** errors do users make, how easily they ***recover***, and, if not, how ***severe*** are the consequences?
- **Satisfaction:** How ***pleasant*** is it to use the design?

Users I – Recap (Lecture)

- No such thing as perfect usability – perfect for who?
- Usability is a ***relationship*** between a ***system*** and a ***user***
- Need to understand both the user and the system to understand usability
- Need to ***align*** design and evaluation with the user
- Conceptual model: an explanation or understanding of how something works
- Mental model: a conceptual model in the mind
- Misalignment between model and reality = usability problem (there are other types of usability problems too, where other things are misaligned)

Users I – Usability Thinking

– The usability as communication model:



Source: The Design of Everyday Things, Don Norman

Users I – Recap (Tutorial)

- You should have investigated your first users, and applied your understanding to the evaluation of the usability of interfaces
- A lot of this was 'informal', and 'unskilled' application – this is fine.
- The power of understanding users is so great that even if you don't know sophisticated techniques for applying that knowledge you can ***still benefit greatly from it***.
- Of course you will still learn some sophisticated techniques in this unit!

Users I – Learning Outcomes

By the end of today's lecture, you should be able to:

- Describe some major models and frameworks used in usability engineering & design
- Identify the key challenges present in the usability context
- Explain the communication model of the usability relationship
- Explain and apply the think-aloud method of usability evaluation

Users I – Systems Analysis

- Usability is a part of product/system design, implementation, and evaluation (product/system development)
- This means its purpose is to improve the results of these activities
- What are the purposes of product/system development?
  - To fulfil a need
  - To solve a problem
  - To implement a required change
  - To take an opportunity
  - Essentially 'to effect some change in a circumstance'
- Be careful – often people use 'system development' to silently mean 'business information system development'
- We are interested in all sorts of products and systems

Users I – Systems Analysis

- So we will start from the beginning:

"to effect some change in a circumstance"

- To bring it into the terminology used in usability:

"The ***purpose*** of product and system development is to effect a ***transformation*** in a ***situation***"

- Everything we do in the usability (and security) portions of this unit (and for many of you a large part of your degree) come back to this purpose.

Users I – Systems Analysis

- We will now flesh out this rather vague purpose to something concrete we can use
- First, what situation do we want to transform? What is our ***Situation of Concern***?
- What 'reality' do we have some need to change? Remember this change might be to fulfil a need, solve a problem, take an opportunity, etc. For example:
  - Students want to enrol in units
  - Your company wants to expand into online retail
  - The government has made a law which impacts your products (think GDPR)
- Sometimes called the ***problem domain***

Users I – Systems Analysis

- The situation of concern is much more than 1 line however:
  - Your company wants to expand into online retail:
    - What does your company already do?
    - Have you tried expanding before?
    - What barriers exist? Competitors? Resistant employees? Unwilling customers?
    - Perhaps the most important: ***WHY*** does your company want to expand? What is your motivation? What specific results are you looking for?
- The more you know about your situation of concern, the more accurately you can answer the questions that follow, and the more chance you have of arriving at a good system or product.

Users I – Systems Analysis

- Next comes the ***transformation***
- Requires knowing:
  - What is the 'state' that currently exists
  - What is the 'state' you want to finish with
- What is your product or system going to ***do*** to the current state to ***transform*** it into the new state?
- Starts out simply stating what it will do – over time develops into the 'how' it will do it.
- Now you implement the 'how' of the transformation, verify that it solves the problem, and you're done

- At least, that is how it works in the 'hard systems' world…

Users I – Systems Analysis

- Systems (and the problems they solve) can be divided a few different ways
- One of those ways is 'hard' and 'soft'
- ***Hard systems*** have definite, verifiably optimal solutions (even if those solutions haven't been found yet)
- When you are starting out learning programming, you usually deal only with 'hard' systems:
  - Your code either compiles or it doesn't
  - It prints the correct value for a mathematical operation or it doesn't
  - It runs in O(n) time or it doesn't
- It doesn't matter who is running your code, or what you think about your code, right is right and wrong is wrong

Users I – Systems Analysis

- ***Soft systems*** on the other hand still have an optimal solution in theory, but it may not be knowable or verifiable
- One of the most common elements of a soft system is ***people***
- We actually talked about this already: "Can we have 'perfect usability'?" – perfect for who?
- More than that, perfect for who ***when?***
- People are messy, we are not always rational, the way we do things and the choices we make are often unpredictable
- This semi-random behaviour is known as ***stochastic*** behaviour

Users I – Systems Analysis

- In that activity there were only 30 possible answers
- In most soft system situations of concern there are many, many more possibilities – when people are involved these possibilities are effectively infinite
- Does that mean we have no chance of understanding a soft system? From the perspective of hard system analysis… it's hopeless
- Thankfully there is a different way of analysing systems where these stochastic behaviours are involved – ***Soft Systems Methodology***

Users I – Systems Analysis

- ***Soft Systems Methodology*** – a way of analysing complex, contextual, systems with components displaying stochastic behaviours (usually people)
- We do not aim for 'optimal', or 'perfect' solutions
- The goal is to find ***satisficing*** or ***good enough*** solutions
- The verification/measurement/evaluation phase is usually more accurate than the design phase
- Therefore often developed using iteration – you may know this from agile development, and we use it in usability / HCI

Users I – Systems Analysis

- How can we do this if the behaviour is random?
- Stochastic = random? Not quite.
- Example: the speed someone can throw a ball. No matter how much you know about the person and the ball, you could not predict the exact km/h the ball will be thrown.
- But we do know it won't be thrown at 1000km/h
- We can predict a range for a sports player, and know that it is higher than the range for a child
- We can observe these ranges (and how they change if we change something about the person) if we use multiple throws

Users I – Systems Analysis

- Soft systems methodology uses these attributes of stochastic behaviour to measure things that appear random
- It allows us to take our situation of concern and transformation from hard systems methodology and expand them to take into account the extra information we need to 'demystify' the messy components (the people)
- However we will still never achieve exact, optimal solutions (but this is ok)
- The framework SSM uses to gather the extra information is called ***CATWOE***

Users I – Systems Analysis

CATWOE

- **Customer/Client** (the users of the system)
- **Actors** (the people involved in the system operation)
- **Transformation** (the transformation the system effects)
- **Weltanschauung/~~Worldview~~** (the wider picture of the system – what will the transformation actually do? What else will the system impact?)
- **Owner** (who has decided the system is necessary and decided to create it?)
- **Environmental Constraints** (what constraints or benefits exist from outside the system? Limited funding, legislation, ethics, existing systems/competitors, etc.) Or the use of a website for your assignment!

Users I – Systems Analysis

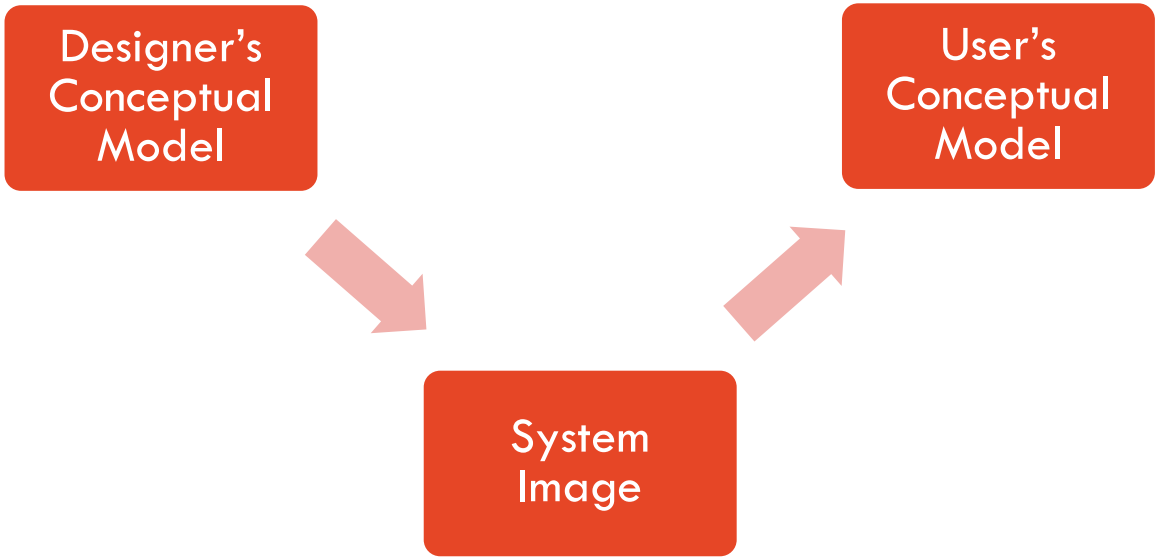
- CATWOE is intended to be applied to 'decomposed' problems. There should only be 1 transformation per separate CATWOE
- The full CATWOE is a little too business-oriented for our learning purposes
- We will combine 'customer/client', 'actors', and 'owner' into a single 'stakeholder' aspect
- We will not focus too heavily on Weltanschauung or Environmental Constraints in practice, but you must always remember they are there

Users I – Systems Analysis

- Our learning model is therefore:
- **Situation of Concern**
  - What is the 'problem domain'
  - What do we want to achieve?
- **Transformation**
  - How are we going to achieve it?
  - If there is more than 1 'it', you need to break your STS down into multiple, more focused STS's.
- **Stakeholders**
  - Who is involved in the processes?
  - How are they likely to interact with the interfaces provided?
  - After measuring, how *have* they interacted, and what does that mean?

Users I – Usability Thinking

– Remember back to last week: the usability relationship as communication:



Source: The Design of Everyday Things, Don Norman

Users I – Usability Thinking

- STS gives us the overview, or the 'list of things to pay attention to'.
- The communication model of the usability relationship gives us one way of understanding how our desired transformation becomes reality
- From one perspective, usability is about 'aligning' the user's mental models with the real way the system works (though aligned does not mean equal!)
- There are 2 things we can do to achieve this
  - Change the user's mental models
  - Change the way the system works

Users I – Usability Thinking

- The arrows on the diagram are not perfect lines of communication
- The designer's conceptual model does not get turned into a system image perfectly
- The user's conceptual model does not get formed from the system image perfectly
- Each step involves a translation, and each translation embeds the context for the designer or the user
- This is the 'soft systems' part of usability

Users I – Usability Thinking

- What is a ***system image***?
- The 'conceptual model' the system presents to the world
- Includes all available information from the system
  - The interface itself
  - The manual
  - Training given
  - Etc.
- Remember all models transfer indirectly, imprecisely, and with added context
- Some users will only engage with part of the overall image, e.g. not reading the manual!

Users I – Usability Thinking

- It is for this reason that the design phase of a project involving usability is ***inherently inaccurate*** – the first design is almost never a good design, let alone the best reasonably achievable design
- Good usability involves design, then evaluation, then redesign, then re-evaluation (more details on this process next week)
- First though we will be going through the primary method of evaluation for this unit – the ***think-aloud***

Users I – Case Study

- A detergent company expanded into Saudi Arabia ~1990
- Used their existing image-only advertising material in a large ad campaign

Pretend example only

- Does anyone know what the issue was?

From Cross-Cultural Marketing: Theory, Practice and Relevance, Burton, D – possibly apocryphal

Users I – Think Aloud

- We will be learning and using the ***think-aloud*** evaluative method
- One of many methods for evaluating the usability of a system
- Should be conducted with goals pre-defined from the analysis phase (CATWOE/STS), more on this process next week
- **By far** the most powerful evaluative tool in the usability expert's arsenal
- Rapid feedback, inexpensive to run, useful even for non-experts
- Primary outcomes are insights into the alignment of your system image, the user's mental models, and the purposes of the system

Users I – Think Aloud

- A ***think-aloud*** study involves a facilitator (e.g. you) observing and recording a participant who is told to complete specific, concrete tasks with your system, during which they speak about their experiences
- What to record:
  - Did the user succeed?
  - Time taken
  - Observations:
    - What the user ***did***?
    - What the user ***said***?
    - What ***errors*** were made?
    - What ***emotions*** did they display at what times/situations?

Users I – Think Aloud

- What the facilitator should do:
- Say nothing, do nothing, DO NOT INTERACT WITH THE USER
- Exceptions:
  - When the user is not speaking – prompt them with non-leading questions:
    - Good: what are you thinking now?
    - Bad: do you think this menu is good?
  - If the user appears distressed
    - The study itself is secondary to the wellbeing of your participants – if they require help, help them
    - While this style of research is not associated with the ethical dilemmas of e.g. medical research, there is still an ethical imperative to not cause harm to your subjects

Users I – Think Aloud

THE GOLDEN RULE

- Confucius: What you do not want done to yourself, do not do unto others.
- Aristotle: We should behave to others as we wish others to behave to us.
- Buddhism: Hurt not others with that which pains thyself.
- Christianity: Do unto others as you would have them do unto you.

Users I – Think Aloud

Who are the participants?

- People who match (or closely match) your target persona
- People you can convince (commercially this usually involves payment, early access, etc.) to test your system or product
- How do you choose them?
  - Many sampling methods from statistics, social science, etc.
  - We will use 'convenience sampling', by far the easiest method, but most prone to errors
  - In its simplest form: go out and find the 5 people *who match your persona* who would be the easiest for you to find and convince to participate

Users I – Think Aloud

Pros of the think-aloud method:

(according to Nielsen & Norman)

- ***Cheap***: no special equipment or software, small number of users
- ***Robust***: small mistakes do not invalidate the study
- ***Flexible***: can be used at any point in the development cycle
- ***Convincing***: provides hard to reject evidence of issues
- ***Easy to learn***: a facilitator can get up and running in days (you are going to need to!)

Users I – Think Aloud

Pros of the think-aloud method:

(additional from this unit)

- ***Effective***: shows the direct links between learnability and errors for the user
- ***Qualitative***: different to many larger study methods because instead of simply showing e.g. "27% of users can't do xyz", it shows "this user can't do xyz ***because*** …"
- ***Synchronous***: Similar to above, "this user can't do xyz because … ***on screen*** abc"
- Embeds the ***emotional response***: by observing displayed emotions you can simultaneously observe user satisfaction: joys, frustrations

Users I – Think Aloud

Cons of the think-aloud method:

(according to Nielsen and Norman)

- ***Unnatural situation***: most users don't talk to themselves when using interfaces
- ***Filtered***: users will not be 100% open and honest (we will cover biases in more detail in Module 4)
- ***Facilitator presence***: The observer effect most definitely applies here
- ***Cannot capture 100% of issues***: should be used along with other methods

Users I – Think Aloud

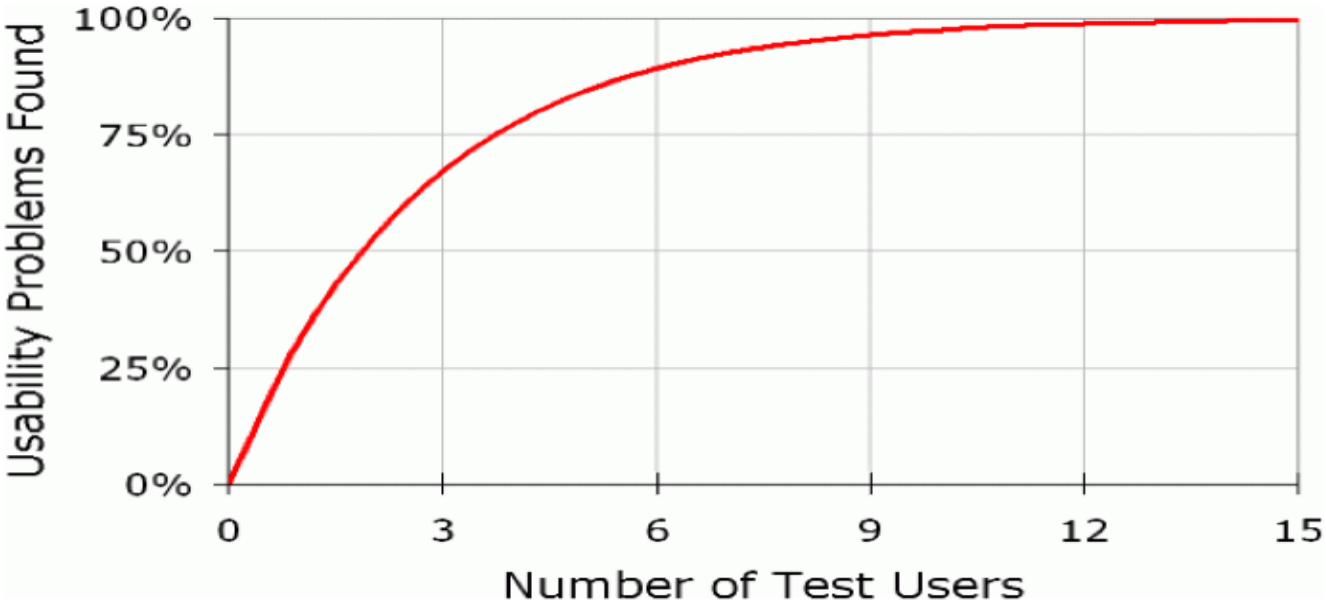
Cons of the think-aloud method:

(additional from this unit)

- The best studies require ***co-location***: while remote studies can provide value, direct observation is necessary for the full benefit
- Require ***fresh users*** after changes: the old users will be affected by the memorability of the old version (take note of this for your assignment!)

Users I – Think Aloud

- How many people should you observe?
- **Why You Only Need to Test with 5 Users,** Jakob Nielsen, 19/03/2000 http://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/



Users I – Think Aloud

A few caveats:

- '100%' in that graph means '100% of the usability issues this method of testing could discover'
- You are only detecting the issues with a single persona – if you are targeting multiple personas you should be testing with 5 participants ***per persona***
- We will see more detailed reasons to choose 5 instead of e.g. 15 next week

Users I – Learning Outcome Reflection

You should be able to:

- Describe the major models and frameworks used in usability engineering & design
- Identify the challenges present in the usability context
- Describe the communication model of the usability relationship
- Explain the think-aloud method of usability evaluation

Users I – Mini Assignment

- You have an assessment item due (when is it due? Assessment Information on Canvas!)
- You should treat these mini assignments as 'tutorial prep' – they are not designed to be difficult (though they will take time), they are designed to allow you to participate in the tutorials
- Most of the tasks you need to complete for the major assignments will be given a 'test run' in the minis.
- You will usually need to bring a printed version of the assignment to the tutorials for others to read and respond to.