UNIVERSITY OF TORONTO SCARBOROUGH

Lecture 3: User Centered Design (UCD), Establishing Requirements (Surveys, Interviews, Observation)

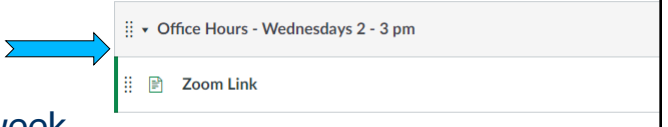
Naureen Nizam
CSCC10H3: Human-Computer Interaction
Department of Computer and Mathematical Science

May 25, 2022

UTSC tomorrow is created here
UNIVERSITY OF TORONTO SCARBOROUGH
1265 Military Trail, Toronto, Ontario M1C 1A4

Administrivia

- Project Phase I
  - Due: **May 31, 2022**
- Assignment 1 - Posted
  - Due: **June 10, 2022**
- Office Hours



- Tutorial this week
  - Project Elevator Pitch
  - Case Study
- Provide your Google email address: **Balsamiq Wireframes for Google Drive Access Request**

Administrivia

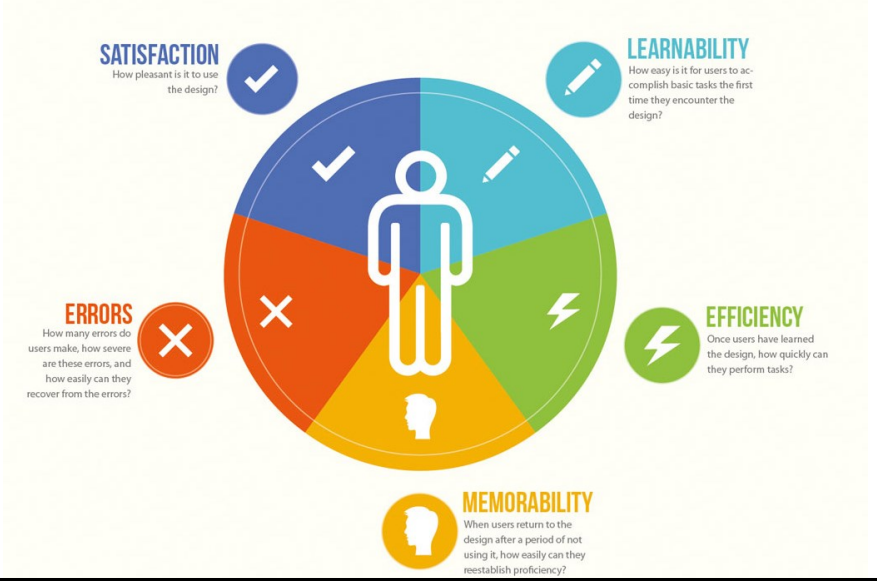
Tentative Course Outline:

Week	Date	Topic	Readings	Assignments/ Projects	Tutorial Topics
Week 1	May 11	Course Overview, Introduction to HCI and Historical Context	HCI – Ch. 1	-	-
Week 2	May 18	Universal Usability, Usability - Guidelines, Principles and Theories	DTUI – Ch. 1, 2, 3	P1 Posted	TA Introduction, Project Overview Form Groups
Week 3	May 25	User Centered Design: Establishing Requirements (Surveys, Interviews, Observation)	ID – Ch. 2, 8, 11 DTUI – Ch. 4, 12	A1 Posted	Project Pitch & Case Study: Understanding Users
Week 4	Jun 1	Designing & Prototyping	ID – Ch. 12, 13 DTUI – Ch. 4, 5	P1 Due (May 31); P2 Posted	Exercise: Surveys, Interviews, etc.
Week 5	Jun 8	Design Workshop – Part 1	ID – Ch. 9, 10	A1 Due (Jun 10); A2 Posted	Demo & Workshop: Prototyping Tools
Week 6	Jun 15	Design Workshop – Part 2 & Evaluating: Heuristic, Usability Testing & Ethics	ID – Ch. 14, 15, 16 DTUI – Ch. 5	P2 Due (Jun 14); P3 Posted A3 Posted	Exercise: Usability Testing Case Study
		Reading Week – No Class (Jun 21 – 25)			

Recap

- Introduction to Usability
- Universal Usability
- Guidelines, Principles and Theories

Recap Trivia



The plan for today…

- **Design**
  - Process
  - Framework <- USER CENTERED DESIGN
  - Methods
  - Tools, Practices and Patterns

- **User Requirements Gathering** & Analysis

IxD vs. UI vs. UXD

IxD

Interaction Design

is a process in which technology products and solutions are designed to center on the human behavior, interaction and utilization of a product (visual interface and interaction, rather than the underlying functionality).

UI

User Interface Design

Focuses on anticipating what users might need to do and ensuring that the interface has elements that are easy to access, understand, and use to facilitate those actions. Composes of IxD, Visual Design, and IA.

UXD

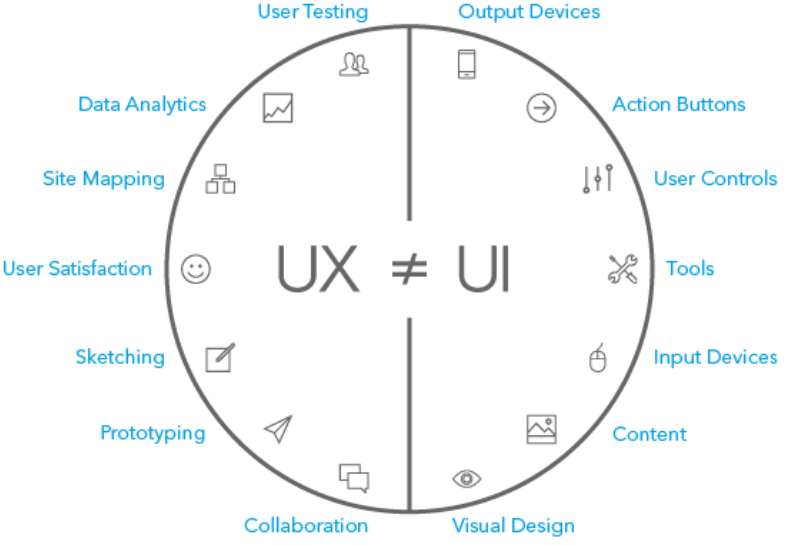
User Experience Design

is the process of enhancing customer satisfaction and loyalty by improving the usability, ease of use, and pleasure provided in the interaction between the customer and the product.

Which one is UI and which one is UX?

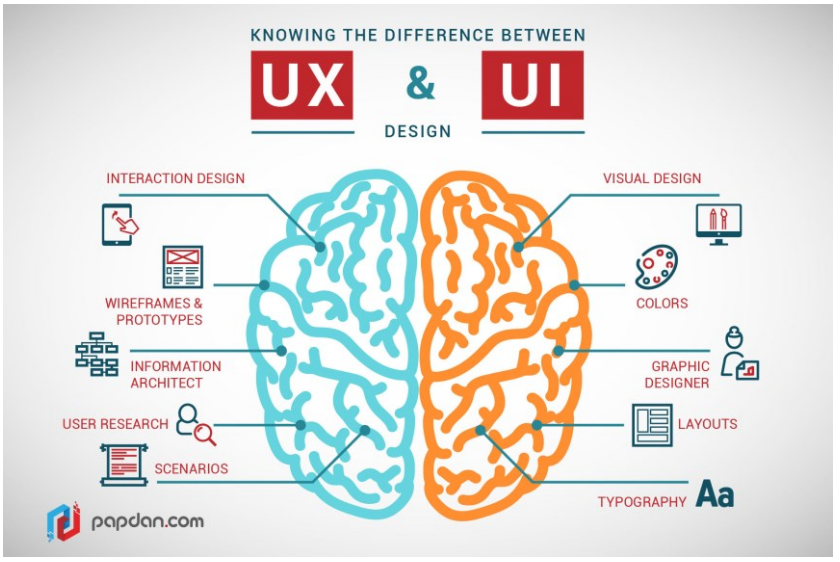
Which one is UI and which one is UX?

UX vs. UI



Source: http://www.ymedialabs.com/ux-vs-ui/

UX vs. UI



Source: http://www.uzu-media.com/blog/2016/5/27/ui-design-vs-ux-design

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Design – an Introduction

- Interactive system designers must blend knowledge of technical feasibility with a esthetic sense of what attracts users.
- Some companies are beginning to employ chief design officers (CDOs), which may help to promote usability and design thinking at every level
- Return on Investment (ROI) business case for focusing on usability has been made powerfully and repeatedly
- *Usability engineering* has evolved into a recognized discipline with maturing practices and a growing set of standards
- The Usability Experience Professionals Association (UXPA) holds annual meetings called the "World Usability Day"

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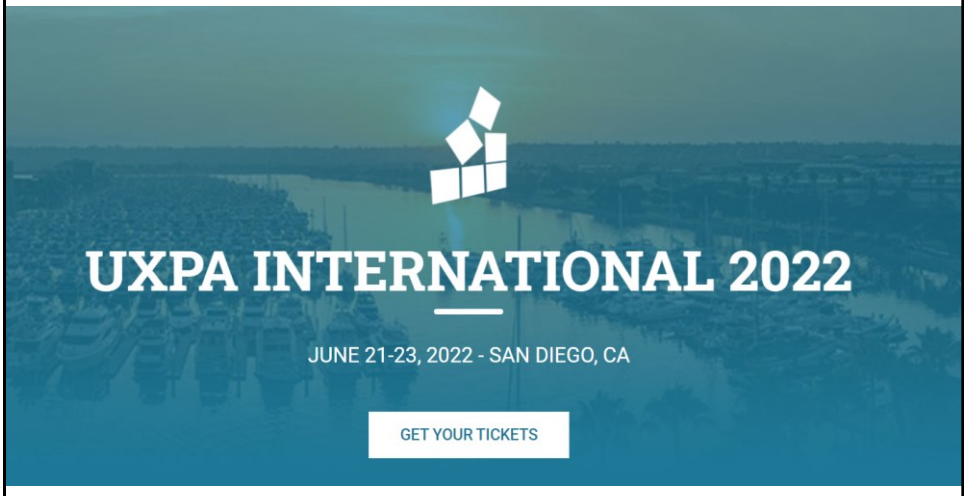
Design – an Introduction

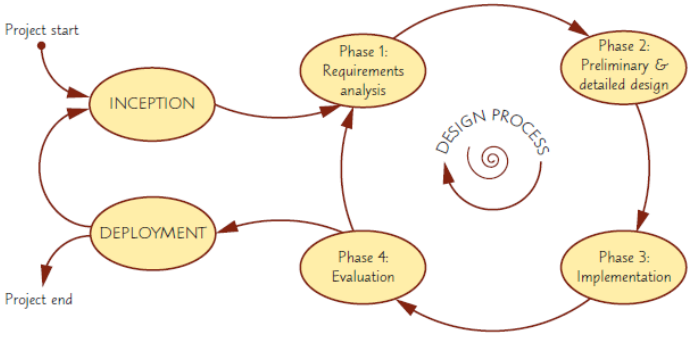


The Design Process

- Rosson and Carroll (scenario-based) design characterization:
  - Design is a *process*, not a state
  - The design process is *nonhierarchical*
  - The process is *radically transformational*
  - Design intrinsically involves the *discovery of new goals*

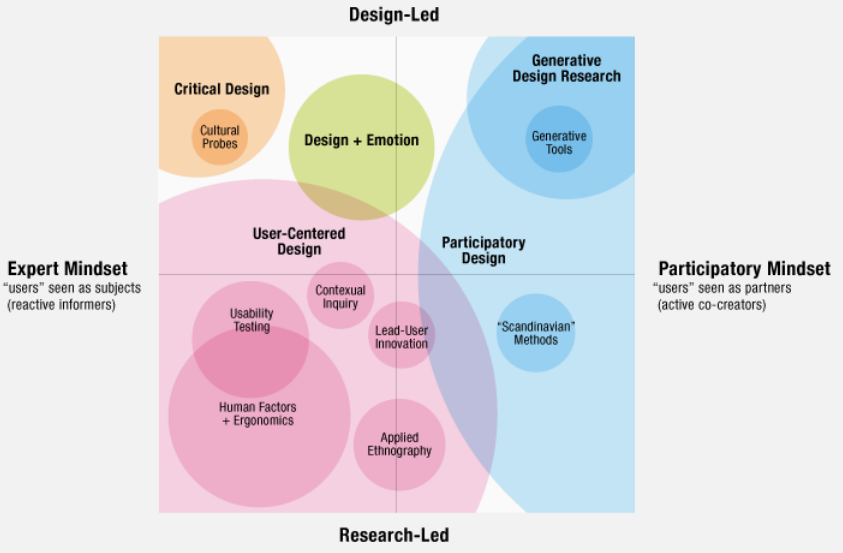
The Design Process (cont'd)

An iterative design **process** would consist of four distinct phases



Design Framework

PD	UCD	AD
Participatory Design	**User Centered Design**	**Agile Interaction Design**
Direct involvement of people in the collaborative design of the things and technologies they use.	*Takes the needs, wants, and limitations of the actual end users into account during each phase of the design process.*	*Development methods for self-organizing, dynamic teams and that facilitate flexible, adaptive, and rapid development that is robust to changing requirements and needs.*



Source: http://www.dubberly.com/articles/an-evolving-map-of-design-practice-and-design-research.html

Participatory Design

- Intergenerational and interdisciplinary design team from the University of Maryland's KidsTeam working on new human-computer interaction technologies using paper prototypes

Agile Interaction Design

- Professor Jon Froehlich and his students working in the HCIL Hackerspace at University of Maryland, College Park

User Centered Design

- A design process that takes the needs, wants and limitations of the actual end users into account during each phase of the design process (*Lowdermilk, 2013*).

- **3 Principles (Gould and Lewis, 1985):**
  - **Early focus on users and tasks:** directly studying cognitive, behavioral, anthropomorphic & attitudinal characteristics
  - **Empirical measurement:** users' reactions and performance to scenarios, manuals, simulations & prototypes are observed, recorded and analysed
  - **Iterative design:** when problems are found in user testing, fix them and carry out more tests

User-Centered Design

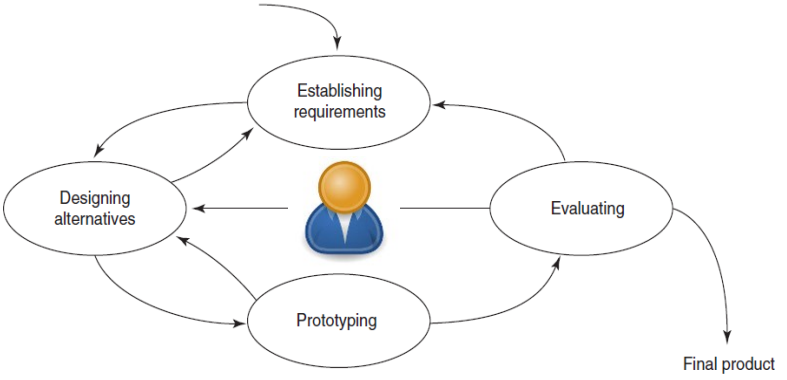


Figure 9.3 A simple interaction design lifecyle model

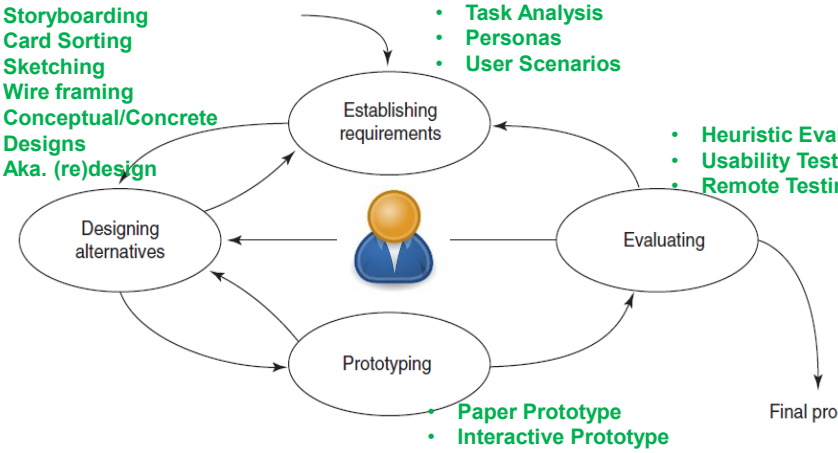
Exemplifies a user-centered design approach

Source: Interaction Design: Beyond Human-Computer Interactoin

User-Centered Design (with components)

- **Analysis (Users, Tasks)**
- **Interviews**
- **Focus Groups**
- **Surveys**
- **Task Analysis**
- **Personas**
- **User Scenarios**

- **Storyboarding**
- **Card Sorting**
- **Sketching**
- **Wire framing**
- **Conceptual/Concrete Designs**
- **Aka. (re)design**



- **Heuristic Evaluation**
- **Usability Testing**
- **Remote Testing**

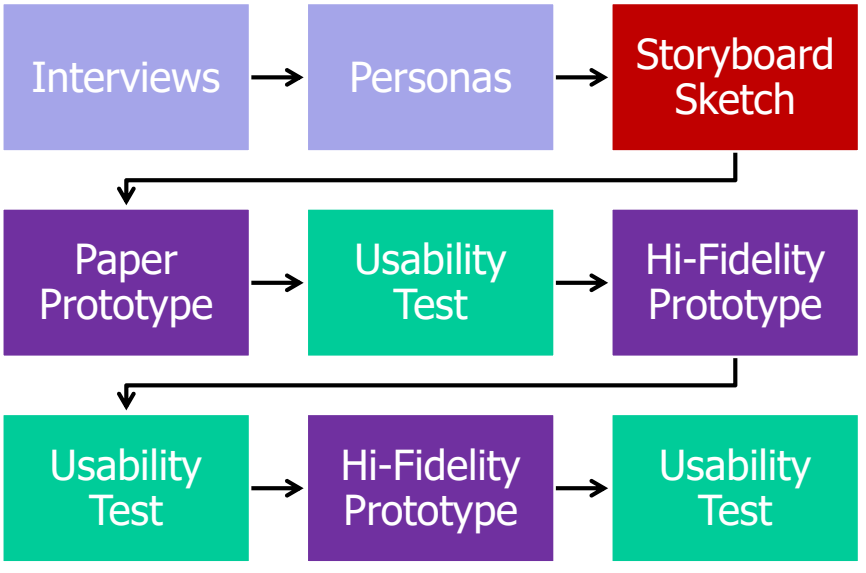
- **Paper Prototype**
- **Interactive Prototype**

Figure 9.3 A simple interaction design lifecyle model

Design Methods

- Practical building blocks that form the actual day-to-day activities in the design process
  - Ideation and creativity
  - Surveys, interviews and focus groups
  - Ethnographic observation
  - Scenario development and storyboarding <- DESIGN (will cover next class)
  - Prototyping <- will cover next class

User-Centered Design – an example



User-Centered Design (with components)

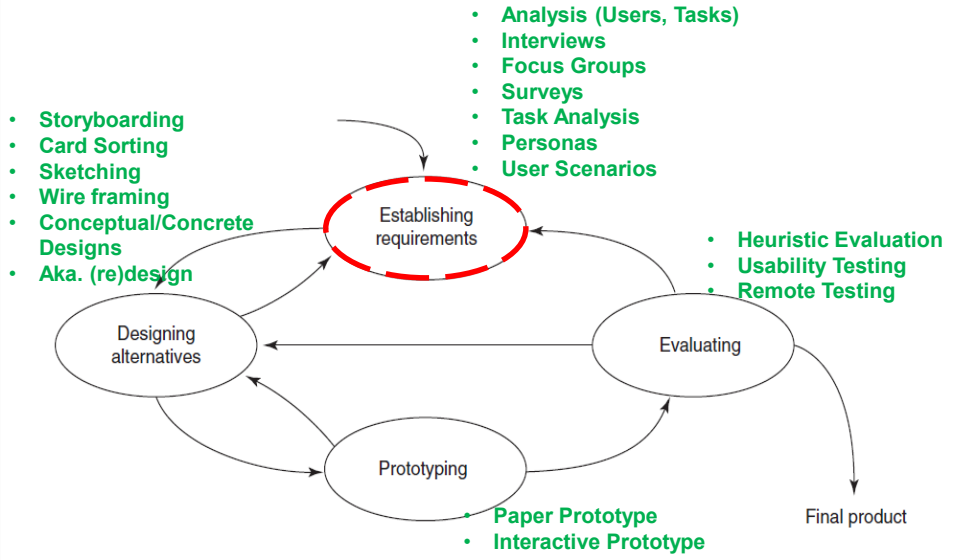


Figure 9.3 A simple interaction design lifecyle model

User Requirement Gathering & Analysis

- The most straightforward way to elicit requirements from users is simply to ask them.
- Requires
  - Establishing Requirements (Ch. 10)
    - Data Gathering (Ch. 7)
    - Data Analysis, Interpretation and Presentation (Ch. 8)
- Up Next…
  - The importance of requirements, different types of requirements, data gathering for requirements, data analysis and presentation, task description: Scenarios, Use Cases, Essential use cases, task analysis: HTA

What, how and why?

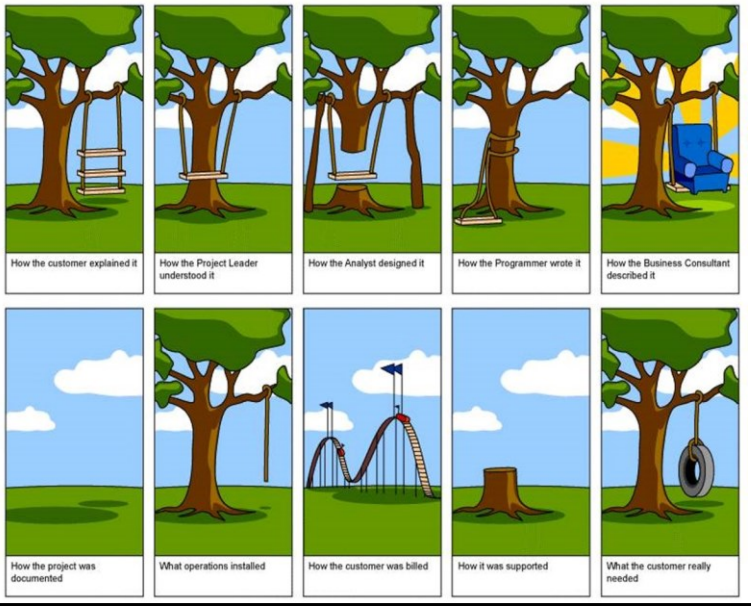
What needs to be achieved?

1. Understand as much as possible about **users**, **task**, **context**
2. Produce a stable set of requirements

How can this be done?

- Data gathering activities
- Data analysis activities
- Expression as ‘requirements’
- All of this is iterative

Why?



Establishing Requirements

- What do users want? What do users 'need'?

  Requirements need clarification, refinement, completion, re-scoping

  Input: Requirements document (maybe)

  Output: stable requirements

- Why 'establish'?

  Requirements arise from understanding users' needs

  Requirements can be justified & related to data

Different kind of requirements

Functional requirements:

- **Website:** The website shall allow users to purchase items and shall provide other, related merchandise based on past visits and purchases.
- **ATM:** The system shall let users enter a PIN code as identification and shall ensure that the code matches the one on file.
- **Mobile app:** The app shall be able to send messages at all times, even when out of the service area (in which case they are saved for later sending).

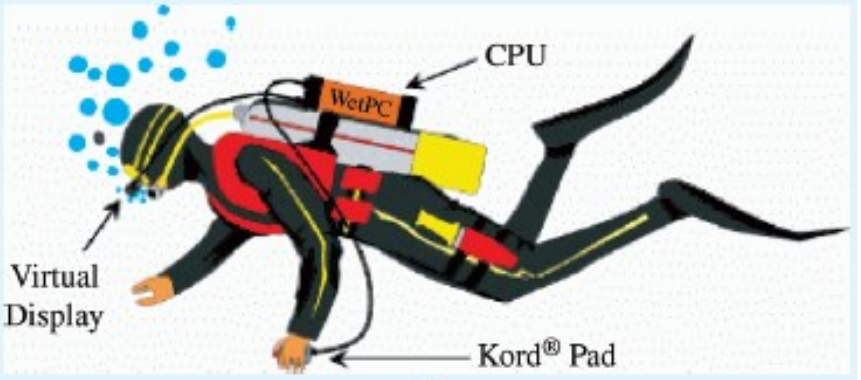
Non-functional requirements:

- **Website:** The website shall give users the ability to access their user account at all times, allowing them to view and modify name, mail address, e-mail address, phone, etc.
- **ATM:** The system shall permit the ATM customer 15 seconds to make a selection. The customer shall be warned that the session will be ended if no selection is made.
- **Mobile app:** Messages should send within 2 seconds, returning the user to the new message window (continuing in the background if necessary).

User experience requirements:

- **Website:** The website shall always have a visible navigation menu in the same position on the screen.
- **ATM:** On-screen prompts and instructions shall be clear and accessible. The ATM should return the user's commands within half a second.
- **Mobile app:** The mobile app shall support customization such as color schemes, skins, and sounds.

Underwater Computing



(a)

Users

Who are they?

— Characteristics: nationality, educational background, attitude to computers

— System use: novice, expert, casual, frequent

— **Novice:** prompted, constrained, clear

— **Expert:** flexibility, access/power

— **Frequent:** short cuts

— **Casual/infrequent:** clear menu paths

Users

What are their capabilities?

Humans vary in many dimensions:

— size of hands may affect the size and positioning of input buttons

— motor abilities may affect the suitability of certain input and output devices

— height if designing a physical kiosk

— strength - a child's toy requires little strength to operate, but greater strength to change batteries

— disabilities (e.g. sight, hearing, dexterity)

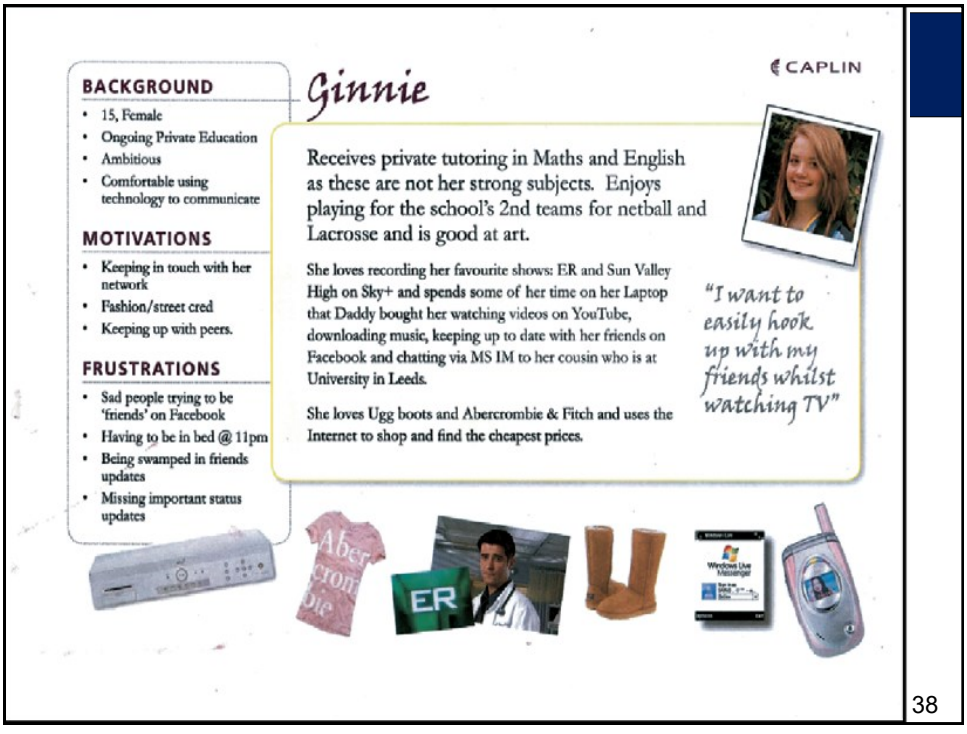
Break (10 min)

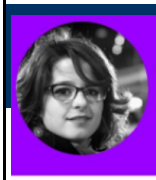
"The best way to predict the future is to invent it."

Alan Kay

Personas

- Capture a set of user characteristics (user profile)
- Not real people, but synthesised from real users
- Should not be idealised
- Bring them to life with a name, characteristics, goals, personal background
- Develop a small set of personas with one primary





Amy the Accountant

Associate Director of Financial Advising | Age 43

Amy has been working at her firm for 6 years, and was recently promoted to a director-level supervisory position. She's a techy, highly educated power user.

Goals & Objectives

- Responsible for accuracy of all reports created by employees in her division
- Needs to see an overview of current billable hours per month completed
- Wants quick reference for relevant tax code info while reviewing reports

Behaviors

- Learns and uses keyboard commands to save time with repetitive work
- Prefers to have her employees send her work for feedback before deadlines
- Keeps key parts of the tax code printed and pinned on her office walls for quick reference

Traits

Task Descriptions

- Scenarios
  - an informal narrative story, simple, 'natural', personal, not generalisable
- Use cases
  - assume interaction with a system
  - assume detailed understanding of the interaction
- Essential use cases
  - abstract away from the details
  - does not have the same assumptions as use cases

Scenario of Travel Organizer

"The Thomson family enjoy outdoor activities and want to try their hand at sailing this year. There are four family members: Sky (10 years old), Eamonn (15 years old), Claire (35), and Will (40). One evening after dinner they decide to start exploring the possibilities. They all gather around the travel organizer and enter their initial set of requirements – a sailing trip for four novices in the Mediterranean. The console is designed so that all members of the family can interact easily and comfortably with it. The system's initial suggestion is a flotilla, where several crews (with various levels of experience) sail together on separate boats. Sky and Eamonn aren't very happy at the idea of going on vacation with a group of other people, even though the Thomsons would have their own boat. The travel organizer shows them descriptions of flotillas from other children their ages and they are all very positive, so eventually, everyone agrees to explore flotilla opportunities. Will confirms this recommendation and asks for detailed options. As it's getting late, he asks for the details to be saved so everyone can consider them tomorrow. The travel organizer emails them a summary of the different options available."

Scenarios & Personas

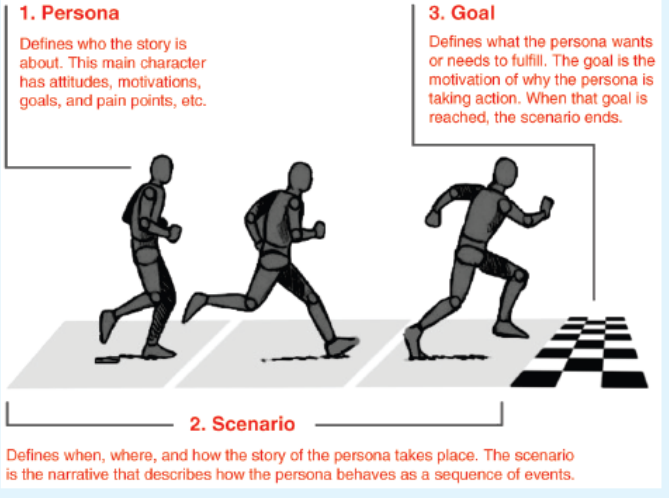


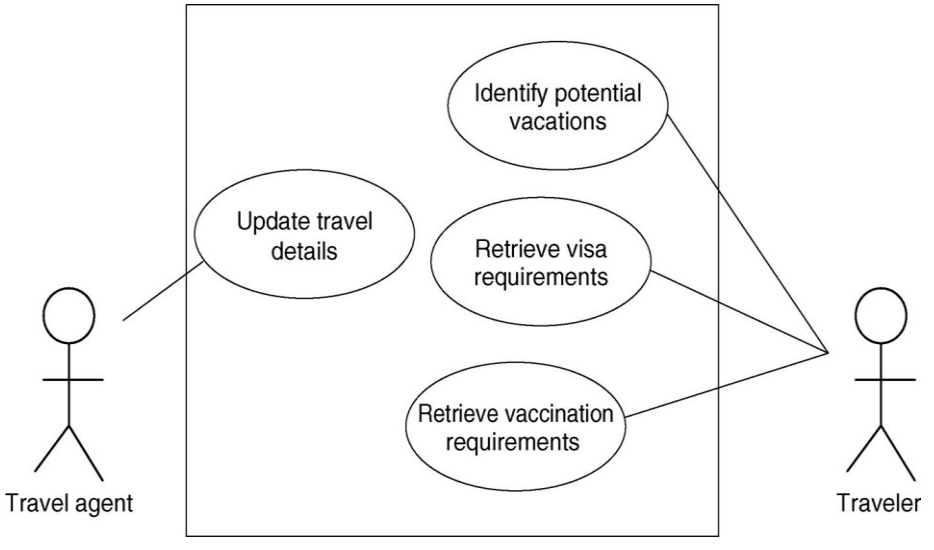
Figure 10.10 The relationship between a scenario and its associated persona

Source: http://www.smashingmagazine.com/2014/08/06/a-closer-look-at-personas-part-1/

Use Case

1. The system displays options for investigating visa and vaccination requirements.
2. The user chooses the option to find out about visa requirements.
3. The system prompts user for the name of the destination country.
4. The user enters the country's name.
5. The system checks that the country is valid.
6. The system prompts the user for her nationality.
7. The user enters her nationality.
8. The system checks the visa requirements of the entered country for a passport holder of her nationality.
9. The system displays the visa requirements.
10. The system displays the option to print out the visa requirements.
11. The user chooses to print the requirements.

Use Case Diagram



Task Description & Analysis

- **Task descriptions** are often used to envision new systems or devices
- **Task analysis** is used mainly to investigate an existing situation
- It is important not to focus on superficial activities
  - What are people trying to achieve?
  - Why are they trying to achieve it?
  - How are they going about it?
- Many techniques, the most popular is Hierarchical Task Analysis (HTA)

Task Analysis – HTA an example

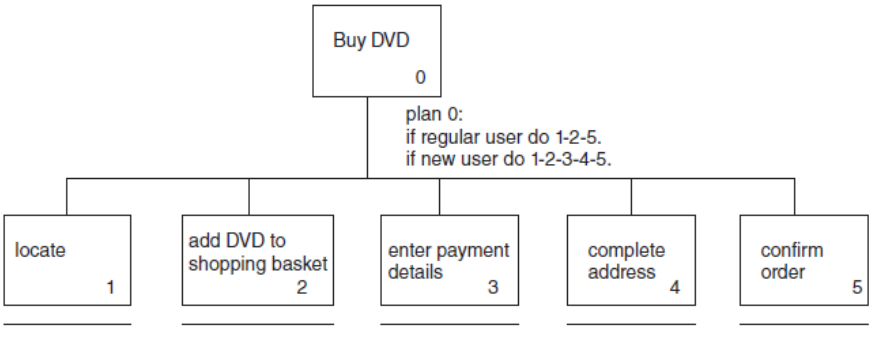
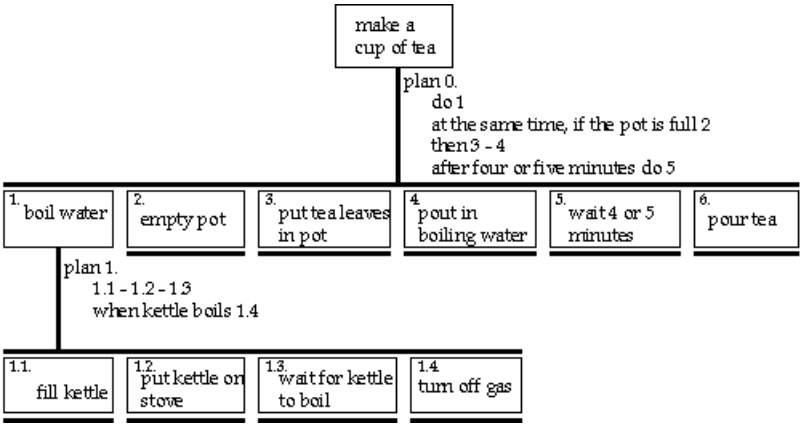
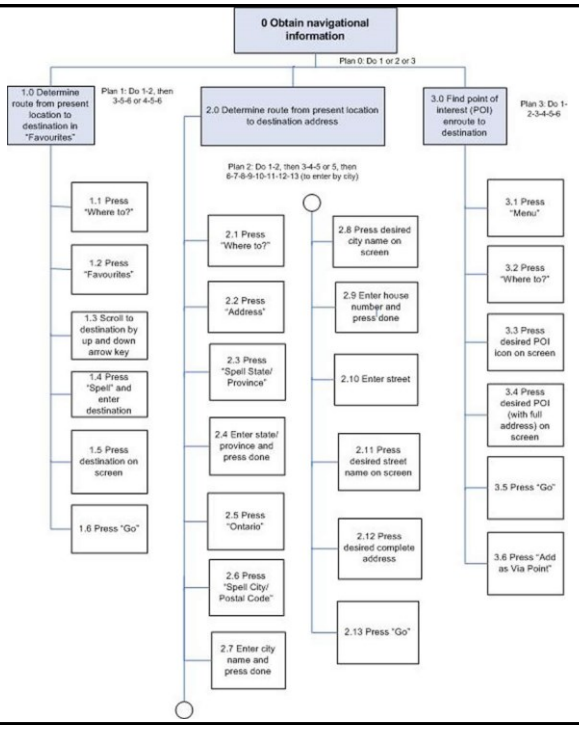


Figure 10.15 A graphical representation of the task analysis for buying a DVD

Task Analysis – HTA an example





Trivia

Peter

Works as product manager for a mid-sized company.

Is 35 years old, holds a marketing degree.

Has got experience working as a product owner on software products with agile teams.

Has had some Scrum training.

Has managed mature products successfully. Now faces the challenge of creating a brand-new product.

Wants to leverage his agile knowledge but needs advice on creating innovative product using agile techniques.

Trivia

Betty is 37 years old, She has been Warehouse Manager for five years and worked for Simpkins Brothers Engineering for twelve years. She didn't go to university, but has studied in her evenings for a business diploma. She has two children aged 15 and 7 and does not like to work late. She did part of an introductory in-house computer course some years ago, but it was interrupted when she was promoted and could no longer afford to take the time. Her vision is perfect, but her right-hand movement is slightly restricted following an industrial accident 3 years ago. She is enthusiastic about her work and is happy to delegate responsibility and take suggestions from her staff. However, she does feel threatened by the introduction of yet another new computer system (the third in her time at SBE).

Trivia

Say I want to find a movie directed by Martin Scorsese. I don't remember the title but I know it came out in the cinemas around 2006 or 2007. I go to the club website and choose the director option. A huge list of directors is displayed – I had no idea there were so many directors with surnames beginning with S! After scrolling through the list I find Martin Scorsese and choose to see further details about him. Another long list of movies eventually leads me to the movie I was looking for – The Departed. As an existing club member, I need to enter my username and password to be able to rent the movie. Once my password has been confirmed, I am given a choice of rental period and payment method. I have my preferences already registered in the system, so I just choose the defaults and download my movie.

MURAL is a digital workspace for visual collaboration, enabling innovative teams to solve important problems.

https://www.mural.co/

Data Gathering

- Interview
- Focus Groups
- Survey/Questionnaires
- Observation
  - Direct
  - Indirect

Five Key Issues

1. Setting goals
   - Decide how to analyze data once collected
2. Identifying participants
   - Decide who to gather data from
3. Relationship with participants
   - Clear and professional
   - Informed consent when appropriate
4. Triangulation
   - Look at data from more than one perspective
   - Collect more than one type of data, eg qualitative from experiments and qualitative from interviews – cross check!
5. Pilot studies
   - Small trial of main study

Data Recording

- Notes, audio, video, photographs can be used individually or in combination:
  - Notes plus photographs
  - Audio plus photographs
  - Video
- Different challenges and advantages with each combination

Interview

- In-person interviews are more labor-intensive than surveys but will yield more accurate and high quality responses.
- Good for exploring issues
- Can also be done in a focus-group setting with multiple users and designers (group interview)
- Structured or Un-structured

Interview (cont'd)

- **Structured** - are tightly scripted, often like a questionnaire. Replicable but may lack richness.
- **Unstructured** - are not directed by a script. Rich but not replicable.
- **Semi-structured** - guided by a script but interesting issues can be explored in more depth. Can provide a good balance between richness and replicability.

Interview Questions

- Two types:
  - **'closed questions'** have a predetermined answer format, e.g.. 'yes' or 'no', likert scale (scale 1 – 5)
  - **'open questions'** do not have a predetermined format
- Closed questions are easier to analyze
- Avoid:
  - Long questions
  - Compound sentences - split them into two
  - Jargon and language that the interviewee may not understand
  - Leading questions that make assumptions e.g.. why do you like …?
  - Unconscious biases e.g.. gender stereotypes

Running the Interview

- *Introduction* – introduce yourself, explain the goals of the interview, reassure about the ethical issues, ask to record, present the informed consent form.
- *Warm-up* – make first questions easy and non-threatening.
- *Main body* – present questions in a logical order
- *A cool-off period* – include a few easy questions to defuse tension at the end
- *Closure* – thank interviewee, signal the end, eg. switch recorder off.

Interview – an example

Semi-Structured Interview

Participants were asked ten questions during the interview session. The audio of interview responses were recorded, transcribed manually in Microsoft Excel and imported in NVivo for coding.

Question 1: Which navigation tools do you use when you navigate websites to find specific information? And why? A total of 35% (12/34) of the participants indicated that they use search to find specific information on websites. They indicated that search is easy to find on websites, helps find relevant information efficiently and is easy to use. Out of these participants, some indicated that they prefer the flexibility of using their own search keywords and retrieving specific information easily. A total of 24% (8/34) of the

Focus Groups

- Group interviews
- Good at gaining a consensus view and/or highlighting areas of conflict
- But can be dominated by individuals

Enriching the Interview/Focus Group

- Props - devices for prompting interviewee, e.g. use a prototype, scenario

Surveys/Questionnaires

- Questions can be closed or open
- Closed questions are easier to analyze, and may be distributed and analyzed by computer
- Can be administered to large populations
- Disseminated by paper, email and the web (online)
- Sampling can be a problem when the size of a population is unknown as is common online evaluation

Surveys/Questionnaires - Design

- The impact of a question can be influenced by question **order**.
- You may need different versions of the questionnaire for different **populations**.
- Provide **clear** instructions on how to complete the questionnaire.
- Strike a balance between using white space and keeping the questionnaire compact.
- Avoid very long questionnaires
- Decide on whether phrases will all be positive, all negative or mixed.

Surveys/Questionnaires - Format

- Yes' and 'No' checkboxes
- Checkboxes that offer many options
- Rating scales
  - Likert scales
  - semantic scales
  - 3, 5, 7 or more points
- Open-ended responses

Surveys/Questionnaires –Good Response Rate

- Make sure purpose of study is clear and the time it will take to complete is mentioned
- Promise anonymity
- Ensure questionnaire is well designed
- Offer a short version for those who do not have time to complete a long questionnaire
- Follow-up with emails, reminders
- Provide an incentive
- 40% response rate is good, 20% is often acceptable

Surveys/Questionnaires – Online Ques.

- Advantages:
  - Relatively easy and quick to distribute
  - Responses are usually received quickly
  - Data can be collected in database for analysis
  - Time required for data analysis is reduced
  - Errors can be corrected easily
- Disadvantages:
  - Sampling is problematic if population size is unknown
  - Preventing individuals from responding more than once can be a problem

Observation

- Direct observation in the field
  - Structuring frameworks
  - Degree of participation (insider or outsider)
  - Ethnography
- Direct observation in controlled environments
- Indirect observation: tracking users' activities
  - Diaries
  - Interaction logging
  - Video and photographs collected remotely by drones or other equipment

Observation

Studying documentation:

— Procedures and rules are often written down in manuals

— Good source of data about the steps involved in an activity, and any regulations governing a task

— Not to be used in isolation

— Good for understanding legislation, and getting background information

— No stakeholder time, which is a limiting factor on the other techniques

Framework to Guide Observation

- Three easy-to-remember parts:
  - The person: Who?
  - The place: Where?
  - The thing: What?
- A more detailed framework (Robson, 2014):
  - Space: What is the physical space like and how is it laid out?
  - Actors: What are the names and relevant details of the people involved?
  - Activities: What are the actors doing and why?
  - Objects: What physical objects are present, such as furniture
  - Acts: What are specific individual actions?
  - Events: Is what you observe part of a special event?
  - Time: What is the sequence of events?
  - Goals: What are the actors trying to accomplish?
  - Feelings: What is the mood of the group and of individuals?

Ethnography Observation

- Ethnography is a philosophy with a set of techniques that include participant observation and interviews
- Debate about differences between participant observation and ethnography
- Ethnographers immerse themselves in the culture that they study
- A researcher's degree of participation can vary along a scale from 'outside' to 'inside'
- Analyzing video and data logs can be time-consuming
- Collections of comments, incidents, and artifacts are made

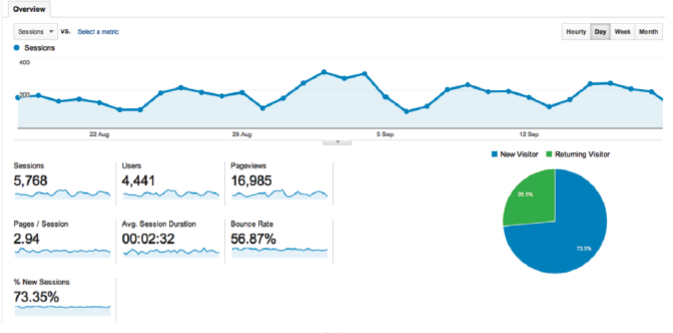
Observation in a Controlled Env.

- Direct observation
  - Think aloud techniques
- Indirect observation – tracking users' activities
  - Diaries
  - Interaction logs
  - Web analytics
- Video, audio, photos, notes are used to capture data in both types of observations

Web Analytics

- A system of tools and techniques for optimizing web usage by:
  - Measuring,
  - Collecting,
  - Analyzing, and
  - Reporting web data
- Typically focus on the number of web visitors and page views

Web Analytics



(a)

Figure 7.14 Segments of the Google Analytics dashboard for id-book.com in September 2014 (a) audience overview, (b) screen resolution of mobile devices used to view the website

Contextual Inquiry

- An approach to ethnographic study where user is expert, designer is apprentice
- A form of interview, but
  - — at users' workplace (workstation)
  - — 2 to 3 hours long
- Four main principles:
  - — Context: see workplace & what happens
  - — Partnership: user and developer collaborate
  - — Interpretation: observations interpreted by user and developer together
  - — Focus: project focus to understand what to look for

Choosing and Combining Techniques

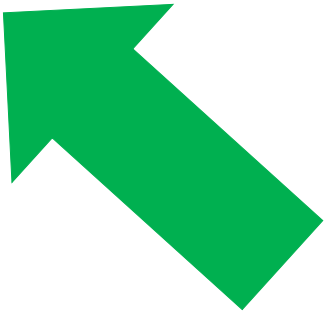
- Depends on the:
  - Focus of the study
  - Participants involved
  - Nature of the technique(s)
  - Resources available
  - Time available

Data Gathering Guidelines

- Focus on identifying the stakeholders' needs
- Involve all the stakeholder groups
- Involve more than one representative from each stakeholder group
- Use a combination of data gathering techniques
- Support the process with props such as prototypes and task descriptions

What we learned & next…

- **User Requirements Gathering (Phase 1)**
  - **Interviews**
  - **Focus Groups**
  - **Surveys/Questionnaires**
  - **Observations**



- **Same techniques used in Evaluation Phase (Lecture 6)**