# Chapter 8
# Data analysis, interpretation and presentation

# Overview

- Qualitative and quantitative

- Simple quantitative analysis

- Simple qualitative analysis

- Tools to support data analysis

- Theoretical frameworks: grounded theory, distributed cognition, activity theory

- Presenting the findings: rigorous notations, stories, summaries

# Quantitative and qualitative

- Quantitative data – expressed as numbers
- Qualitative data – difficult to measure sensibly as numbers, e.g. count number of words to measure dissatisfaction
- Quantitative analysis – numerical methods to ascertain size, magnitude, amount
- Qualitative analysis – expresses the nature of elements and is represented as themes, patterns, stories
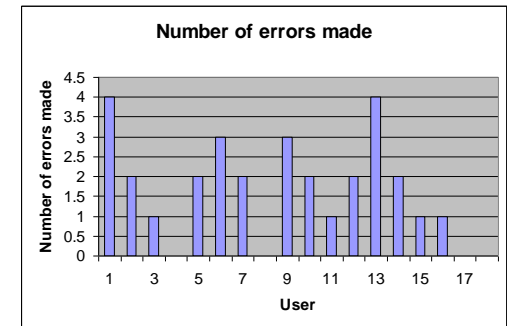
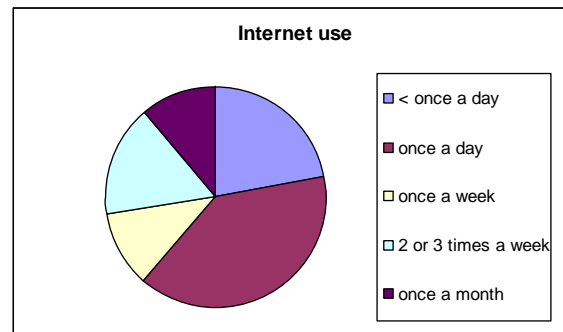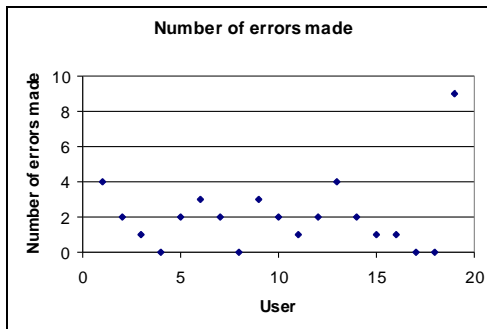- Be careful how you manipulate data and numbers!
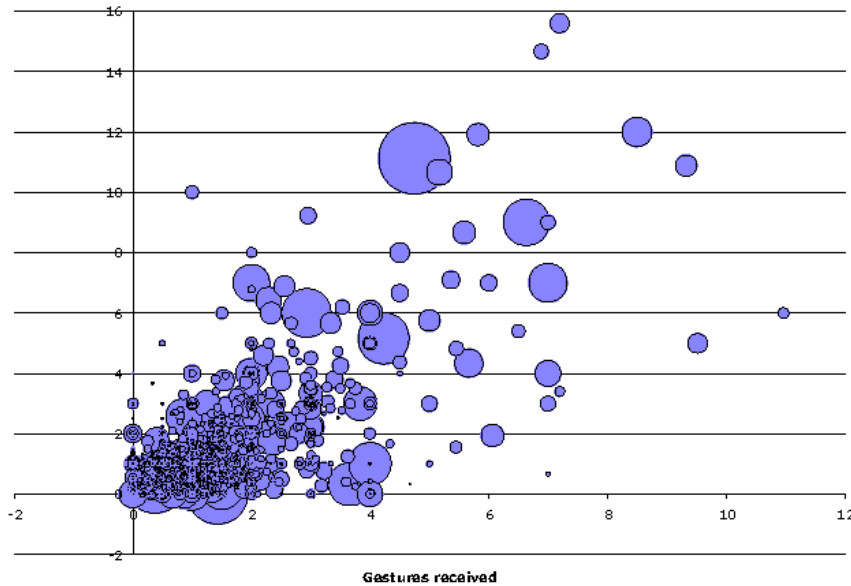
# Simple quantitative analysis

- Averages
  - Mean: add up values and divide by number of data points
  - Median: middle value of data when ranked
  - Mode: figure that appears most often in the data

- Percentages

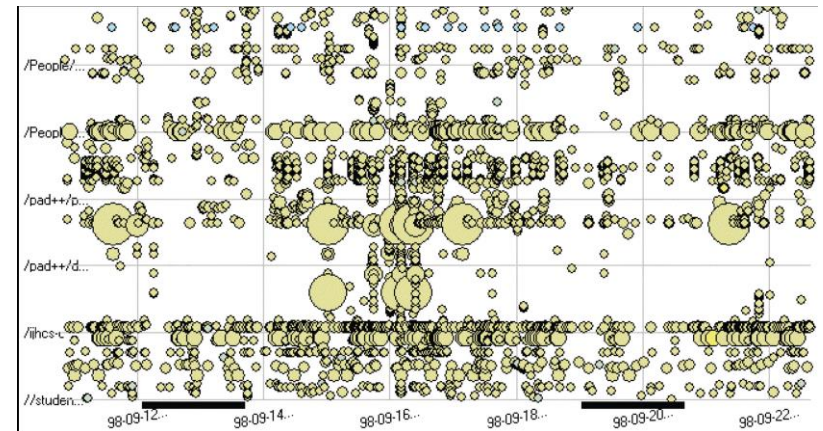- Graphical representations give overview of data
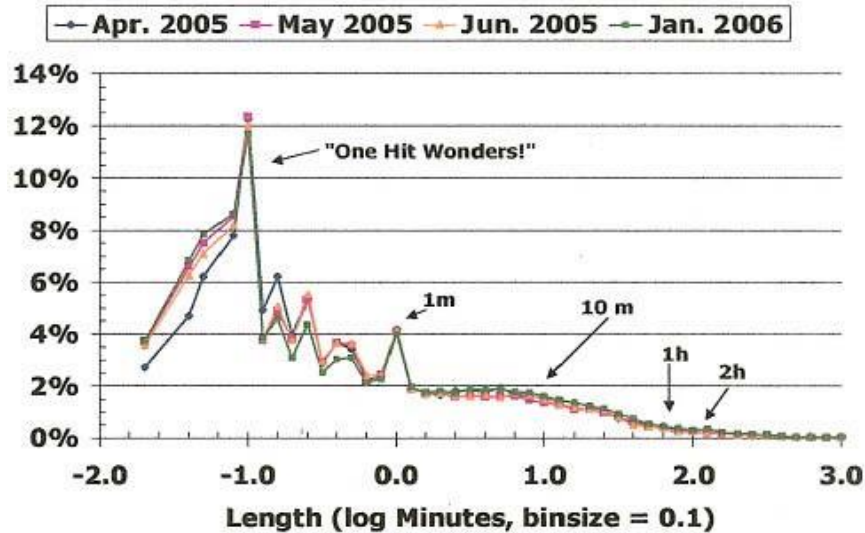
# Visualizing log data



Gestures received

Interaction
profiles of players
in online game

Log of web page
activity

# Web analytics

## Session Length



Legend: Apr. 2005, May 2005, Jun. 2005, Jan. 2006

"One Hit Wonders!"
1m
10 m
1h
2h

Length (log Minutes, binsize = 0.1)

## Login Frequency Histogram



Several Users on One Account

Regular Usage: Spikes occur at 1d, 2d,

Multiple Sessions on the Same Day

log(²t, days binsize=0.01)

Legend: All Users, Top 10 Users, Top 20 Users
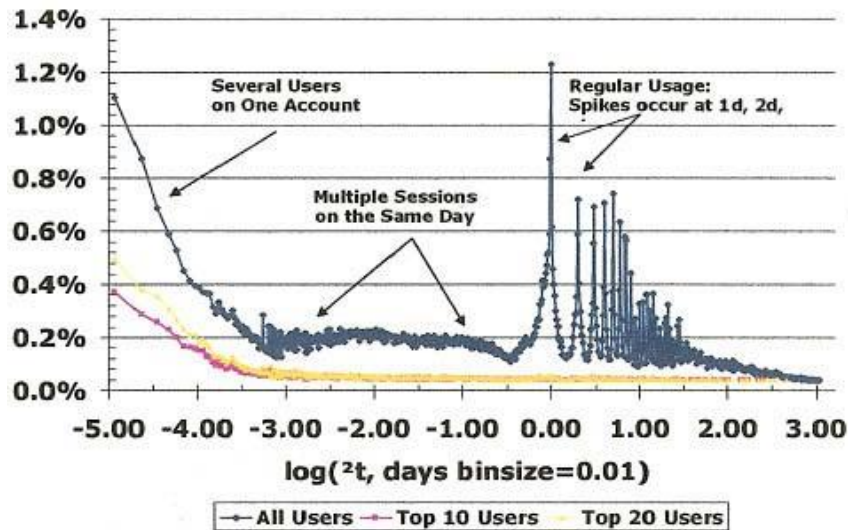
# Simple qualitative analysis

- ## Recurring patterns or themes
  - Emergent from data, dependent on observation framework if used

- ## Categorizing data
  - Categorization scheme may be emergent or pre-specified

- ## Looking for critical incidents
  - Helps to focus in on key events
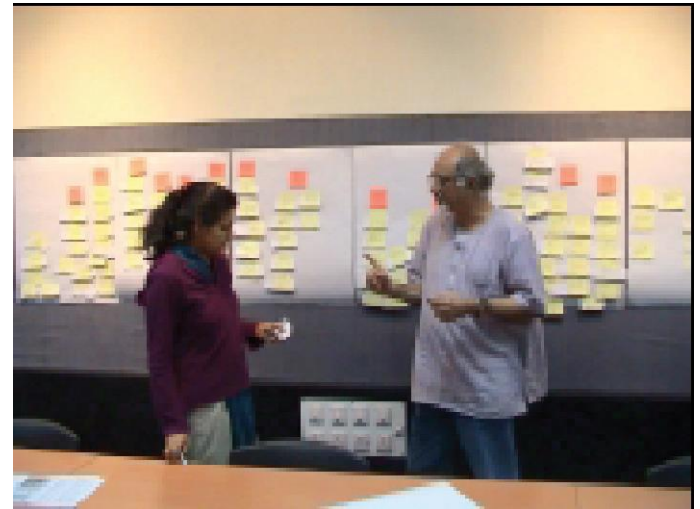
# Tools to support data analysis

- Spreadsheet – simple to use, basic graphs

- Statistical packages, e.g. SPSS

- Qualitative data analysis tools
  - Categorization and theme-based analysis, e.g. N6
  - Quantitative analysis of text-based data

- CAQDAS Networking Project, based at the University of Surrey (http://caqdas.soc.surrey.ac.uk/)

# Theoretical frameworks for qualitative analysis

- Basing data analysis around theoretical frameworks provides further insight
- Three such frameworks are:
  - Grounded Theory
  - Distributed Cognition
  - Activity Theory

# 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

# Distributed Cognition

- The people, environment & artefacts are regarded as one cognitive system

- Used for analyzing collaborative work

- Focuses on information propagation & transformation
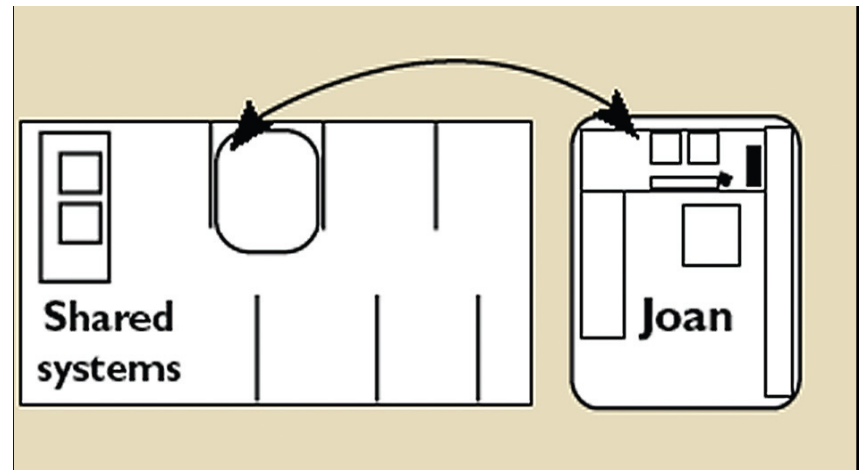
# Activity Theory

- 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

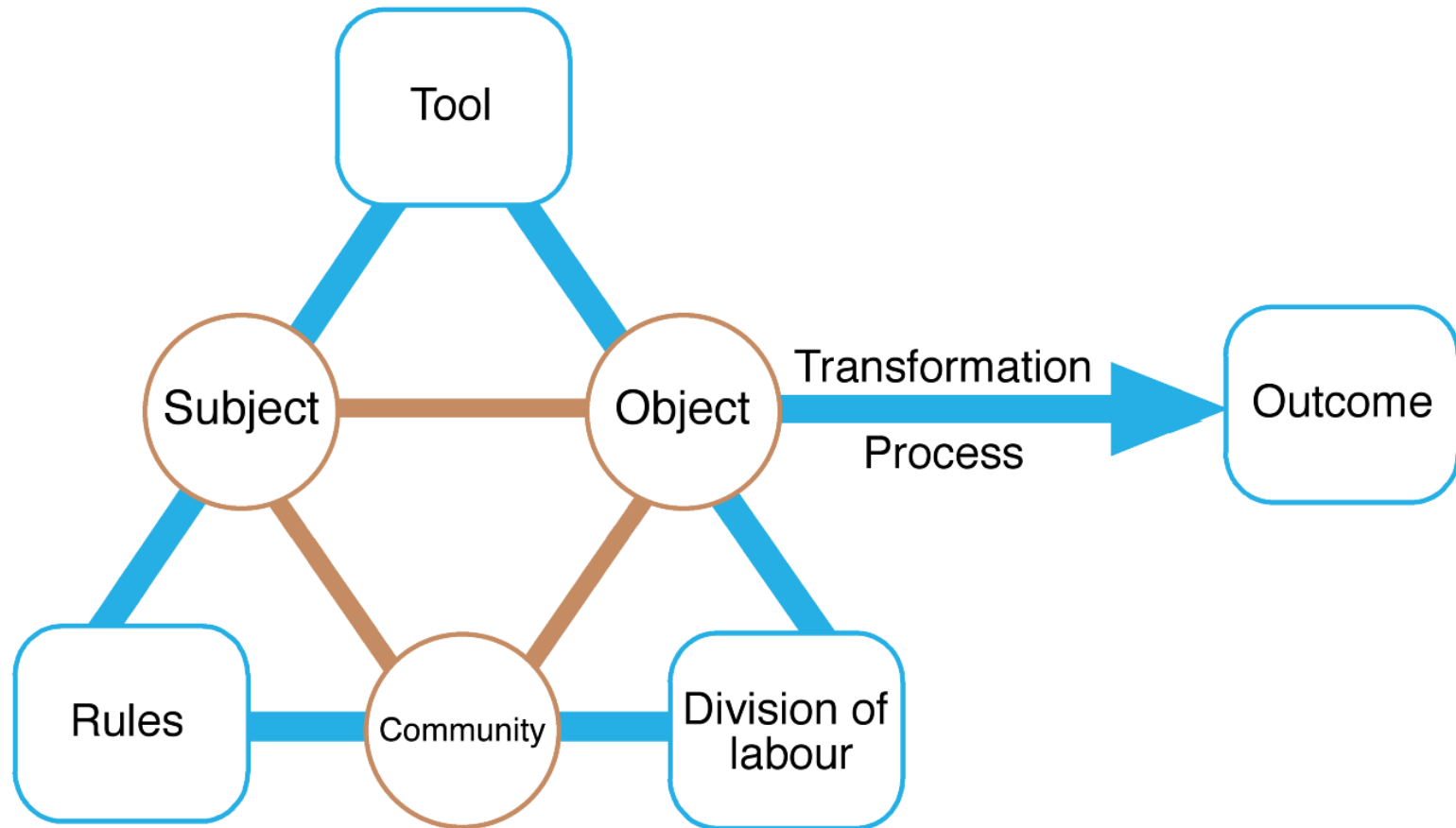# Individual model

Activity   –   Motive

↑ ↓        ↑ ↓

Action   –   Goal

↑ ↓        ↑ ↓

Operation  –  Conditions

# *Engeström's (1999) activity system model*

# Presenting the findings

- Only make claims that your data can support

- The best way to present your findings depends on the audience, the purpose, and the data gathering and analysis undertaken

- Graphical representations (as discussed above) may be appropriate for presentation

- Other techniques are:
    - Rigorous notations, e.g. UML
    - Using stories, e.g. to create scenarios
    - Summarizing the findings

# Summary

- The data analysis that can be done depends on the data gathering that was done
- Qualitative and quantitative data may be gathered from any of the three main data gathering approaches
- Percentages and averages are commonly used in Interaction Design
- Mean, median and mode are different kinds of 'average' and can have very different answers for the same set of data
- Grounded Theory, Distributed Cognition and Activity Theory are theoretical frameworks to support data analysis
- Presentation of the findings should not overstate the evidence