Evaluating and Presenting Collected Data

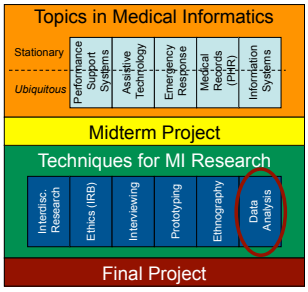
Class 33

Agenda

- 3:00-3:25 Presenting Data
- 3:25-3:35 Final Presentations
- 3:35-3:50 Group brainstorming

Project Questions?

Where are we?



What are some data collection methods we can use in studies?

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- Interviews
- Surveys/Questionnaires
- Shadowing
- Logging
- Observations
- Think-Alouds
- Heuristic Evaluation
- Cognitive Walkthrough

Mapping Data Collection Methods with Qualitative and Quantitative Data

- Interviews
- Surveys/Questionnaires
- Shadowing
- Logging
- Observations
- Think-Alouds
- Heuristic Evaluation
- Cognitive Walkthrough

Mapping Data Collection Methods with Qualitative and Quantitative Data

	Usual Raw Data	Ex. Qual. Data	Ex. Quant. Data	Initial Processing
Interviews	Audio recordings Interviewer notes Video recordings	Responses to open questions Video pictures Participant opinions	Age, job role, years of experience Responses to closed questions	Transcription of recordings Expansion of notes
Questionnaires	Written responses Online databases	Responses to open questions Responses in comments Participant opinions	Age, job role, years of experience Responses to closed questions	Clean up data Filter into different data sets
Observations	Observer's notes Photographs Audio and video recordings Data logs Think alouds	Records of behavior Description of a task as it is undertaken Copies of informal procedures	Demographics of participants Time spent on tasks The number of people involved in an activity	Expansion of notes Transcription of recordings Synchronization between data recordings
Methods without Users	Notes Proposed actions Group actions	Problems found with interface Discussion of problems	Number of problems found per action Total # of problems Time to complete	Expansion of notes Prioritize problems Discuss solutions

Edited from *Interaction Design*. Preece, Rogers, and Sharp

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Qualitative Data Analysis

Qualitative analysis – expresses the nature of elements and is represented as themes, patterns, stories

- Goetz and LeCompte (1984)
  - Who is present
  - What is happening
  - Where is it happening
- Goals:
  - Identify recurring patterns and themes
  - Categorize data
  - Analyze critical incidents

Qualitative Data Analysis Methods

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

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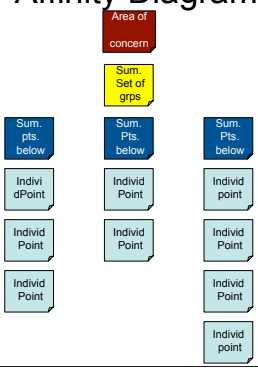
Affinity Diagrams



- ***Post-it notes***
- ***Paper cut-outs***
- ***Software***

Coding Transcripts

- Develop coding scheme
- Read through transcript and bracket area referencing coding scheme
- Quantify number of usability problems; mean number of problems per participant; number of unique problems, etc.

Coding Example

1. Interface Problems
   a) Verbalization showing dissatisfaction about aspect of interface
   b) Verbalization of confusion about aspect of interface
   c) Verbalization of outcome of an action
   d) Participant has difficulty obtaining goal
   e) Verbalization of physical discomfort
   f) Participant makes a suggestion for redesign of the interface
2. Content Problems
   a) Verbalization of dissatisfaction about aspects of the content
   b) Verbalization about confusion of the content or text
   c) Verbalization of a misunderstanding of the electronic text

I'm thinking that's a lot of information to absorb on the screen. I don't concentrate very well when I have one hand on the baby while I'm looking at the small screen. It would still be nice to see it on a piece of paper…There is so much reference to what I previous input into the PDA like I've already forgotten the name of the measurement method, so I'm not sure what to put in here…Now when I click previous, I have to click previous four times to get the data I want!

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[I'm thinking that's a lot of information to absorb on the screen. **UP 1.a] [**I don't concentrate very well when I have one hand on the baby while I'm looking at the small screen. **UP 1.a] [**It would still be nice to see it on a piece of paper **UP 1.f]**…**[**There is so much reference to what I previous input into the PDA **UP 2.a] [**like I've already forgotten the name of the measurement method, so I'm not sure what to put in here **UP 2.b]**…[Now when I click previous, I have to click previous four times to get the data I want! **UP 1.a, 1.d]**

Grounded Theory

- Aims to derive theory from systematic analysis of data
- Based on categorization approach (called here 'coding')
- Three levels of 'coding'
  - Open: identify categories
  - Axial: flesh out and link to subcategories
  - Selective: form theoretical scheme
- Researchers are encouraged to draw on own theoretical backgrounds to inform analysis

From *Interaction Design*. Preece, Rogers, and Sharp

Activity Theory

- Explains human behavior in terms of our practical activity with the world
- Provides a framework that focuses analysis around the concept of an 'activity' and helps to identify tensions between the different elements of the system
- Two key models: one outlines what constitutes an 'activity'; one models the mediating role of artifacts

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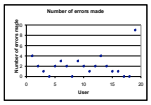
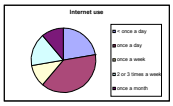
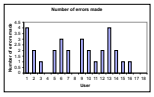
Simple quantitative analysis

- Averages
  - Mean: add up values and divide by number of data points
  - Median: middle value of data when ranked
  - Standard Deviation: variability in the group of data
  - Mode: figure that appears most often in the data
- Raw Numbers or Percentages (only when N>15-20)
- Graphical representations give overview of data







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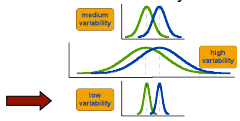
More Complex Quantitative Data Analysis

- T-Tests
  - Two groups to compare
  - Are two means statistically different from each other?



- ANOVA
  - Statistical significance of the difference in mean scores among 2 or more groups

Tools to Support Data Analysis

- Spreadsheet – simple to use, basic graphs
- Statistical packages, e.g., R (Book: Crawley *Statistical Computing)*, SPSS
- Qualitative data analysis tools
  - Categorization and theme-based analysis (e.g., N6)
  - Quantitative analysis of text-based data

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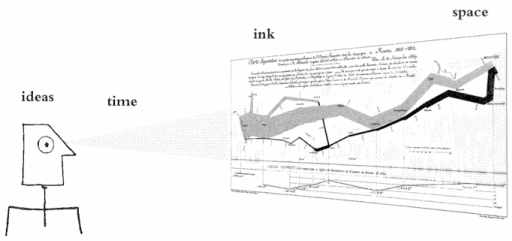
Words to ***avoid*** when writing up your results…

- Words that make your findings sound too general
  - Many, often, all
- Percentages (e.g., 50% of people)
  - Instead write, " 2 out of 4 people…"
- Strunk and White: Empty Phrases

(automatic -3 points for each empty phrase in final report)

- Despite the fact that
- The fact that/For the fact that
- Due to (*Due to the fact that)*
- In order to/In order that
- That are being
- It is shown that/It appears that/What this shows is that

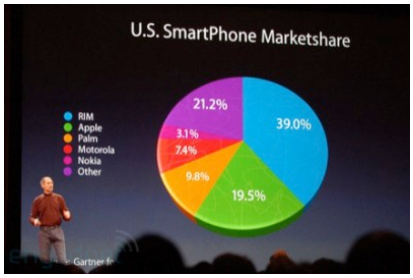
Get your message across!



Give the user the greatest amount of ideas in the shortest time with the least ink in the smallest space.

For more information, see Edward Tufte books

Hmm…



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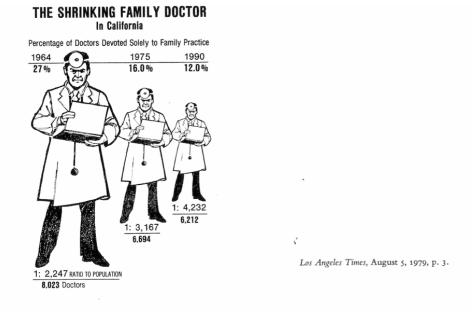

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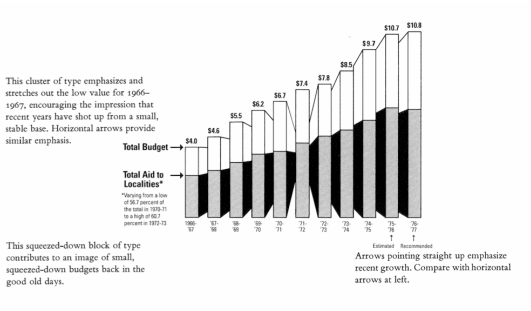
Hmmmm……lots of growth?



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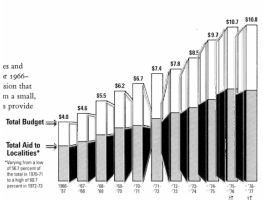

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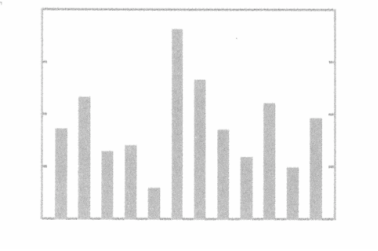

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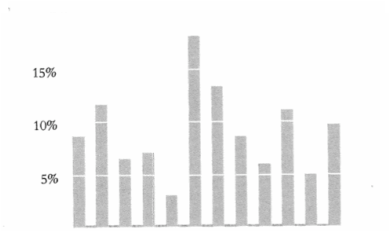

Still needs x and y labels, figure #, and caption

For more information, see Edward Tufte books

Get your message across!

As predators increase, prey decreases…

For more information, see Edward Tufte books

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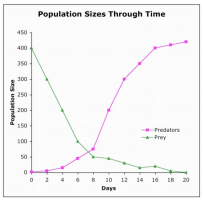

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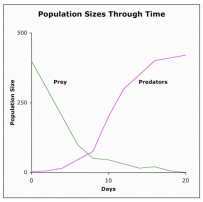

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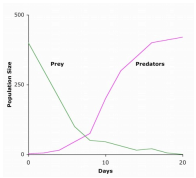


Figure 1: Predator and prey populations over time

As predators increase, prey decreases…

For more information, see Edward Tufte books

Why is this important?

http://www.youtube.com/watch?v=j4JOjcDFtBE

Challenger, January 28, 1986

Why is this important?

HISTORY OF O-RING DAMAGE ON SRM FIELD JOINTS

	SRM No.	Cross Sectional View: Erosion Depth (in.)	Cross Sectional View: Perimeter Affected (deg)	Cross Sectional View: Nominal Dia. (in.)	Top View: Length Of Max Erosion (in.)	Top View: Total Heat Affected Length (in.)	Clocking Location (deg)
61A LH Center Field**	22A	None	None	0.280	None	None	36°-66°
61A LH ~~CENTER~~ FIELD**	22A	NONE	NONE	0.280	NONE	NONE	338°-18°
51C LH Forward Field**	15A	0.010	154.0	0.280	4.25	5.25	163
51C RH Center Field (prim)***	15B	0.038	130.0	0.280	12.50	58.75	354
51C RH Center Field (sec)***	15B	None	45.0	0.280	None	29.50	354
41D RH Forward Field	13B	0.028	110.0	0.280	3.00	None	275
41C LH Aft Field*	11A	None	None	0.280	None	None	--
41B LH Forward Field	10A	0.040	217.0	0.280	3.00	14.50	351
STS-2 RH Aft Field	2B	0.053	116.0	0.280	--	--	90

*Hot gas path detected in putty. Indication of heat on O-ring, but no damage.
**Soot behind primary O-ring.
***Soot behind primary O-ring, heat affected secondary O-ring.

Clocking location of leak check port - 0 deg.

OTHER SRM-15 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY AND NO SOOT NEAR OR BEYOND THE PRIMARY O-RING.

SRM-22 FORWARD FIELD JOINT HAD PUTTY PATH TO PRIMARY O-RING, BUT NO O-RING EROSION AND NO SOOT BLOWBY. OTHER SRM-22 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY.

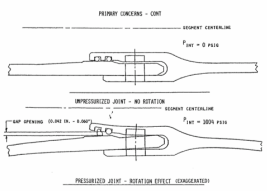
For more information, see Edward Tufte books

Why is this important?

PRIMARY CONCERNS -

FIELD JOINT - HIGHEST CONCERN

- EROSION PENETRATION OF PRIMARY SEAL REQUIRES RELIABLE SECONDARY SEAL FOR PRESSURE INTEGRITY
  - IGNITION TRANSIENT - (0-600 MS)
    - (0-170 MS)HIGH PROBABILITY OF RELIABLE SECONDARY SEAL
    - (170-330 MS) REDUCED PROBABILITY OF RELIABLE SECONDARY SEAL
    - (330-600 MS) HIGH PROBABILITY OF NO SECONDARY SEAL CAPABILITY
- STEADY STATE - (600 MS - 2 MINUTES)
  - IF EROSION PENETRATES PRIMARY O-RING SEAL - HIGH PROBABILITY OF NO SECONDARY SEAL CAPABILITY
    - BENCH TESTING SHOWED O-RING NOT CAPABLE OF MAINTAINING CONTACT WITH METAL PARTS GAP OPENING RATE TO MEOP
    - BENCH TESTING SHOWED CAPABILITY TO MAINTAIN O-RING CONTACT DURING INITIAL PHASE (0-170 MS) OF TRANSIENT



For more information, see Edward Tufte books

Why is this important?

CONCLUSIONS :

- TEMPERATURE OF O-RING IS NOT ONLY PARAMETER CONTROLLING BLOW-BY

  SRM 15 WITH BLOW-BY HAD AN O-RING TEMP AT 53°F SEAL 13 WITH BLOW-BY HAD AN O-RING TEMP AT 75°F FOUR DEVELOPMENT MOTORS WITH NO BLOW-BY WERE TESTED AT O-RING TEMP OF 47° TO 52°F

  DEVELOPMENT MOTORS HAD PUTTY PACKING WHICH RESULTED IN BETTER PERFORMANCE

- AT ABOUT 50°F BLOW-BY COULD BE EXPERIENCED IN CASE JOINTS

- TEMP FOR SRM 25 ON 1-28-86 LAUNCH WILL BE 29°F 9 AM
  38°F 2 PM

- HAVE NO DATA THAT WOULD INDICATE SRM 25 IS DIFFERENT THAN SRM 15 OTHER THAN TEMP

RECOMMENDATIONS :

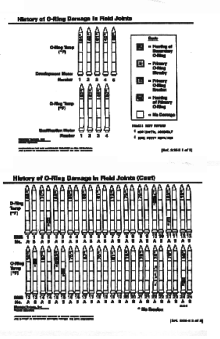
- O-RING TEMP MUST BE $\geq$ 53°F AT LAUNCH

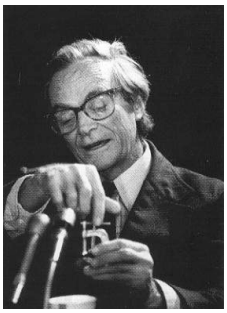
  DEVELOPMENT MOTORS AT 47° TO 52°F WITH PUTTY PACKING HAD NO BLOW-BY SRM 15 (THE BEST SIMULATION) WORKED AT 53°F

- PROJECT AMBIENT CONDITIONS (TEMP & WIND) TO DETERMINE LAUNCH TIME

For more information, see Edward Tufte books

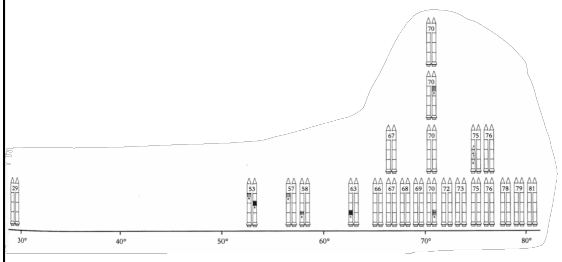
Why is this important?





For more information, see Edward Tufte books

Monday Morning Quarterbacking



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Looking forward

- Class on Monday
- Guest Speaker on Wednesday
- No Class on Friday