

Task Analysis and Contextual Inquiry

CS160: User Interfaces

John Canny

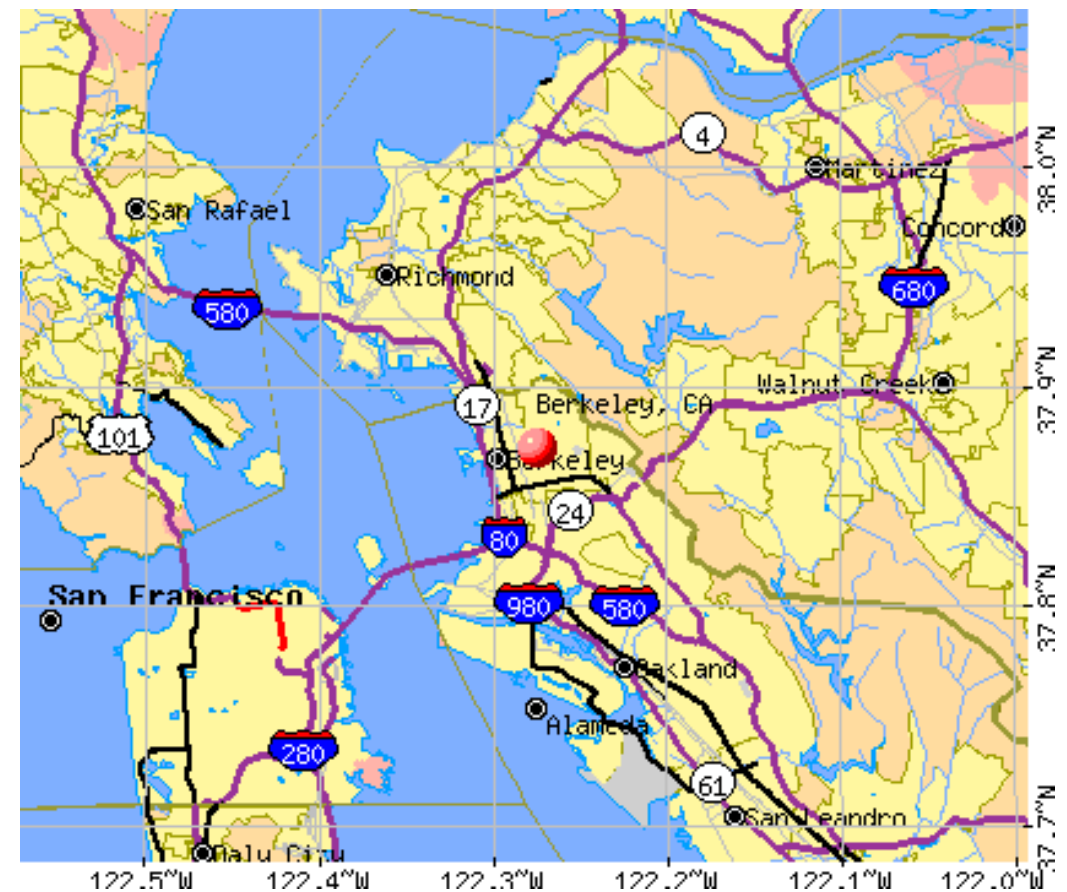
Brainstorming Assignment

While brainstorming: Remember that a mobile device is a lot more than a portable phone.

Individual programming assignment preview:

Assignment 3

- Get GPS value
- Get map image from web service
- Post point of interest data
- Get all POIs



Brainstorming Assignment

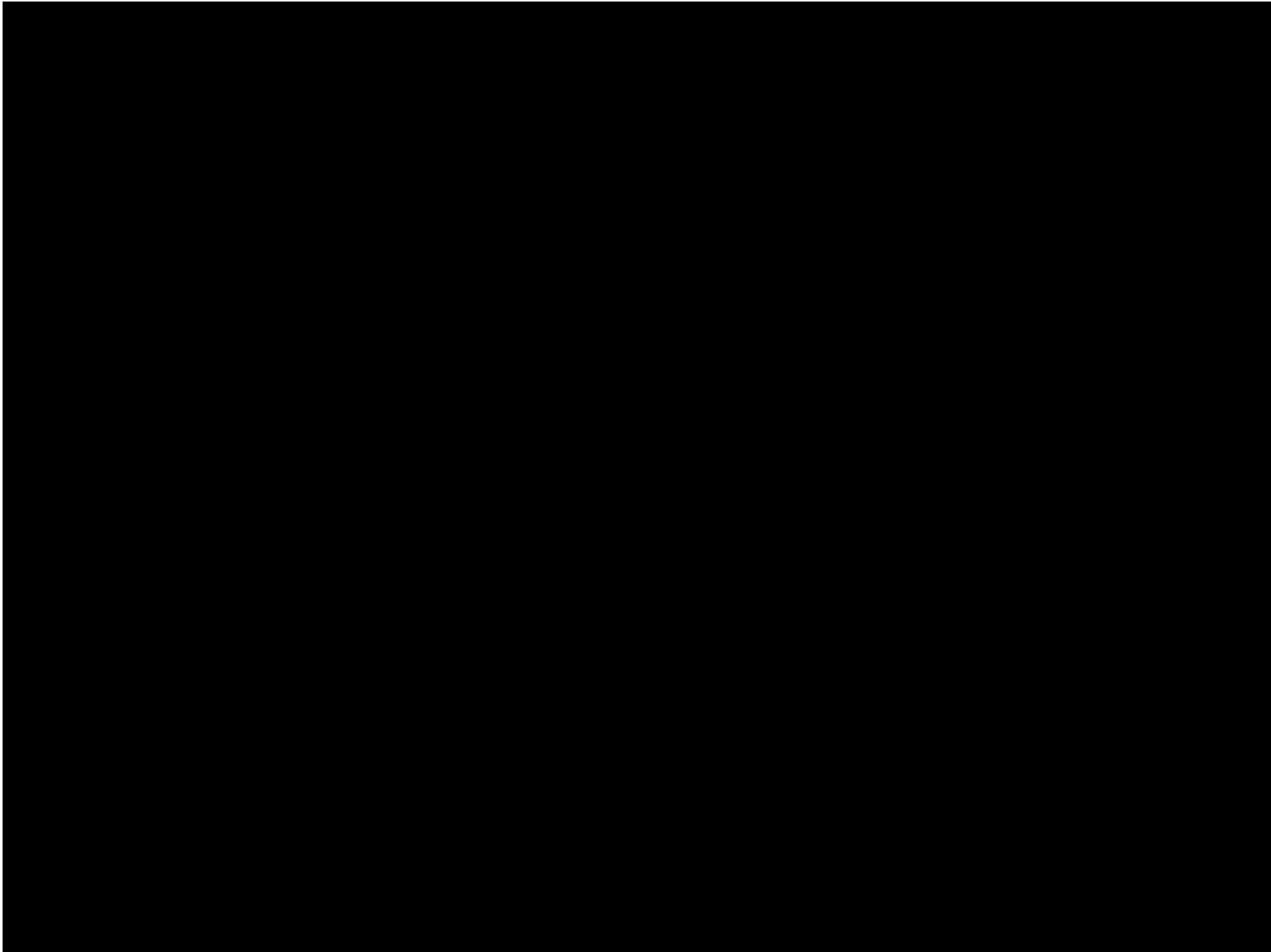
Assignment 4

- Connect to external sensor (Wii Remote) with bluetooth
- Render a live stream of data
- Whole body movement capture (4 points)



Topics

- Task Analysis
- Contextual Inquiry
- Personas



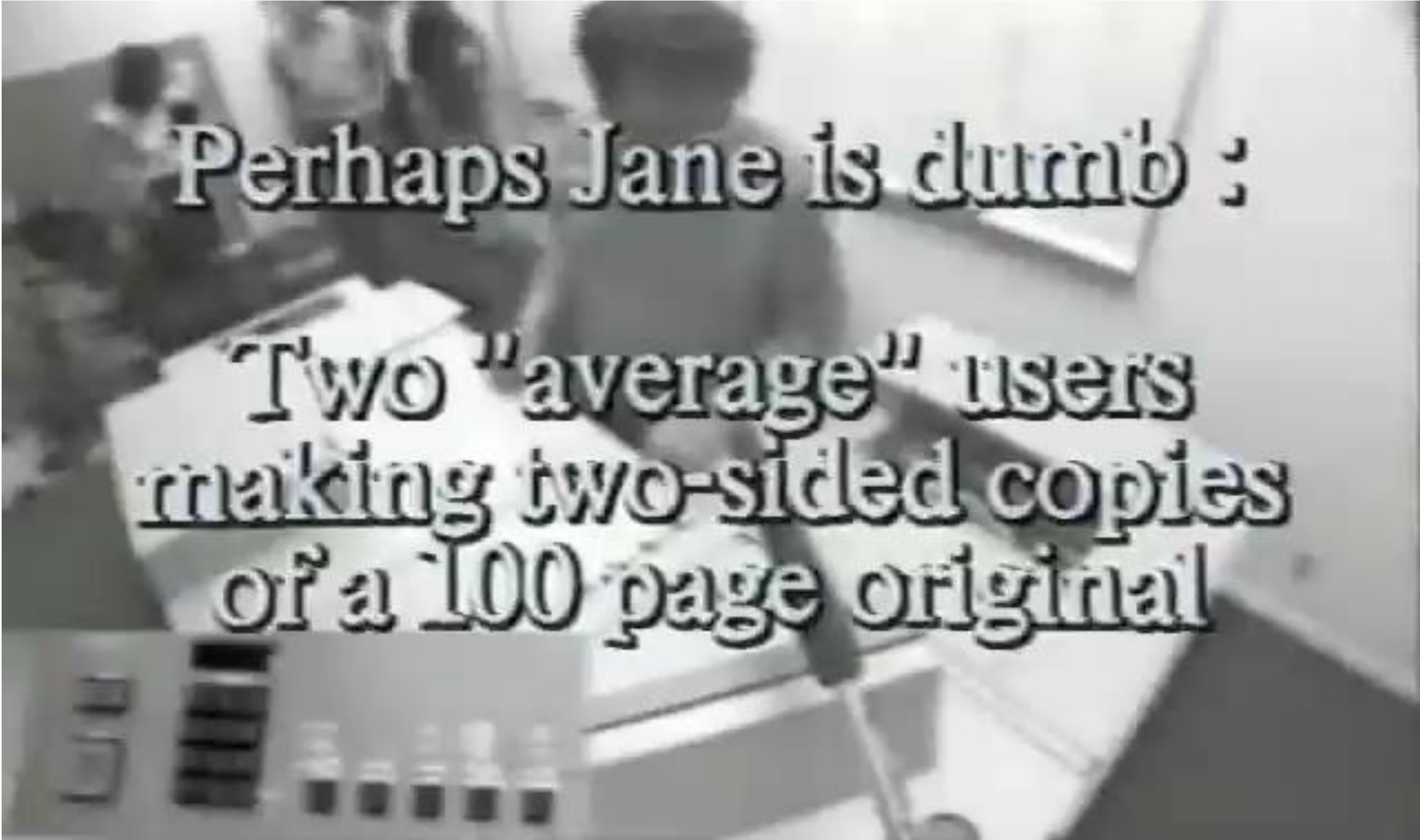
Xerox, ca. 1983...

Existing copiers judged as “too complicated” by customers. But why?

Lucy Suchman (UC Berkeley grad – Anthropology) at Xerox PARC suggests videotaping interactions.



Pushing the Green Button
(advertisement for the
8200 copier, c. 1983)



Perhaps Jane is dumb :

Two "average" users
making two-sided copies
of a 100 page original

About those “average” users...

- Allen Newell
 - (ACM Turing Award Winner)
- Ron Kaplan
 - (ACM Fellow, Chief Scientist at Powerset/Bing)
 - Observation showed that difficulties were not due to lack of sophistication of users, but due to problems “reading” (making sense of) an unfamiliar artifact.

Many varieties of observation techniques:

- Ethnography / Ethnomethodology
- Task Analysis
- Contextual Inquiry
- Cultural Probes
- Diary Studies
- Prompted “pager” studies”

Task Analysis



BART Ticket Machine

- Goals:
 - Buy new ticket
 - Add value to ticket
 - Pay with:
 - Debit, Credit, Cash



How To Improve Design?

Understand users' tasks

Designers must think about ...

- Who are the users?
- What tasks they would want to carry out?
- ...

Observe existing practices

Create scenarios of actual use

Try out ideas before building software

Task Analysis Questions

1. Who is going to use system?
2. What tasks do they now perform?
3. What tasks are desired?
4. How are the tasks learned?
5. Where are the tasks performed?
6. What's the relationship between user & data?
7. What other tools does the user have?
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Who is going to use it?

- Identity
 - Need several typical users for broad product
- Background/Skills
 - Knowledge users already have and rely on to perform task
- Values, Likes/Dislikes
- Personal characteristics
 - Education
 - Literacy
 - Physical abilities/disabilities
 - Some physical traits may be relevant: height, weight, ...
 - Age

Who (BART)?

- Identity
 - Types of users

- Background/Skills
 - Knowledge they use to perform task

Who (BART)?

- Identity
 - Tourists and visitors from elsewhere
 - Regular BART riders
 - Business people, students, disabled, elderly, etc.
- Background/Skills
 - Have an ATM card or credit card?
 - Know how to use ATM?
 - Experience with other public transit?

Who (BART)?

- Values, Likes/Dislikes
 - (i.e. May not like driving)

Who (BART)?

- Values, Likes/Dislikes
 - May not like driving
 - Want minimum fuss
 - Sometimes in a hurry
 - Maybe frugal (like saving money)
 - Maybe environmentalists
 - Hate having money eaten
 - Want to feel safe and maintain privacy
 - Hate feeling stupid

Who (BART)?

- Personal characteristics
 - Education, Physical abilities, Age, etc

Who (BART)?

- Personal characteristics
 - Mostly educated, fluent in English
 - Varying heights → don't make it too high or too low!
 - Mixture of ages, a few disabled users (e.g. wheelchairs).
 - Some bike users (make interface one-handed?)

Who is going to use it?

- Observe
 - Go out and find who uses the thing you are replacing

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Talk to Them

Find some real users

Talk to them

- Find out what they do now
- How would your system fit in?
- More on this a bit later

Are they too busy?

- Buy their time
 - t-shirts, coffee mugs, etc.



Old and New Tasks

Old

- The way people do things now

New

- The way you anticipate them doing things in future

Observe!

- Pick the most important tasks
- Remember you're guessing about future tasks
- Return to this when you test your prototypes

On-Line Billing Example


Dental office had billing automated

Assistants unhappy with new system

Old forms had hand-written notes

- e.g., patient A's insurance takes longer than most, etc.

B.C. CORONERS' SERVICE
DENTAL IDENTIFICATION FORM



CORONER CASE No. 98-129-0008 DATE: 09 December 1998
 INVESTIGATING CORONER S. Pallanin EXAMINATION SITE Vancouver City Hospital
 LOCATION Port Hardy
 CORONERS FORENSIC UNIT CASE # 98-123
 POLICE FILE No. 98-2317 AUTOPSY No. _____
 POLICE AGENCY RCMP Port Hardy HOSPITAL _____
 POLICE INVESTIGATOR Cst. H. Gillman PATHOLOGIST _____

CIRCUMSTANCES OF EXAMINATION Skeletal remains found on Nov 09, 98 in the gut of Seal Point, Port Hardy, B.C. Tantaline I.D. " - D.O.B. _____
01 Aug 19

	A,21	A	A,20	Px	Pc	Pc	22	Pc	Pc	Pc	Pc	Pc	Pc	Pc	X	X
UPPER RIGHT																
	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
LOWER RIGHT																
	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
	A,5,5	EN,25	Px	Pc	Pc	Pc	Pc	Pc	Pc	Pc	Pc	Pc	Pc	A,5,5	X	
	29	21												29		

CODE: Shade all restorations on Chart. Outline Prosthetic Appliances. Circle the appropriate descriptions

Fellow Code:	TC. Temporary Crown	EN. Root Treatment	X. Missing
A. Amalgam	GC. Gold Crown	BR. Bridge Work (Bracket & shedel)	PX. Posthumously missing
S. Composite	PC. Porcelain Crown	PP. Partial Denture (Bracket & describe)	NR. Not Recovered
G. Gold	PFM. Porcelain / Metal Crown	SC. Stainless Steel Crown	
SE. Fissure Sealant			
TF. Temporary Filling			

1. Mottled Enamel	8. Erosion	15. Retained Deciduous Teeth	22. <u>Congenitally Absent</u>
2. Enamel Hypoplasia	9. Fractured Enamel	16. Unusual Restorations	23. <u>Extremal points maxilla</u>
3. Discoloration	10. Retain	17. Unusual Appliances	24. <u>Buccal restoration compesi</u>
4. Staining	11. Malpositioned Teeth	18. Cyst Formation	
5. Calculus	12. Malocclusion	19. Post	
6. Abrasion	13. Unerupted Teeth	20. Pin	
7. Attrition	14. Supernumerary Teeth	21. Caries	

Post mortem dental x-ray Yes No
 Photos Yes No
 Study Models Yes No
 Jaws Disarticulated Yes No

Deciduous: Unrecoverable

Remarks: Calculus deposits gross, root headmouth uniget, likely to have "peg-shaped" #22. Extremal material #1

What Tasks (BART)?

Old

- Cash to buy new ticket
- Cash to add fare to existing ticket
- Cash or credit to buy a BART Plus at window

New

- Cash, credit, or ATM card to
 - Buy new ticket
 - Add fare to existing ticket
 - Buy a BART Plus ticket

Task level of detail can vary based on goals of analysis

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How are Tasks Learned?

What does the user need to know?

Do they need training?

- Book/manual information
- General knowledge / skills
- Special instruction / training

Experience, level of education and literacy

- 8th grade is often reasonable in broad design contexts

Learning Tasks (BART)

What does the user need to know?

- Walk up & use system
- Can't assume much background/training

Do they need training?

- Too time consuming

Experience, level of education and literacy

- Must be simple & similar to existing systems
- Vending machines
- ATM machines

Where is the Task Performed?

Office, laboratory, point of sale, home?

Effects of environment on users?

- Lighting, sound, comfort, interruptions, water

Social influence of environment

- Rituals, sacred places

Effects of other people (bystanders)?

- Rushing, safety, privacy

Under stress?

Where (BART)? Train Station



Where (BART)? Train Station

Loud

- Voice I/O not a good idea

Privacy

- Others can look over shoulder
- PIN must be confidential
 - ✦ Don't confirm with sound

Lighting is dim

- Make sure messages are readable

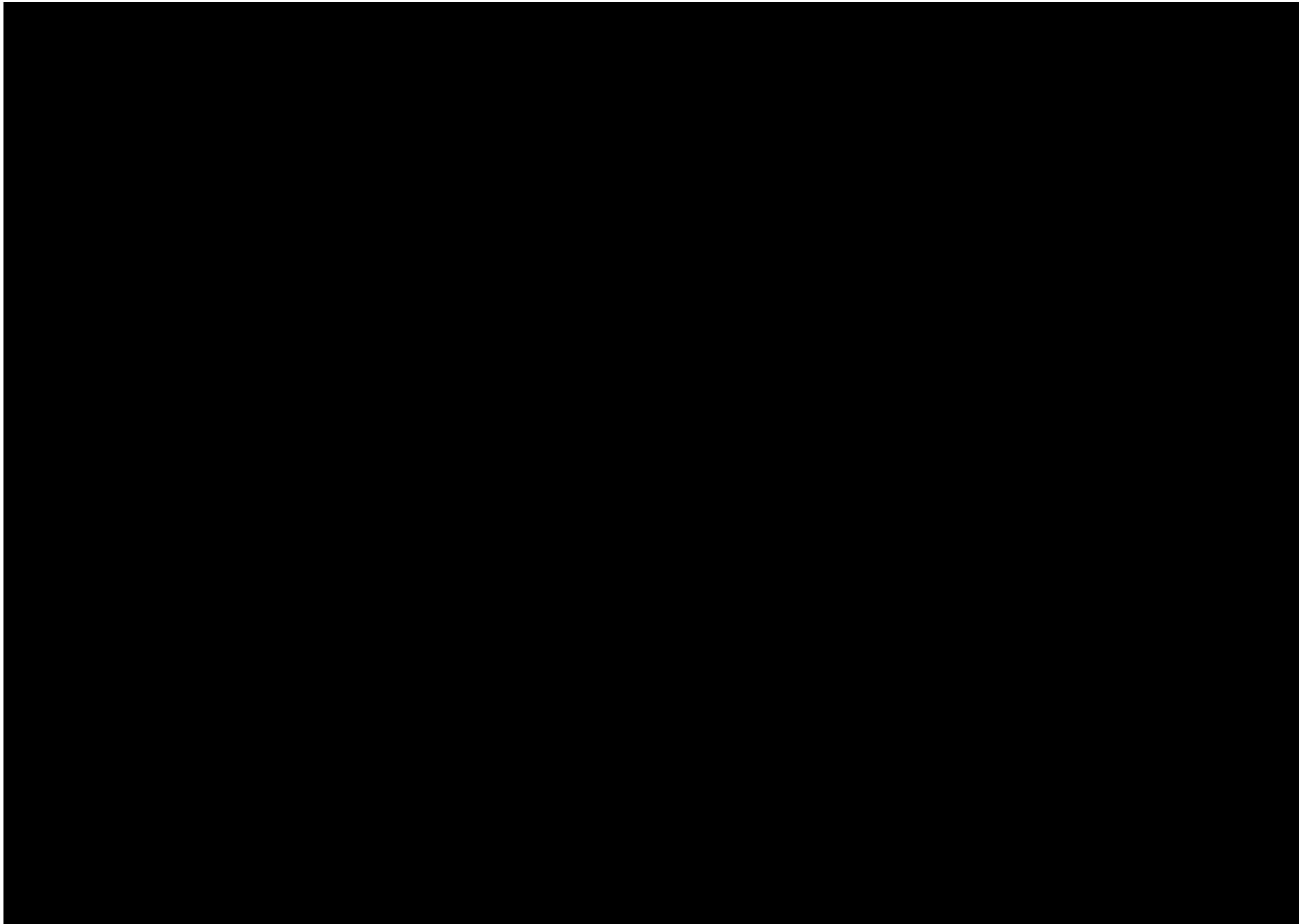
Rituals

- Panhandlers, musicians, reading the paper, cell phones



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Data Relationships

Personal data

- Privacy

- ✦ Always accessed at same machine?
- ✦ Do users move between machines?

Common data

- Handling and processing

- ✦ Used concurrently?
- ✦ Passed sequentially between users?

Remote access required?

Access to data restricted?

Data Relationships (BART)

Personal data

- Users may use any machine
- Store info on BART card

Common data

- Fare rules (e.g., how much for BART Plus)
- Used concurrently

Access to data restricted?

- Only you can use your ATM or credit card

No need for remote access

Other Tools

Users work with collection of tools

- Cell phone
- Home PC
- PDA
- Timetable booklet
- Maps

Can we use other tools to facilitate interaction?

Other Tools (BART)

- Credit card, ATM card (today)
- E-wallet in cell phone or organizer (someday)
- Real-time train info on the web
- User has PC at home
 - Could provide auditing for them?
- Text on phone, use for BART delay alerts?

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How do Users Communicate With Each Other?

Who communicates with whom?

About what?

Follow lines of the organization? Against it?

– Example: assistant to manager

- Installation of computers changes communication between them
- People would rather change their computer usage than their relationship

Not so relevant in context of BART

How often are the tasks performed?

Frequent users remember more details

Infrequent users may need more help

- But don't make it tedious

Which function is performed

- Most frequently? By which customers?
- Optimize system for these tasks will improve perception of good performance

Frequency (BART)?

Varying frequency of customers

- Some (most) take BART every day
- Some take it only occasionally

Varying frequency of tasks

- Can only do BART Plus every 2 weeks
- Might do add fare or buy new ticket every day
- Novices: Just one set of detailed instructions
- Experienced Users: Provide overview of process

How to find out for sure?

- Observe and interview customers!

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When Things Go Wrong (BART)



Time Constraints

What functions will customers be in a hurry for?

Which can wait?

Is there a timing relationship between tasks?

Time Constraints (BART)?

Customers will almost always be in a hurry

Lines form

Take less than 1 minute/transaction

Be able to do any task in any order

When Things Go Wrong

How do people deal with

- Errors?
- Practical difficulties?
- Catastrophes?

Is there a backup strategy?

Things Go Wrong (BART)?

Confusion/errors on task

- “Dismiss transaction” button (that works!)

Practical difficulty

- Generated ticket with too much money
- Cash-in policy?

Catastrophe

- Machine eats card → swipe instead of insert

Backup strategy

- Use cash in regular machines (and provide ATM)

BART TICKET KIOSK REDESIGNED

LJUBA MILJKOVIC
BEN COHEN

For our final project in User Interface Design at UC Berkeley's School of Information, we redesigned the [Bay Area Rapid Transit \(BART\)](#) ticket kiosk. Our goal was to improve the user interface software within the limitations of the existing 8-button, ATM-style physical interface - instead of going with a touch-screen. We believe our design offers major usability advantages, especially for infrequent riders. Pick the location of the kiosk and give it a try. Let us know what you think at feedback@bartkiosk.com.



Choose a destination

Buy a large-value ticket



Quick ticket to SFO ✈️

Quick ticket to OAK ✈️



Using Tasks in Design

Real tasks users have faced

- Collect any necessary materials

Should provide reasonable coverage

- Compare check list of functions to tasks

Mixture of simple & complex tasks

- Easy task (common or introductory)
- Moderate task
- Difficult task (infrequent or for power users)

Using Tasks in Design

1. Write up a description of the tasks
2. Produce scenarios covering each task
3. Rough out an interface design

Using Tasks in Design

- Write up a description of tasks
 - Formally or informally
 - Run by users and rest of the design team
 - Get more information where needed

Using Tasks in Design

- Produce scenarios covering each task
 - Task-based scenarios
 - Elaborated scenarios
 - Full-scale scenarios

“Jill is traveling to Seattle for her job next week and she wants to check on the amount she can be reimbursed for meals and other expenses.”

Using Tasks in Design

- Produce scenarios covering each task
 - Elaborated scenario example:
 - It's Friday afternoon and Joe is flying to Sydney. He doesn't have enough money for a taxi to the airport, and he's running late.

He goes to the local ATM and identifies himself.

He specifies that he wants \$100 from his savings account. He'd like the money in \$20 notes so that he can give the taxi driver the correct change.

He doesn't want a printed receipt, as he doesn't bother keeping track of transactions in this account.

Using Tasks in Design

- Rough out an interface design
 - Discard features that don't support your tasks
 - (or add a real task that exercises that feature)
 - Sketch major screens & functions (not too detailed)

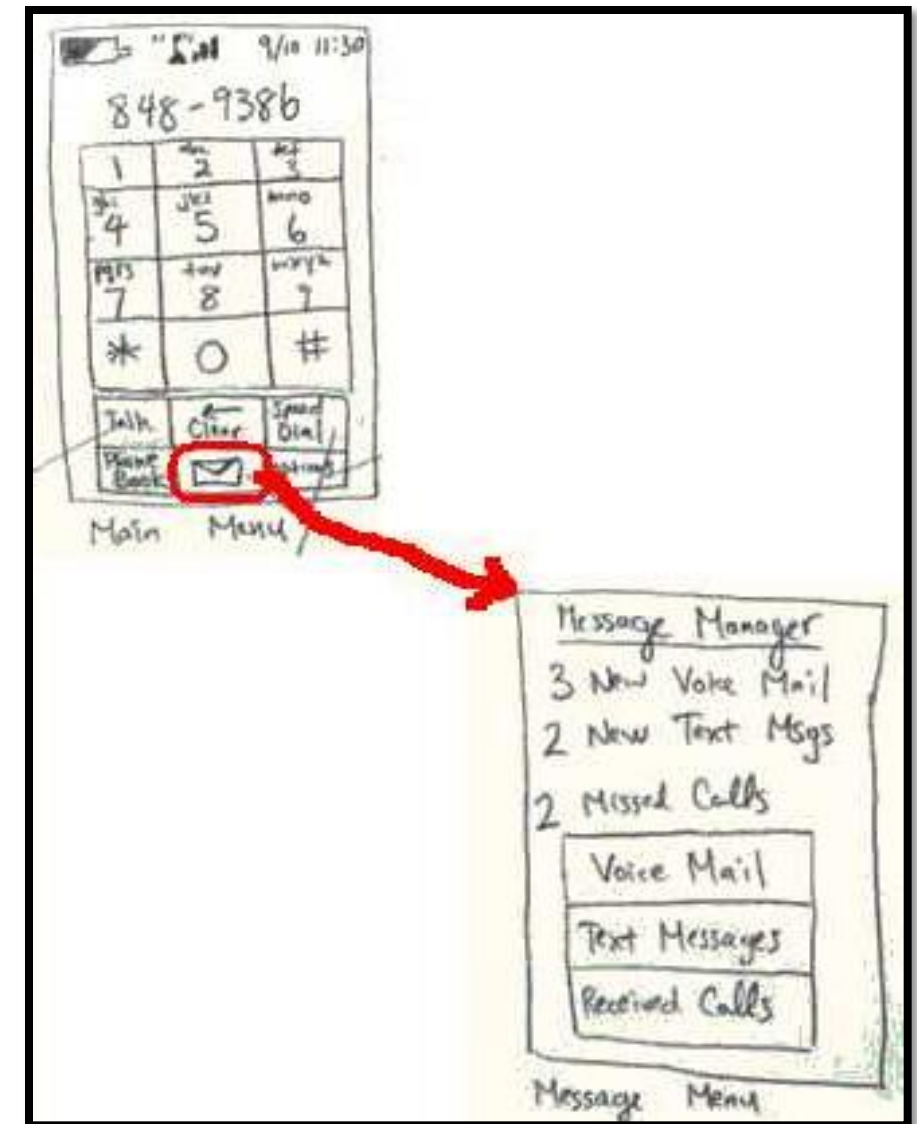
Roughing out

Sketch the design to

- Show how features will work together
- Settle design arguments by seeing examples
- Only examples → sometimes need to look beyond

Use storyboards

- sequences of sketches showing screens
- actions customers can take



Contextual Inquiry

Goals

- Get inside the user's head
- See their tasks the way they do
- Neither pure observation nor pure interview

Master-Apprentice Model



Allows user to teach us what they do

- Master (the user) works & talks
- We interrupt to ask questions as they go
- Each step reminds master of the next
 - Better than asking user to summarize work habits

Master-Apprentice Model



- Allows user to teach us what they do
 - Skill knowledge is usually tacit (can't put it in books)
 - Sometimes literal apprenticeship is best

Master-Apprentice Model

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Matsushita Home Bakery – First automatic bread maker to have twist/stretch motion [Nonaka 95]

Principles: Context

Conduct inquiry in a normal work environment

People summarize, but we want details

Keep it concrete when people start to abstract

- “We usually get reports by email”, ask “Can I see one?”

Look for skipped steps, ask user to fill them in.



Show and Tell

Encourage story-telling



Principles: Partnership

Stick with master-apprentice; avoid other models, i.e.

- Avoid interviewer/interviewee
- Above all, don't "teach"!

Partnership allows more apprentice interaction

- OK to be a designer and interrupt!
- ... but go back "in role":

Alternate watching & probing (*withdrawal & return*)

Principles: Interpretation

Good facts only the starting point

- Design based on interpretations

Validate & rephrase

- Check interpretations with user
 - Users uncomfortable until phrasing is right - theirs is right by definition
- Be committed to hearing what user is really saying

Principles: Focus

You need data about specific tasks

- Steer conversation to stay on useful topics

Respect triggers (flags to change focus/understanding)

- Shift of attention (some one walks in)
- Treat every user utterance as a potential clue to ***something important***



Users: Unique or One of Many?

“.. nothing any person does is done for no reason; if you think it's for no reason, you don't yet understand the point of view from which it makes sense.”

“Take the attitude that nothing any person does is unique to them, it always represents an important class of customers whose needs will not be met if you don't figure out what's going on.”

Thoughts on Inquiries

Establish rapport before diving in

Use recording technologies

- Notebooks, tape recorders, still & video cameras

Master/apprentice can be hard

- Staying in role – it's a lot like acting
- Don't correct! Its not a lesson!
- Its hard not designing on the fly
- Sometimes you need to put down your product

Personas

Personas (from Cooper)

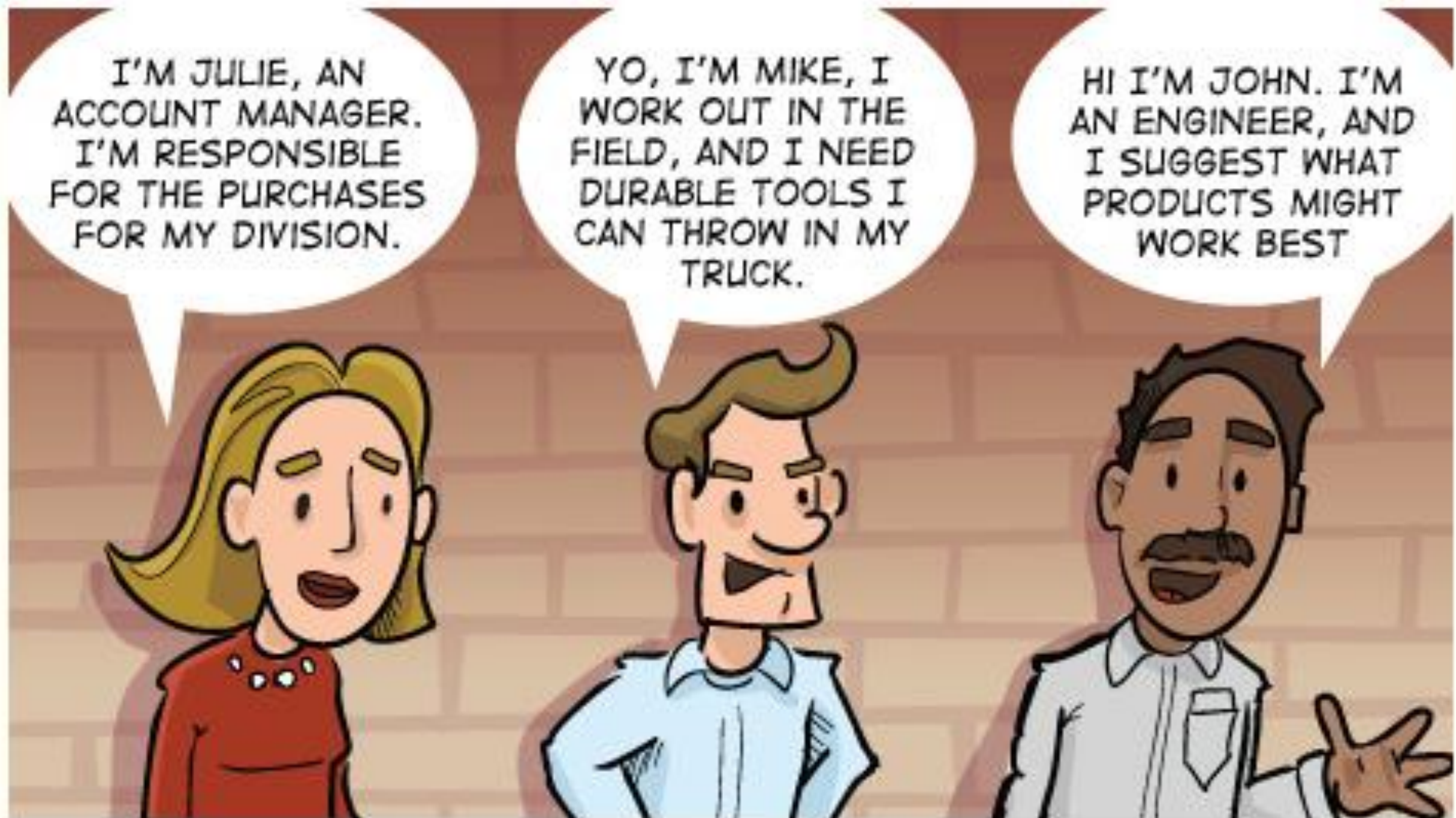
“Hypothetical Archetypes”

- Archetype: (American Heritage)
 - An original model or type after which other similar things are patterned; a prototype
 - An ideal example of a type; quintessence

A precise description of user in terms

- Capabilities, inclinations, background
- Goals (not tasks)

Persona Examples



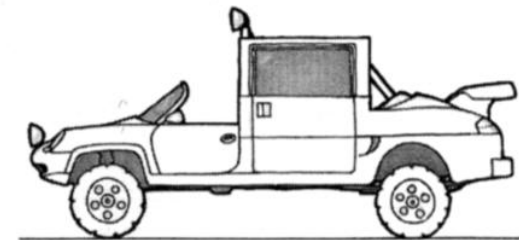
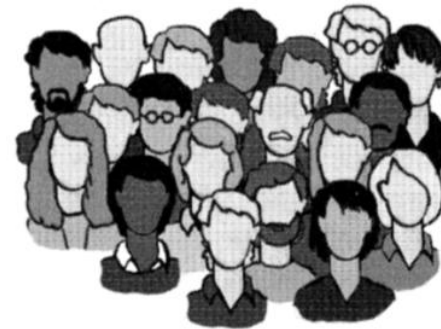
Brad Colbow (<http://carsonified.com/blog/design/how-to-understand-your-users-with-personas/>)

Why Personas?

Easier to generalize about specific fictional people

- We can easily discuss what Harry Potter or Scarlett O’Hara will think or do

General users have too many conflicting goals



Specific personas have clear, well-articulated goals



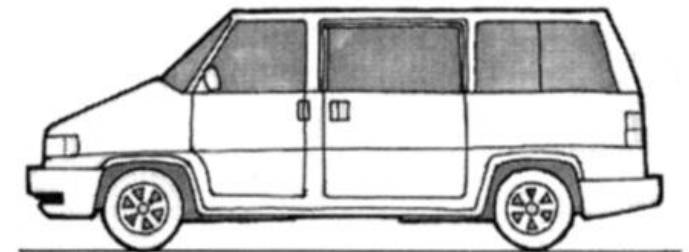
Alesandro's goals

- Go fast
- Have fun



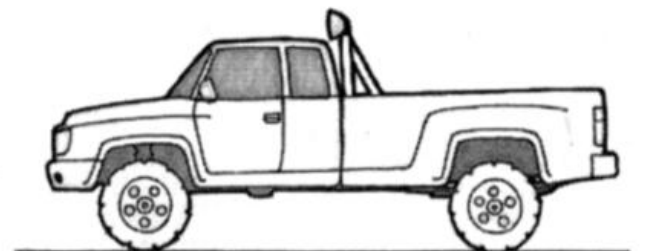
Marge's goals

- Be safe
- Be comfortable



Dale's goals

- Haul big loads
- Be reliable



Defining and Using Personas

Defining them

- Identify major clusters from multiple user interviews/inquiries
- Synthesize their goals
- Check for completeness and specificity
 - Specificity prevents “elastic user”
- Try them out by developing narrative

Design each interface for a **single primary** persona

- Yet other type might use the interface

AMANDA



GLORIA



CHARLES



Age

7

34

66

Occupation

Second grade student

Part-time
office administrator

Retired accountant

Home Life

Lives with her mother,
father, and younger
sister in the suburbs of
a large city.

Lives with her husband
and two children in a
mid-sized city.

Lives with his wife
in the suburbs; has
four children and six
grandchildren.

Education

In elementary school

Has a bachelor degree

Has an MBA

LIFESTYLE

Activities

Plays soccer, reads, and
takes ballet lessons;
saves her birthday
money and allowance to
spend at the mall.

Enjoys crossword
puzzles and reading
mystery novels. Spends
a lot of time driving her
children to activities.

Likes to work in the
garden and drink wine.
Enjoys traveling with his
wife and investing in the
stock market.

Ultimate Goal

Goal is to turn 10 so that

Goal is to make sure her

Goal is to make sure

Summary

Task analysis

- Understand users and their tasks
- Real tasks with reasonable functionality coverage
- Do your best to anticipate new tasks

Contextual inquiry

- Helps answer the task analysis questions
- Hybrid between interview and observation
- Use master-apprentice model to get them to teach you

Personas

- Specific archetype of target user
- Build based on contextual inquiries/interviews

Resources

- Summary of usability methods
 - <http://www.usability.gov/methods/>