

# *Introduction to Human-Computer Interaction*

Designing Interactive Systems

Lecture 2 – Understanding Users

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with acknowledgements to:  
Petra Isenberg, Anthony Tang, Nic  
Marquardt, Raimund Dachsel

# *last time you learned*

the user is not like me:

- perceptual capacity
- motor capacity
- cognitive capacity
- domain knowledge

Goal

***CREATE A DEEP UNDERSTANDING OF  
THE USER AND PROBLEM SPACE***

# *task-centered system design*

## Steps:

- Articulate concrete descriptions of real-world people doing their real-world tasks
- Use these descriptions to determine which users and what tasks the system should support
- Prototype an interface to satisfy these requirements
- Evaluate the interface by performing a task-centered walk-through (or another method)

Reading: The Handbook of Task Analysis for Human-Computer Interaction (Chapter 2)

# *phase 1: discovering the tasks that users do*

- strive for realism:
  - discover how real people do real tasks
  - but this is not always possible → other methods exist

# *research methods - ideal*

- observing and/or interviewing the real end users
  - find out what current methods users use for doing their tasks  
(paper, competing systems, antiquated systems, ...)
  - abstract users → real people with real needs

*example:*

*if you are interested in customers who purchase items in a store, observe and talk to store customers as they move about the store*

## *research methods – second best*

- interviewing the end-user representative
  - if you absolutely cannot get hold of end-users
  - carefully select and interview end-user representatives
  - MUST be people with direct contact with end users and intimate knowledge and experience of their needs and what they do
  - people who work with end users are the best

*Example:*

*talk to front-line sales staff about their customers if you cannot observe or talk to customers directly. Better: interview/observe front-line staff as they deal with customers*

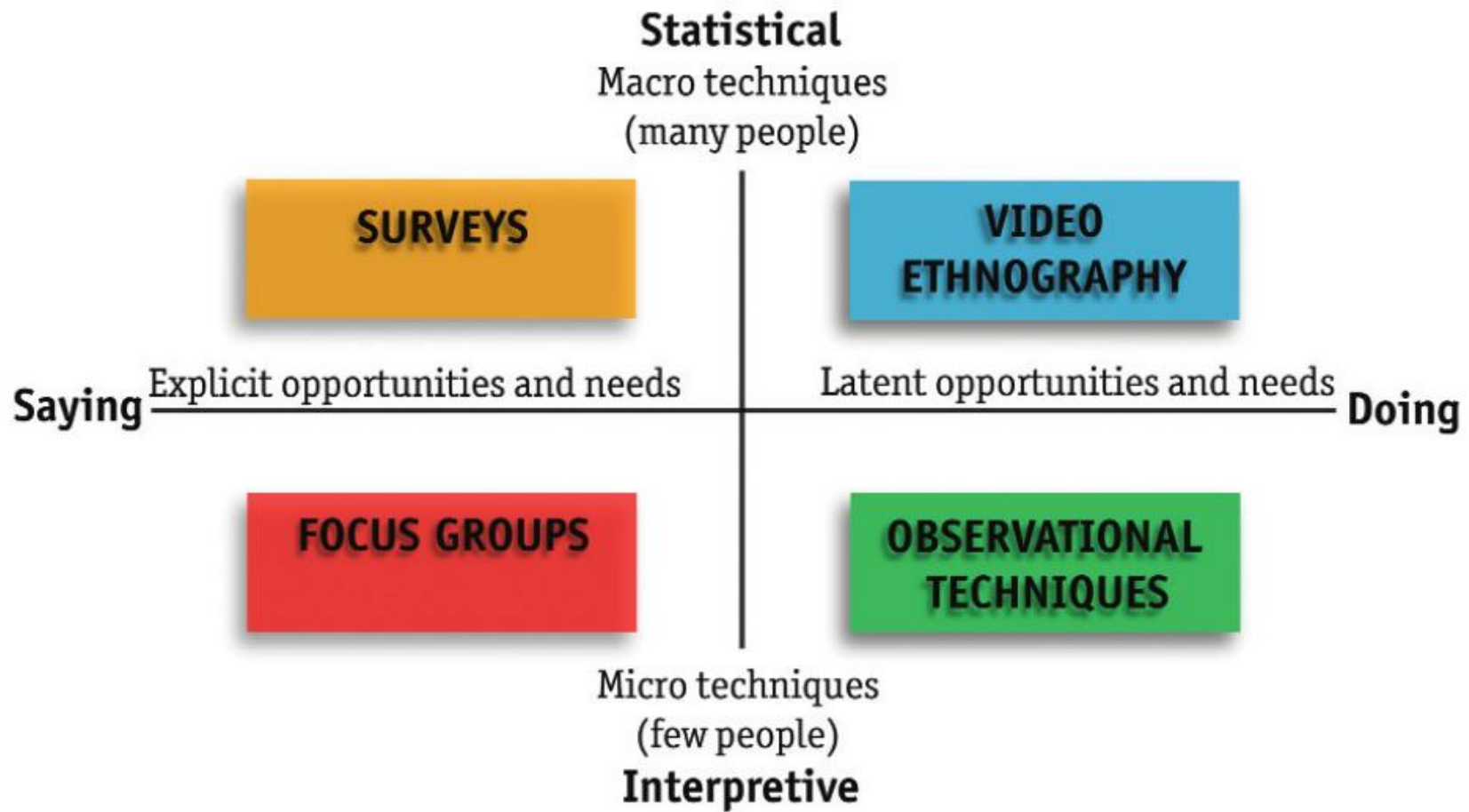
# *research methods – if all else fails*

- make your beliefs about the end users and the task space explicit
  - if you cannot get in touch with real end users or their representatives
  - use your team to articulate their assumptions about end users and their tasks
  - risk: resulting user and task descriptions do not resemble reality → only use as last resort



# research methods

categories and examples (there are more methods than just these)



From: Moggridge – Designing Interactions

# *research methods*

from the analyst's perspective:

- observe: users and their behavior in context
- engage: interact with and interview users
- immerse: experience what users experience

# *resource: 51 ways of learning about people*

- IDEO method cards  
(remember the shopping cart people?)
- four categories:
  - Look: at what users do
  - Ask: them to help
  - Learn: from the facts you gather
  - Try: it for yourself

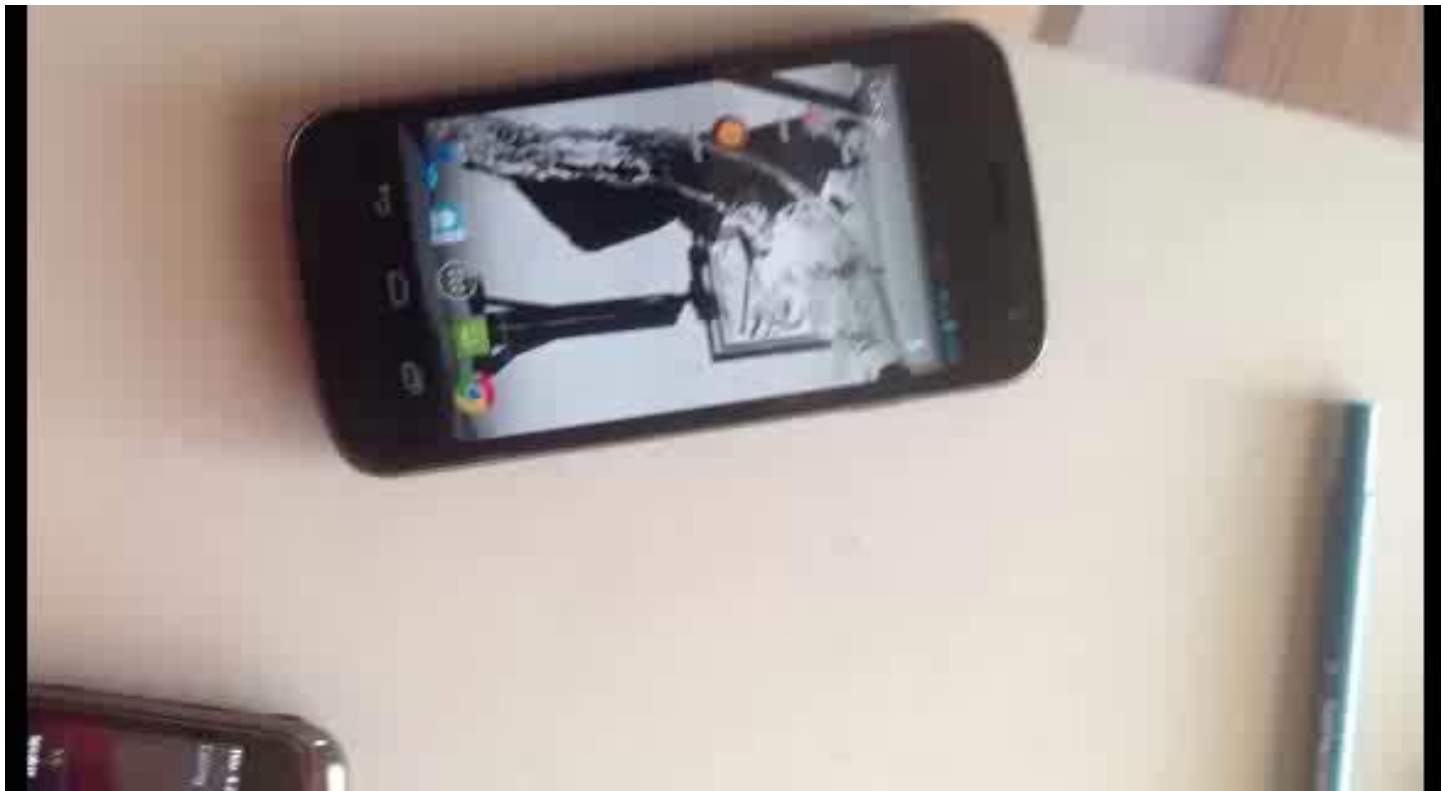


Look

# ***OBSERVATION METHODS***

*first some caveats...*

example 1: let's look at my friend Tony answering his phone



*lets look at him answering his phone again*



# *fat thumb example*

- what happened here? What did you see?
  - a breakdown in a fundamental task
- what does this observation tell you?
  - opportunities for a new design
  - workaround possibilities
- would he have been embarrassed to tell you that his thumb sometimes hinders him from answering his phone?
  - very likely
  - (more on this problem later)

## *example 2: Swiffer*



- people said they wanted a more powerful cleaner
- P&G outsourced design to a design firm
- firm discovered
  - mops are a pain, people don't like them
  - people cleaned their house before team showed up
  - they dropped coffee on the floor
  - people grabbed a paper towel and just mopped up
  - inspired the design of the Swiffer



# *lesson to learn*

- what people say they want and what they want is not always the same
  - through observation you can uncover the latter
- what people say they do is not always what they actually do
  - through observation you can see what they do

# *(some) observation methods*

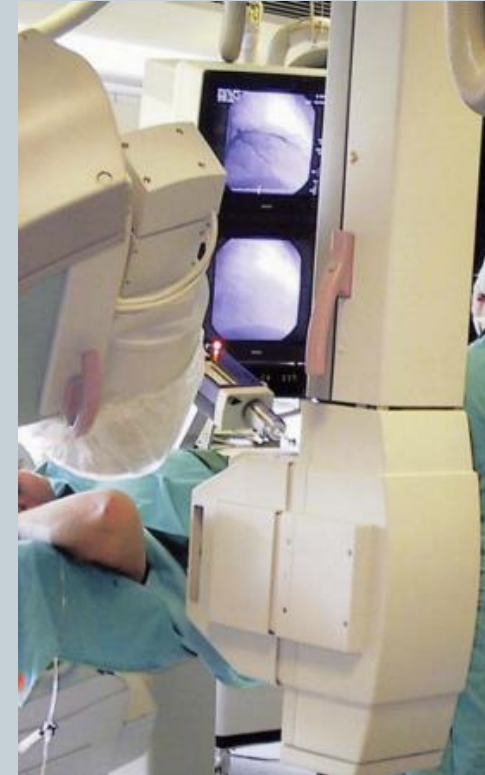
- A Day in the Life
- **Behavioral Archaeology**
- Behavioral Mapping
- **Fly on the Wall**
- **Guided Tours**
- Personal Inventory
- Rapid Ethnography
- **Shadowing**
- Social Network Mapping
- Still-Photo Survey
- **Time-Lapse Video**

# *general observation methods*

- natural
  - no interference from the investigator
    - High validity data, but “Hawthorne effect”
- controlled
  - the investigator sets a task and observes it being carried out
    - Accurate data but lower validity
- participatory
  - the investigator actively joins in the activity being observed to gain a firsthand activity
    - Deeper insight but can influence user behavior, need specialist knowledge

## *method: fly on the wall*

- observe and record behavior within its context
- take notes, record audio and video if you can
- do not interfere with people's activities



*example:*

*IDEO designers witnessed the regard with which the surgeons treated a transplant organ and incorporated these ideas into a transport box design*



# *exercise*



apply this method to designing a new coffee house experience



# *designing a mop/dustpan*



it's important to know what people do so that you don't inadvertently bust something/take something away that they expected to do.



# *method: shadowing*

- tag along with people to observe and understand their day-to-day routines, interactions, and contexts
- this is a valuable way to reveal design opportunities and show how a product might affect or complement users' behavior



*example:*

*the IDEO team accompanied truckers on their routes in order to understand how they might be affected by a device capable of detecting their drowsiness*

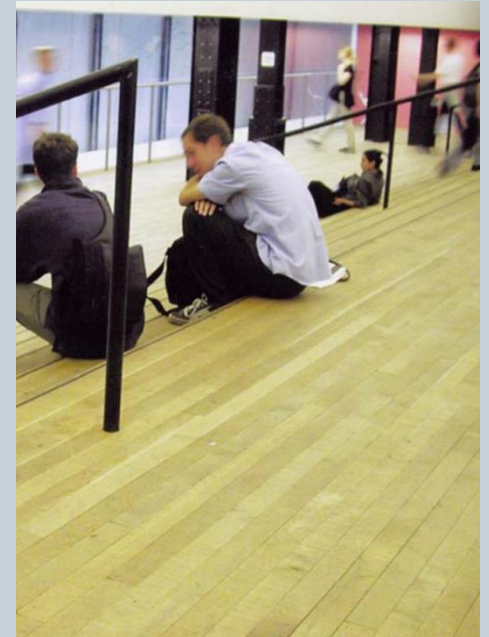


## *method: shadowing*

- distract the observed person as little as possible
- ask questions only in critical or unintelligible situations. You can deal with this by:
  - conducting interviews first to get to know the topic and/or situation before you start
  - collect all questions and do interviews later
  - bring a commentator who will explain behaviors, actions, and background as necessary

## *method: time-lapse video*

- set up a time-lapse camera to record movements in a space over an extended period of time
- useful for providing an objective, longitudinal view of activity within a context



*example:*

*IDEO team recorded the activity of museum visitors over several days to learn how to improve space layout*

*exercise: take notes on interesting behavior here*

# **Casual Interaction in a Hallway**

**Greenberg, S. (1990)**

**Grouplab Video Report**

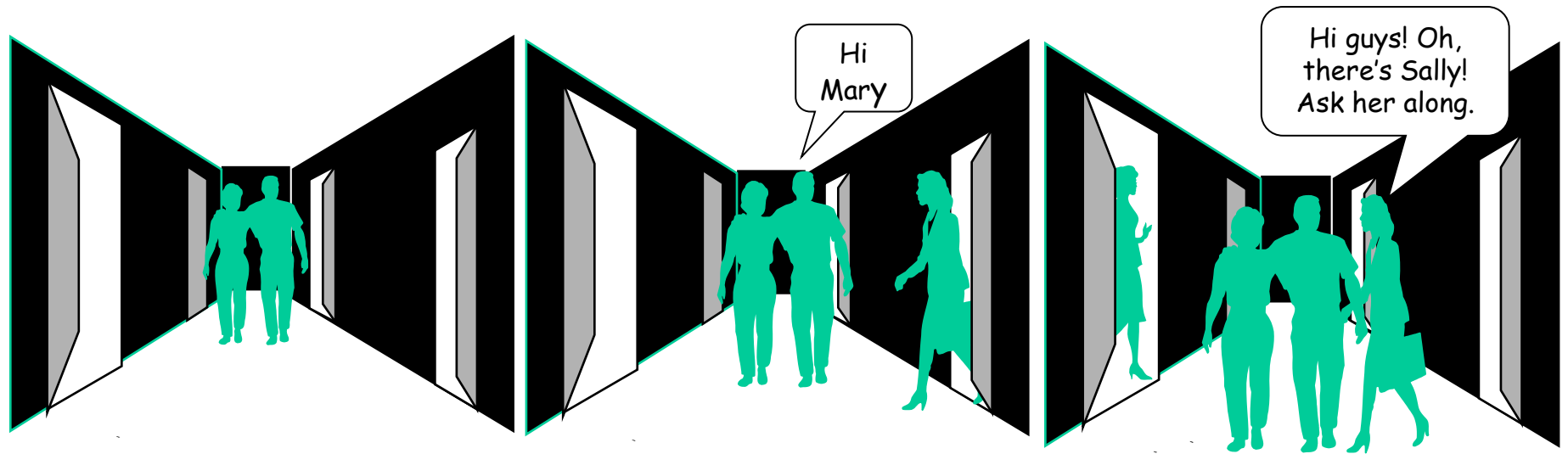
**Department of Computer Science**

**University of Calgary, Canada**

**Duration ~2:30**

# *observations inspired design*

- understanding casual interaction



# Notification Collage



public display



personal display

The Notification Collage: Posting Information to Public and Personal Displays.  
In Proceedings of the ACM Conference on Human Factors in Computing  
Systems - ACM CHI'01. ACM Press, pages 515-521

# *method: behavioral archaeology*

- look for the evidence of people's activities inherent in the placement, wear patterns, and organization of places and things
- this reveals how artifacts and environments figure in people's lives, highlighting aspects of their lifestyle, habits, priorities and values



*example:*

*noting that people efficiently organized multiple work tasks by stacking paper all over their desk surfaces, IDEO invented a brand-new system furniture element to support this*





# *where should we put new walkways on campus?*





# *what to pay attention to*

- key features

- Space
- Actors
- Activities
- Objects
- Workarounds
- Acts
- Events / triggers
- Time
- Goals
- Feelings

## questions

how is the physical space adapted to the task?

what are the key constraints on the task?

where are decisions made?

## *method: guided tours*

- accompany participants on a guided tour of the project-relevant spaces and activities they experience
- making an exploration of objects and actions in situ helps people recall their intentions and values



example:

*by following users through their homes, the IDEO team understood the various motivations behind ways photographs are used and stored*

Ask

***THEM TO HELP***

# *when LOOKing is not enough...*

- LOOKing gives you great insight into the state of the world
- but it doesn't tell you why people are acting the way they do, or what their goals, needs, or feelings are



*what may be some problems asking people?*



## *problems with asking*

- people can be unduly influenced by cultural context (hype), and what they think you expect them to say (this rocks!).
- people may lie—deliberately to save face (embarrassment, cultural / polite)
- people may lie—their boss is around

# *wait, are people completely useless?*

- people are really good at telling us a few things:
  - what they are doing right now.
  - how they are feeling right now.
  - what their goal is right now.

# *ideally, combine interview with observation*

- watch people in their own environment
- watch people do everyday tasks
  
- opportunities for new designs arise from:
  - workarounds
  - breakdowns
  - unexpected uses of existing tools



# *(some) ASKing methods*

- **Camera Journal**
- Card Sort
- Cognitive Maps
- Collage
- Conceptual Landscape
- Draw the Experience
- Extreme User
- **Interviews**
- Five Whys?
- Foreign Correspondents
- **Narration**
- **Surveys & Questionnaires**
- Unfocus Group
- Word-Concept Association

# *Method: Interviews*

## Types:

- Unstructured - exploratory and in-depth
- Structured - are scripted with pre-written questions
- Semi-structured - guided by a script but can become more open as it progresses
- Group (focus groups) - allows diversity and more views/issues to be raised and reflected on

# *method: interviews*

## question types

- two types:
  - 'closed questions' have a predetermined answer format, e.g., 'yes' or 'no'
  - 'open questions' - no predetermined answer format

# *the role of props*

- props are useful (especially with kids) to get conversation going
- often used in focus groups



# *method: surveys & questionnaires*

- ask a series of targeted questions in order to ascertain particular characteristics and perception of users
- this is a quick way to elicit answers from a large number of people



*example:*

*developing a new gift-wrap packaging concept the IDEO team conducted web-based surveys to collect consumer perspectives from many people around the world*

# *surveys & questionnaires*

very popular method

- good for finding out about attitudes, values, opinions, likes and dislikes
- can be administered to large populations, web-based, paper or email
- sampling can be a problem when size of population is unknown
- can be offputting to people if appears too long
- 40% response rate is high, 20% is often acceptable

# *questionnaire content*

- be clear on the goal
- open and closed questions
  - What do you think about X?
  - Which of the following are things you might use?
    - a, b, c, d, e
- rating scales
  - I think X is a good idea
    - 1 strongly disagree to 5 strongly agree
- be sure to pilot your questionnaire

# *questionnaire design*

how it is structured is key

- impact of a question can be influenced by its order
- strike a balance between using white space and keeping the questionnaire compact
- decide whether phrases will all be positive, all negative or mixed
- providing check boxes and drop down menus to choose from - makes it easier to fill in
- open-ended questions allow for more interview-like comments



# *questionnaires: pros & cons*

- advantages
  - 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
  - individuals can respond more than once
  - people can be too quick in selecting options

## *method: narration*

- as they perform a process or execute a specific task, ask participants to describe aloud what they are thinking
- this is a useful way to reach users' motivations, concerns, perceptions, and reasoning



*example:*

*In order to understand how food is incorporated into people's daily routines, the IDEO team asked people to describe what they were thinking while eating*

## *method: camera journal*

- ask a potential user to keep a written and visual diary of their impressions, circumstances, and activities related to the product
- this rich, self-conducted notation technique is useful for prompting users to reveal points of view and patterns of behavior



*example:*

*the IDEO team designing a travel information system distributed camera journals to families taking car trips to capture map reading and other car travel behavior*

# *camera journal / diaries*

- record events, activities, thoughts, observations, emotions, etc., over a period of time
  - written, artefacts, photos, drawings, texts
  - in depth access to reflections, concerns, and insights
- benefits
  - good for long term studies examining habits, behavioural patterns, etc.,
- disadvantages
  - false memories & exaggeration
  - people forget or get too busy

# diary studies example

are kindles/nooks good for work-related reading?

- paper logs – fit in a pocket
  - log reading activity
  - what else is going on
- findings
  - people write while reading
  - searching/finding is frequent
  - annotations are common
  - single displays may be inadequate

Day of Week: S M T W T F S

Time of Day: 12am - 6pm, 6am - 9am, 9am - 11am, 11am - 1pm, 1pm - 6pm, 6pm - 9pm, 9pm - 12pm

Location: Meeting room

What are you reading?:  
- financial reports  
- quarterly earnings

What are you doing?:  
- reporting on what's going on  
- circling new <sup>unexpected</sup> things

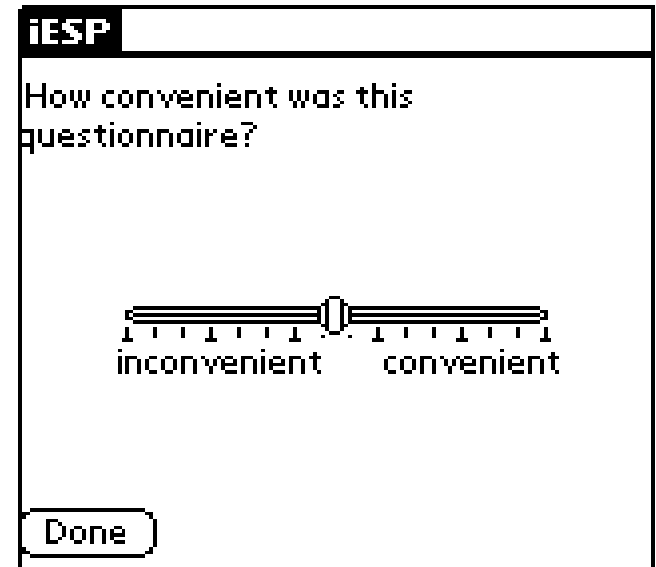
What are you working with?:  
- nookbook

Reading for how long?: <5 min, 5min - 15min, 15min - 30min, 30min - 1hr, 1hr>

Have you read this before?: Yes *KINDLE* No

# *experience sampling*

- have users carry around a device that has them answer questions at given intervals
  - Cell phone, PDA, Pager



- ***example:*** page user once every 3 hours and ask them to fill out a short survey on their current activity and rate sleepiness level on a scale from 1 to 7

Often observations and asking are combined

## ***ASK & LOOK***

# *methodology: ethnography*

- collection of methods
- includes field work done in natural settings
  - Spend as much time as you can with people relevant to the design topic.
  - Establish their trust in order to visit and/or participate in their natural habitat and witness specific activities
- study of the large picture
  - get more complete context of activities
  - get objective perspective with rich description of people, environments, and interactions
  - use a “wide-angle research lens”
- goal: elicit user requirements that would be hard for a typical user to articulate
- very (!) time intensive



# *ethnographic method: contextual inquiry*

- combining “looking” and “asking” by immersing oneself into a particular context/culture: *understand mental models and work practices*
- “the core premise of Contextual Inquiry is very simple:
  - go where the customer works,
  - observe the customer as he or she works, and
  - talk to the customer about the work.do that, and you can’t help but gain a better understanding of your customer.”

# *contextual inquiry: principles*

- context: in the setting of the participant
- relationship: you are the apprentice, participant is the expert
- interpretation: observed facts must be considered for design implications
- focus: lots of themes will emerge, but this helps to orient the team

# *expert/apprentice*

- you are the noob
- what does this mean?
  - be a keen observer
  - ask questions
  - be eager to learn
  - admire the master
  - aspire to see the world as the expert does

## Ethnography: Do It Right...

Anthropological research can be a potent tool—or a waste of time and money. Here's how to get the most bang for your buck:

### Think Big Thoughts

Ethnography is **most effective when it's used to spot breakthrough innovations**. Don't use it for incremental improvements or to solve small problems. Ethnography works best when the questions are big and broad. "The good time to use it is with futuristic research," says Natalie Hanson, SAP's director for business operations.

### Due Diligence

Many companies do not have the resources to hire their own anthropologists or social scientists. So **picking the right consultants can make or break a project**. With many poseurs jumping on the bandwagon, it's important to hire a firm with a track record, client references, and a staff with a mix of skills in social science, design, and business.

### Start Early

Using ethnography at the beginning of the product development process is key because **it helps identify consumers' unmet needs**. It's those findings that can inspire a hit product or service. One danger of waiting too long to bring in social scientists is that you might end up with "feature creep," simply adding unnecessary bells and whistles.

### Sell, Sell, Sell

Let's face it: Many executives think ethnography is bunk. So **managers must constantly educate others about its value**. Be clear that ethnography is not a cure-all but can spark innovation. "To get people to think about a softer approach is a challenge," says GE's marketing operations manager, Dominic McMahon.

### Build a Culture

**Organizations that have used ethnography to the greatest effect have usually made such research an integral part of their culture**. "I don't believe it is one person's job to figure out user problems," says Alex Lee, president of OXO, a long-time user of ethnography. "What's important is the mindset of the people. Ideas come from every which way."

## ...and Reap the Rewards

### Motorola A732

After observing how popular Chinese-character text messaging was in Shanghai, Motorola researchers developed a cell phone that lets you send messages by writing



directly on the keypad using your finger.



### TownePlace Suites

A team of ethnographers and designers from IDEO found that TownePlace guests often turn their bedrooms into work spaces. So it came up with a flexible modular wall unit where there had been only a dining table. Guests can use the unit either as an office or a place to eat.

### OXO Hammer

To develop a line of professional-grade tools for consumers, OXO and Smart Design visited contractors and home renovators. One result: A hammer with a fiberglass core to cut vibration and a rubber bumper on top to avoid leaving marks when removing nails.



### Citigroup PayPass

Citigroup teamed up with Dublin Group to brainstorm new payment services for consumers. This summer, Citi will launch a pilot project called PayPass that lets New York City subway riders pay with a special key chain tag that debits their checking accounts.

### Sirius S50

Sirius and Ziba Design studied how people listen to music, read magazines, and watch TV. That led them to develop a portable satellite-radio player that is easily loaded with up to 50 hours of digital music for later playback.



# *summary*

- A broad assumption in user-centered design: as designers, we know very little
- ASK methods complement LOOK methods to help us discover what is happening and why
- contextual inquiry combines these ideas into one technique

# ***DATA RECORDING***

# *types of data to collect*

- verbal responses
  - interviews
- written responses
  - questionnaires, diaries
- recording
  - Notes, audio, video, photographs

# *when to stop collecting data*

- when should you stop to collect data and generate user and task descriptions?
  - when you notice ever increasing repetition when you do observations and interviews
  - you stop when new types of people and tasks are rare and it is no longer cost-effective to continue (cost can involve money but also time and resources)



# *advice*

- respect your participants
  - they volunteer their time for your work
  - they often volunteer thoughts and feelings, too
- have consideration for their health, safety, privacy, and dignity at all times

# *study principles*

1. approach people with courtesy (see previous slide)
2. identify yourself and your intent and what you are looking for
3. offer to compensate participants
  - coffee, free t-shirt, candy, money, ...
4. describe how you will use the information you collect and why it is valuable
5. get permission to use the information and any photos and videos you take
6. keep all information you gather confidential
7. let people know they can decline to answer and stop participating at any time
8. maintain a non-judgmental, relaxed, and enjoyable atmosphere

Learn

***FROM THE FACTS YOU GATHERED***

# *LEARN from your data*

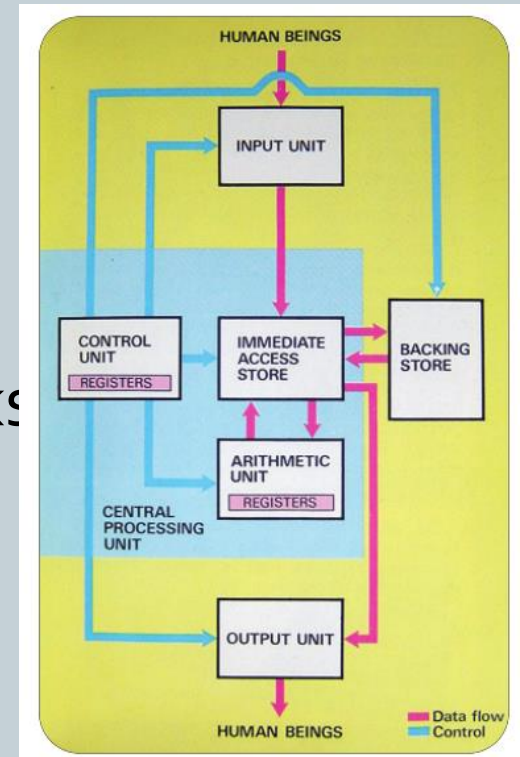
- now that you have a huge stack of notes and ideas from all of your LOOKing and ASKing, it's time to make some sense of the data
- methods are intended to help you organize your thinking, and express it to help make it concrete and real

# *some Methods: Learn*

- Activity Analysis
- **Affinity Diagrams**
- Anthropometric Analysis
- **Character Profiles**
- **Cognitive Task Analysis**
- Competitive Product Survey
- Cross-Cultural Comparisons
- **Error Analysis**
- **Flow Analysis**
- Historical Analysis
- Long-Range Forecasts
- **Task Descriptions**

# *method: flow analysis*

- represent the flow of information or activity through all phases of a system or process.
- this is useful for identifying bottlenecks and opportunities for functional alternatives.



Example:

*Designing an online advice Web site, flow analysis helped the team to gain a clearer sense of how to make it easy to find your way around the site.*

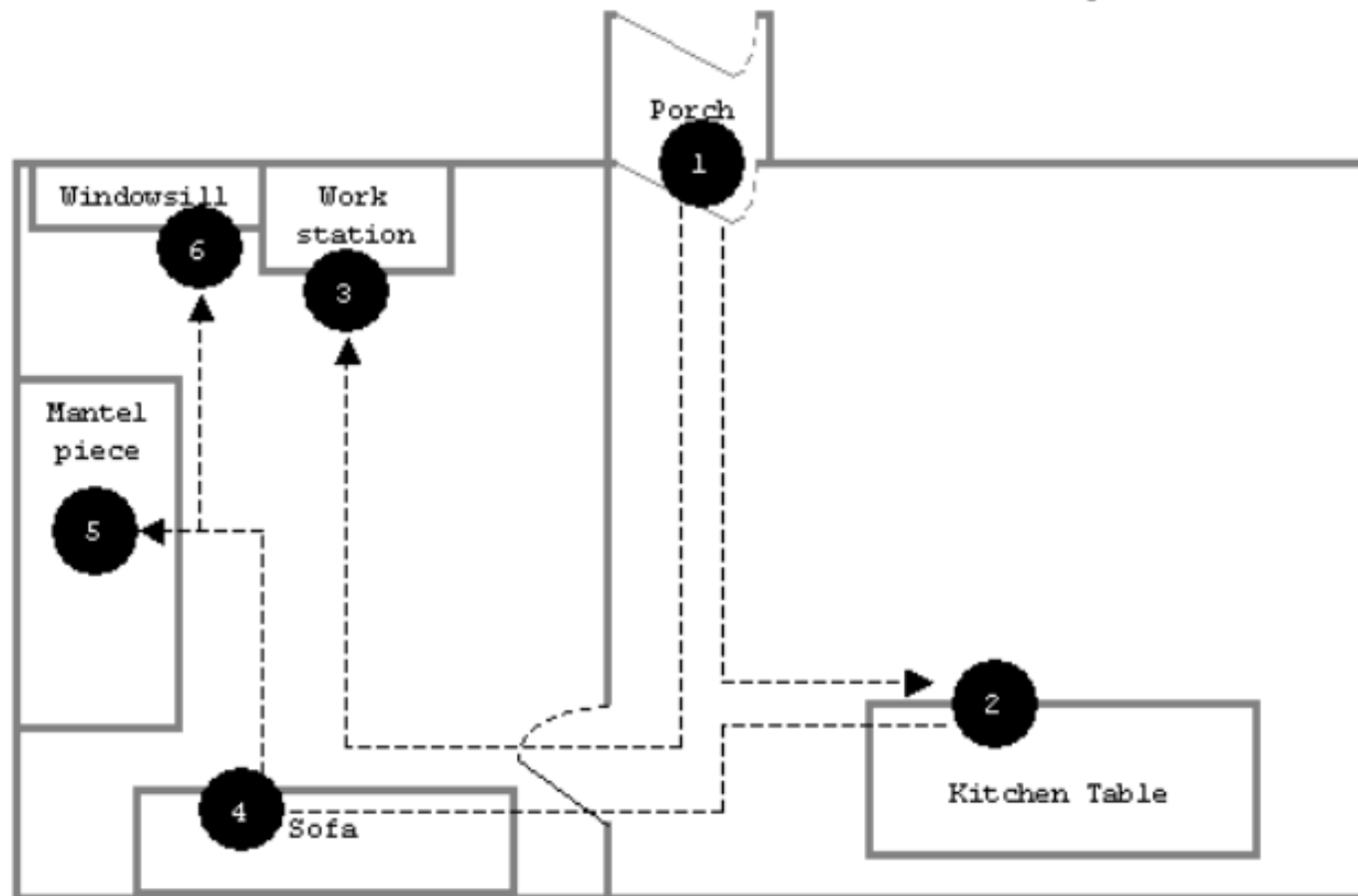


[http://www.zazzle.ca/thank\\_you\\_cards\\_red\\_daisy-137447214949027033](http://www.zazzle.ca/thank_you_cards_red_daisy-137447214949027033)

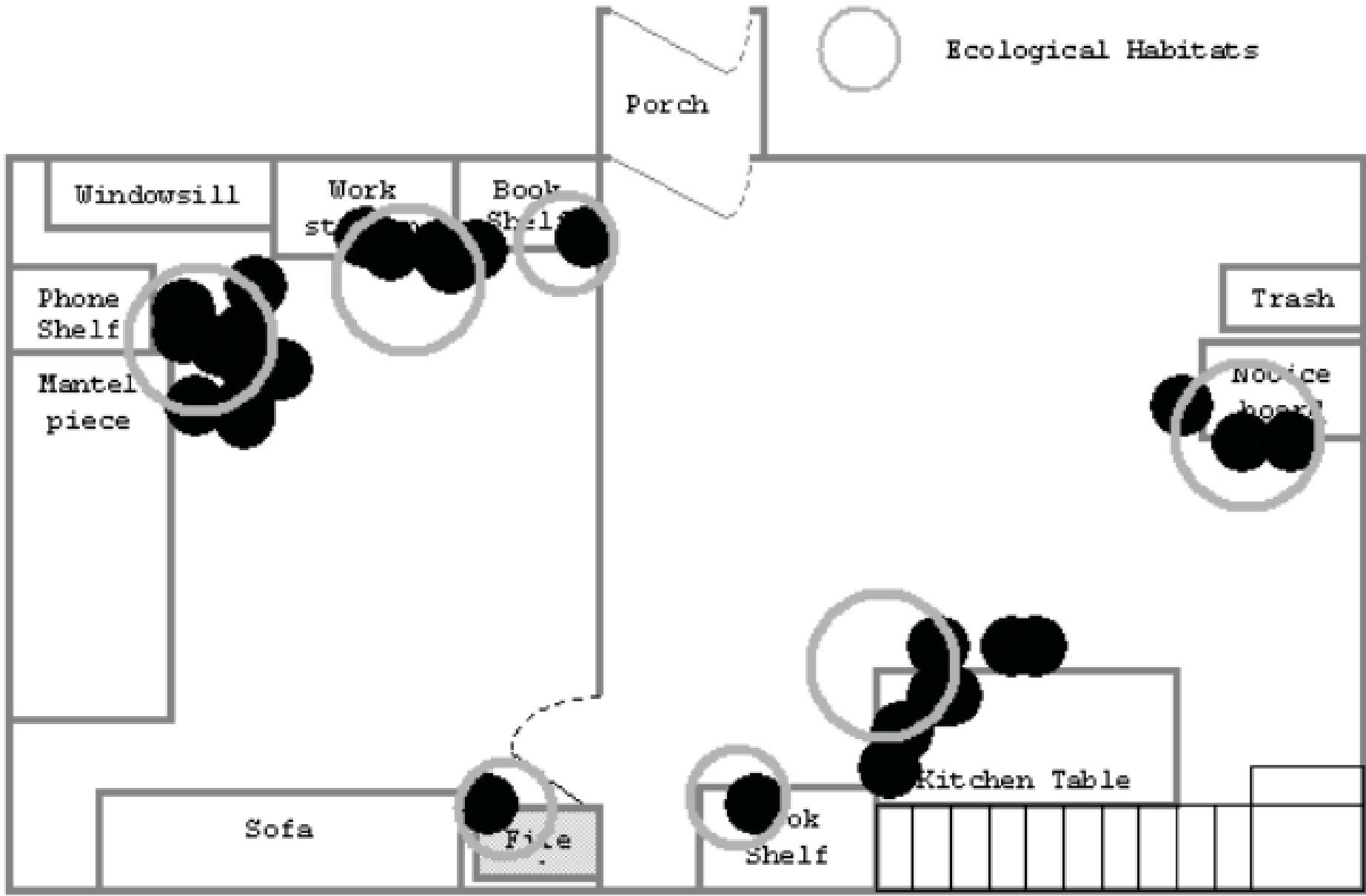
## Receiving a 'thankyou' card from a friend

Media: Cards --- Cards ----- Email ----- Cards ----- Card ----- Postcard

Location: 1.Porch > 2.Table > 3.Workstation > 4.Sofa > 5. Mantelpiece > 6.Windowsill







## *method: error analysis*

- List all the things that can go wrong when using a product and determine the various possible causes
- This is a good way to understand how design features mitigate or contribute to inevitable human errors and other failures



*example:*

*The IDEO team used error analysis on a remote-control concept in order to maximize the functionality of each button's size, shape, and texture*

# *error Analysis Exercise (try at home)*

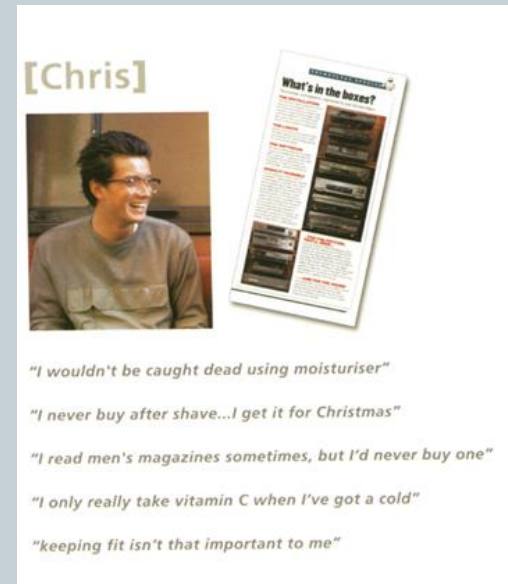
- **Activity**: List all of the errors that could happen when driving a car.
- **Activity 2**: Why does that error occur?

# *method: character profiles*

- based on observations of real people, develop character profiles to represent archetypes and the details of their behavior or lifestyles
- this is a useful way to bring a typical customer to life and to communicate the value of different concepts to various target groups

*example:*

*In order to understand different types of customers and how to target them, IDEO developed four characters for a pharmacy wanting to reach the male beauty-product market*



# Wendy

busy budget vegetarian

*I have kept 20 lbs off for over 10 years, mostly by eating vegetarian and watching calories and fat. I wish healthy food, especially organic produce, were less expensive. Plus, it's hard to fit healthy cooking into a busy schedule.*

primary persona

## Personal Details

Age: 38

Profession: **Fashion Stylist**

Home: **Los Angeles, CA**  
**High rise apartment with boyfriend and a cat.**

## Goals and Priorities

Eat great vegetarian food

Maintain healthy weight

Affordable and convenient

Wendy is a 38 year old vegetarian living with her boyfriend in an urban Los Angeles neighborhood. She was a "fat kid" growing up, and continues to work hard to maintain healthy habits and stay in shape. She tries to eat right, mostly by limiting calories, fat, and carbohydrates, and by avoiding meat altogether. She used to track her eating with paper and pencil, using the Weight Watchers point system. It was a hassle though, and once she got the feel for portions and types of foods, she stopped tracking. She has a smart phone now, but uses it mostly for social networking and text messaging, and isn't really interested in heavy duty apps. She would like to track food somehow though, to help resist cravings and bad habits.

For exercise, Wendy uses the elliptical trainer in the gym in her building three times a week, but doesn't always find time to stick to that schedule. She almost always cooks at home, and considers cooking a hobby. She consciously avoids fast food, but often gets take-out for lunch when she hasn't had time to pack something, and enjoys eating out with her boyfriend a few times a week. Wendy drives to Ralph's (Safeway-esque) for most of her groceries, but also tries to get fruits and veggies at the farmer's market in her neighborhood. On a limited income in an expensive city though, she finds it challenging to always afford fresh and organic produce.

## Wendy's Goals and Priorities

- Maintain healthy weight
- Learn to be an expert on what's healthy or not
- Cook at home with fresh ingredients, pack lunches
- Healthy microwave or take-out options when in a hurry
- Resist junk food temptations in favor of healthy snacks
- Get the best fresh food value for her money

Wendy Facts	
Serving Size: 1	
Serving Per Container: 1	
Amount Per Serving	
Age: 38	Los Angeles, CA
Health Facts*	
Total Weight pounds	155
Height inches	69
BMI	23
Cholesterol 168 mg/dl	Normal
Sodium 124 mEq/L	Normal
Glucose 122 mg/dL	Normal
Blood pres. 121/76 mmHg	Good
Not a significant health risk. Adding healthier daily nutrition and exercise will alleviate.	
* Based on blood test a part of her yearly physical.	

# Lance

mobile gourmet

*I know it's important to eat well for all the right reasons, and I love delicious food. But in reality, it's really tough to make time for shopping and cooking. Fresh stuff requires more frequent trips to the grocery store, planning, and preparation, which I really just don't have time to do.*

secondary persona

## Personal Details

Age: 32

Profession: **Architect**

Home: **Nashville, TN**  
**Small house, also functions as his studio.**

## Goals and Priorities

Convenience above all

New flavors and experiences

Balanced healthy ingredients

Lance is always juggling 2 (or more likely 5-6) projects at once. He is an architect with a focus on green housing, and he supervises a team of off-site collaborators and on-site contractors. Lance loves to eat healthy and tasty food, but prioritizes his nutrition and health like everything else in his life (deadlines *always* come first).

His main objective in buying food is convenience and flavor. Lance really loves trying new flavors and new food experiences. He considers himself a sushi expert, sandwich snob, and barbecue aficionado. With his busy work life, he tends to fall back on restaurant meals to feed his needs, but he knows that too much of that really hits the waistline and drags his energy level down. He's also lactose intolerant, and it can be tricky avoiding dairy in restaurant food.





The majority of his groceries come from Amazon Fresh®, and he appreciates the flexible functionality of the site. For example, keeping lists, maintaining a grocery history, and adding alerts for items he frequently buys. Since he's always online, in the studio and in the field, he's really comfortable using technology to get things done.

## Lance's Goals and Priorities

- Convenient food where and when he needs it
- Stay healthy so he can maintain his high-energy lifestyle
- New flavors that satisfy his adventurous palate
- Mobile solution that keeps up with him
- Easy, so it doesn't take any more valuable time

Lance Facts	
Serving Size: 1	
Serving Per Container: 1	
Amount Per Serving	
Age: 32	Nashville, TN
Health Facts*	
Total Weight pounds	140
Height inches	64
BMI	24
Cholesterol 194 mg/dl	Normal
Sodium 148 mEq/L	Elevated
Glucose 116 mg/dL	Normal
Blood pres. 128/74 mmHg	Good
Not a significant health risk. Adding healthier daily nutrition and exercise will alleviate.	
* Based on blood test a part of his yearly physical.	



	The researcher	The Sysadmin	The OSS developer	The CS student
				
<b>Name</b>	Alexander Weiß	Donald M. Berry	Kristian Larsson	Eric Neville
<b>Age</b>	30	30	26	24
<b>Location</b>	Germany	US	Sweden	France
<b>Social Life</b>	Alexander lives with his girl-friend in a flat in Hamburg.	Donald lives with his wife and 1-year old daughter in a house in Portland.	Kristian shares an apartment with two friends in Stockholm. His girl-friend lives in Uppsala. They see each other every weekend.	Eric lives with his parents in a small city close to Lyon. He visits the university there. Often, he stays at his friend's apartment for playing PC games and programming.
<b>Work Life</b>	He works at centre for environmental systems research and designs plans for replacable energies in a EU-funded project.	He is a lead system administrator in a huge network solutions company in Portland.	A software developer with a dayjob in a medium-sized software company. Works on KDE in his spare time.	He is a student of computer science. Besides university, he performs small programming jobs for people in his neighbourhood.

# *method: cognitive task analysis (CTA)*

- list and summarize all of a user's sensory inputs, decision points, and actions
- this is good for understanding users' perceptual, attentional, and informational needs and to identify bottlenecks where errors may occur









# *cognitive task analysis*

- understand how cognition allows humans to get things done
- goal: turn the understanding into aids for helping people get things done better
- examples:
  - Performance differences between novices and experts
  - Mental workload associated with complex controls and displays
  - Decision-making of experts
  - The development and evolution of mental models.
  - Information requirements for command and control systems
  - Troubleshooting, fault isolation, and diagnostic procedures

Reading: Working Minds: A Practitioner's Guide to Cognitive Task Analysis

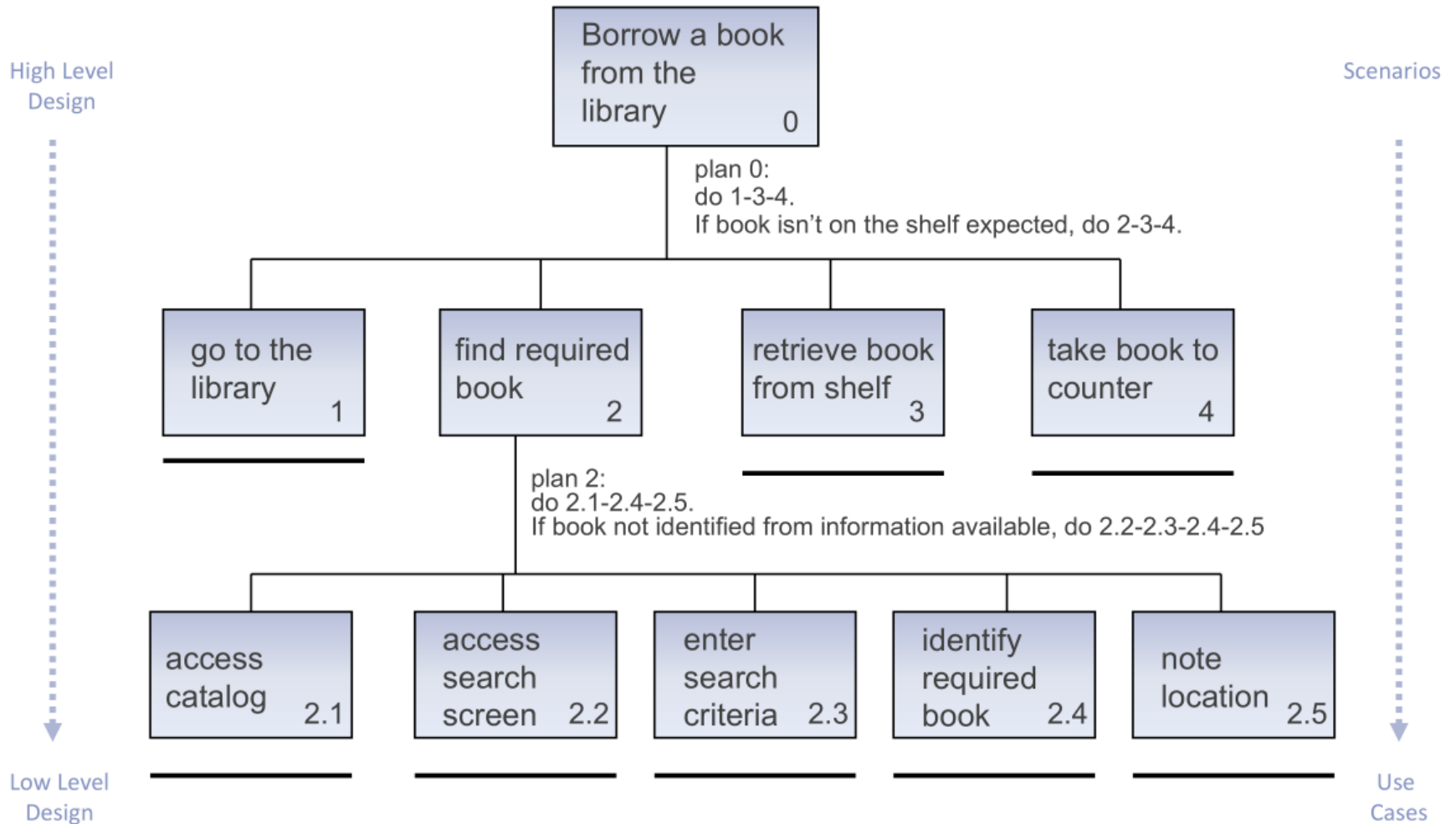
# *cognitive task analysis*

- usually study people in “complex cognitive systems”
  - knowledge and reasoning of individuals & groups important
- when tasks people are doing are complex, pure observation is not enough
  - you also need to understand how they think, what they know, how they organize & structure information, what they seek to understand better

# *Method: Hierarchical Task Analysis*

- Involves breaking a task down into subtasks
  - Recursively if needed
- Group these as plans which specify how the tasks might be performed in practice
- Start with a user goal  
then identify main tasks for achieving it

# Example



# *developing good task descriptions*

rules:

1. describe what the user wants to do but NOT how the user would do it

- do not describe interface mechanics
- identify the user's goals and steps they would take to achieve the goal no matter what system is used

*this is important because you want to use your description for different design alternatives that allow for different ways to accomplish a task*

- also because tasks will be used later to evaluate and compare your solutions

# *developing good task descriptions*

rules:

## 2. be specific

- your description needs to be concrete
- say exactly what the user wants to do
- include items that the user would eventually want to input (not matter how) into the system
- include results the user will want out of it

*this is important because it provides concrete rather than imaginary data for the types of information your system must handle*

# *developing good task descriptions*

rules:

## 3. describe a concrete job

- flow through all aspects of the task: start → end

*this is important because it forces you to consider how interface features will work together. Also allows you to contrast what happens with input and output*

# *developing good task descriptions*

rules:

4. say who the users are and reflect their real interests
  - name real people
  - include what they know and don't know about performing the task and using computers

*this is important because the success of your system is strongly influenced by what the users know. You will eventually use this information to see if people have the desire, knowledge, and capabilities to use your system*



# *developing good task descriptions*

Rules:

5. identify a broad coverage of users and task types

- “expected” users
- occasional but still important users
- unusual users
- routine tasks
- infrequent but important tasks
- unexpected and odd tasks

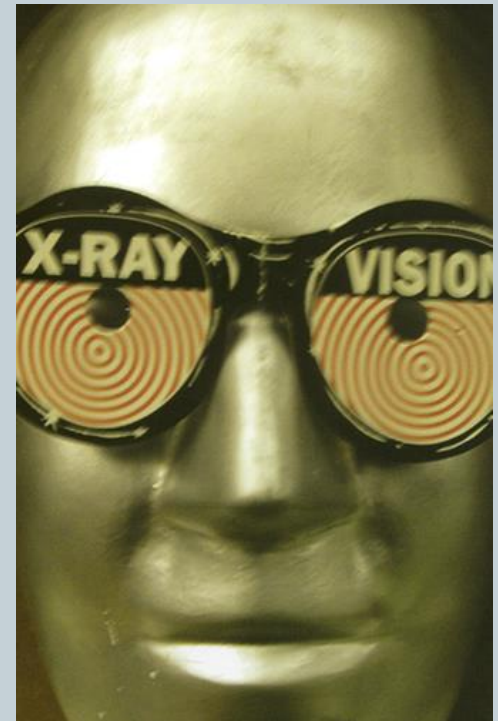
*this is important because you need a way to decide the coverage of your system design-which tasks and user groups must be included and which could be left out.*

# *validating the tasks*

- get a reality check on your task descriptions, by e.g.
  - showing them to the end users / representatives
  - ask them to check whether you adequately covered the end users
  - ask for details omitted, clarifications, suggestions
  - then rewrite based on feedback

## *method: secondary research*

- Review published articles, papers, and other pertinent documents to develop an informed point of view on the design issues
  - This is a useful way to ground observations and to develop a point of view on the state of the art
- you can do this before and/or after you've done other research methods: inform vs. compare

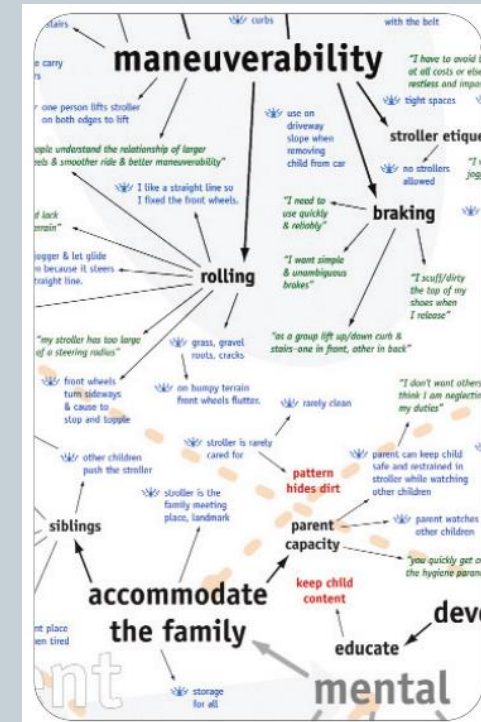


# *secondary research*

- What are some sources you might look at for secondary research for your projects?

# method: affinity diagrams

- cluster design elements according to intuitive relationships such as similarity, dependence, proximity, etc.
- this method is a useful way to identify connections between issues and reveal innovation opportunities



# *affinity diagramming*

- assemble your team for 1-2 hours
- take your observations, notes and transfer them to sticky notes, one per finding
- ask team to stick the notes on a whiteboard/wall, close to any other notes on a similar topic
- group and regroup until consensus has been reached
- you can include users in this process if you wish



<http://wiki.fluidproject.org/display/fluid/Affinity+Diagrams>

What's next?

***AFTER HAVING DONE ALL THIS...***





<http://www.projectcartoon.com/cartoon/2>

# *why what we talked about is hard work*

- requirements definition: the stage where failure occurs most commonly

# *who are your users?*

- not as obvious as you might think:
  - those who interact directly with the product or competitor's products
  - those who manage direct users
  - those who receive output from the product
  - those who make the purchasing decision
- three categories of user (Eason, 1987):
  - Primary: frequent hands-on
  - Secondary: occasional or via someone else
  - Tertiary: affected by its introduction, or will influence its purchase

# *deciding which users to include*

- most systems are considered successful if they have about 90% coverage
  - 90% of the people can do 90% of the tasks reasonably well
- divide your user types into
  - *absolutely must include*: your basic audience
  - *should include if possible*: try to accommodate these perhaps somewhat atypical users. Perhaps they must do some more work to use your system
  - *exclude*: rare, unimportant and quite different users from your core group. Inclusion cannot be justified from a cost perspective

# *deciding which tasks to include*

You want your tasks to be handled effectively and efficiently. Order task descriptions:

- *absolutely must include*: key tasks, essential things people would do, frequent & important
- *should include if possible*: if budget and time permits, important but more rare than above, perhaps include in version 2
- *could include*: could be supported but only if “almost for free” – adding is easy without much impact on main system
- *exclude*: unimportant/rare tasks, no effort should be made to include these tasks

# *user-centered design*

- an iterative design process that makes use of knowledge through investigation of a domain of work/play to create ideas and prototypes.
- prototypes are used for evaluation, and to further stimulate investigation, and idea and prototype generation.
- these prototypes and evaluations are used to aid in production.

# *Acknowledgements*

- Lecture slides include material from:
  - Petra Isenberg (INRIA)
  - Anthony Tang (University of Calgary)
  - Nicolai Marquart (City University London)
  - Raimund Dachsel (University of Dresden)

# Break

Class will resume in 15 minute(s)



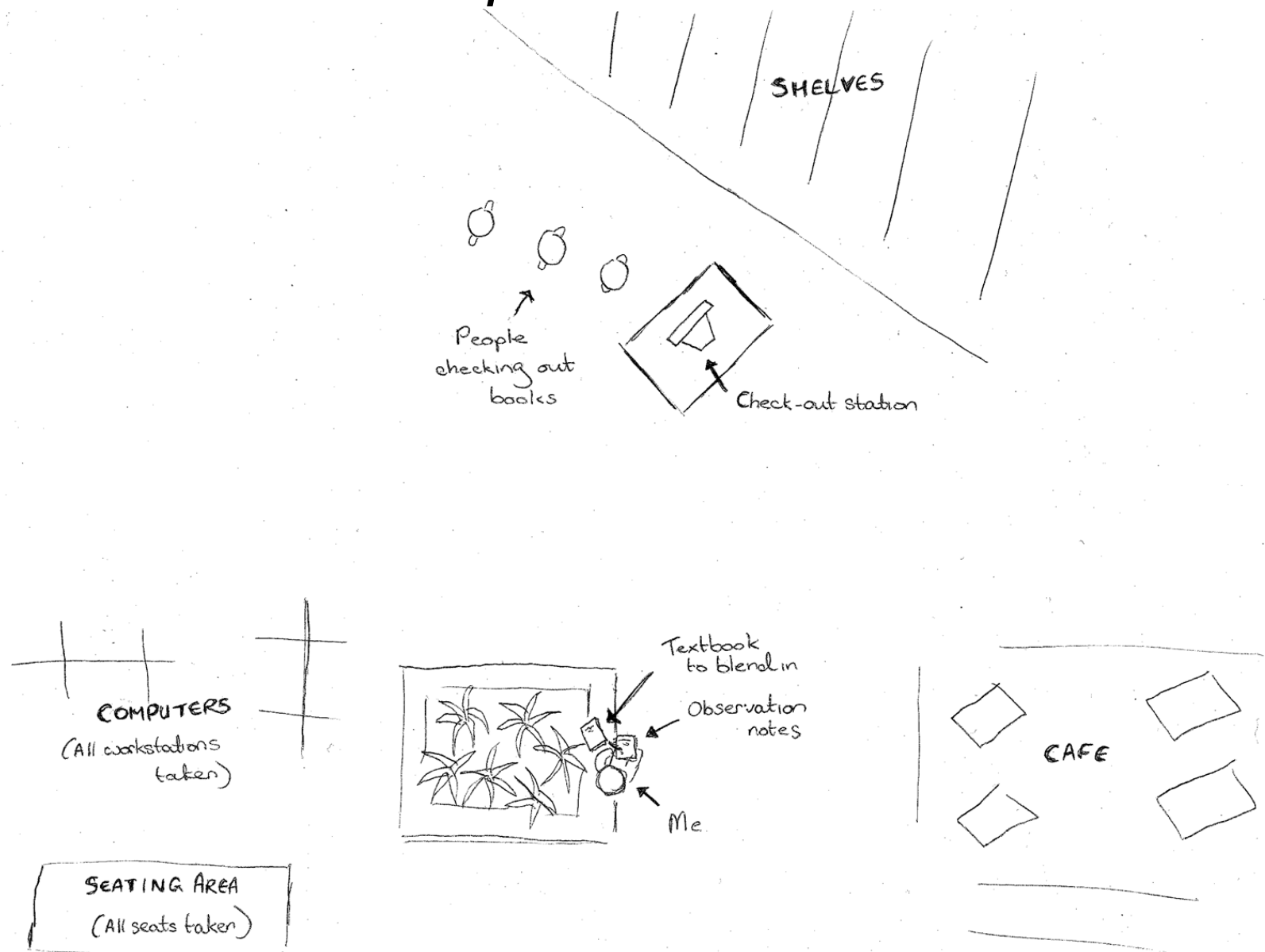
Gathering requirements

## ***LAB 2***

# *Remember from Lecture: Observations*

- Recording methods
  - Notes
    - At time of observation!
  - Video/Photographs
  - Audio
- Choose the methods that best fit the environment
- When taking notes, have a plan for what you will record
- If multiple people will be taking notes, agree on conventions
- Decide where you will observe from
  - Where will you get the best view of what you want to see?

# Observation Example



# *Interviews*

- Who should you interview?
  - Users
  - Experts
  - Stakeholders
- How long should you interview?
  - As long as it takes to get the info you need
  - Or until your interviewee loses interest
- What should you do if your interviewee doesn't say much?
  - Prepare prompts (e.g. could you say more about X?)
- How should you capture responses?
  - Take notes during or soon after the interview; record audio or video

# *Running an interview*

- Introduction
  - Introduce yourself, explain the goals of the interview
  - Reassure about the ethical issues, ask to record, present any 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
- Closure – thank interviewee, signal the end, e.g., switch recorder off

# *Interview Questions*

- Open vs. closed questions
  - Closed questions produce short answers
  - Open questions produce longer answers (harder to analyze/compare, but more interesting)
- Avoid leading questions
  - e.g. “What do you think about X” vs. “Do you think that X is awesome?”
- Avoid unconscious biases
  - e.g., “So you drink a lot of coffee?”
- Only ask one question at a time
  - “Do you agree that X is awesome and everyone should be using it?” is two questions
- Depending on what you’re looking for:
  - Make your questions clear and specific, or
  - Make your questions vague

# *Redesign these...*

1. What do you think about shopping?
2. Are you a good student or a bad student?
3. How long have you been stressed out?
4. How often do you relax and what do you do when you relax?

# *Class Exercise: Interview Guide – 10-15min*

- Imagine you are trying to build a good commuter bicycle.
- Who should you talk to?
- Where should you talk to them? Why?
- What do you want to find out?



# *Team Exercise: Planning – 10 mins*

- Get into your project groups
- Create an interview guide (~10 mins)
  - Five questions that are relevant to your project – think carefully about these given all the things we discussed earlier
  - Later, you will use these to interview someone

# *Interview Practice – 20 mins*

- Get into groups of three or four
  - each person should be from different group.
- Take turns in different roles: interviewer, interviewee, observer.
  - Interviewer: use your questions to interview the person
  - Interviewee: answer them to the best of your ability—take mental note of when things are weird
  - Observer: take notes of the interview, particularly when a question is not getting the interviewer what s/he wants. Provide suggestions on how to revise the question.

## *Discussion: Interviews – 10mins*

- From each project group I want to hear
  - What did you find out (about your topic)?
  - What was your experience of interviewing?
  - What was your experience of being interviewed?
  - Notes and thoughts from observers? (without embarrassing one another)

## *Class Exercise:*

### *Planning an Observation – 10 mins*

- Returning to the commuter bike design example, plan an observation.
- What are you interested in understanding or learning?
- What is a good site? What would you take notes on?

# *Project Component II*

## Your mission

1. Conduct ONE user research method with potential users or stakeholders
  1. extra credit if you conduct more than one method
2. Define design requirements for your system
  1. must have
  2. should have
  3. could have

Checkout these notes from P. PU for a good design requirement example:

[http://hci.epfl.ch/teaching/hci/course\\_material/design/UserCenteredDesign-taskanalysisII\\_x6.pdf](http://hci.epfl.ch/teaching/hci/course_material/design/UserCenteredDesign-taskanalysisII_x6.pdf)

## *Remaining time...*

- Discuss with your team about which method makes sense to use for your project
- Construct a research plan
  - You will likely need to do this at a later time anyway. If you have time right now, this would be a good time to do it.

