

Introduction to Human Computer Interaction

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Week 11

GOMS, Others...

Ponnurangam Kumaraguru (“PK”)

Associate Professor

ACM Distinguished & TEDx Speaker

[Linkedin/in/ponguru/](https://www.linkedin.com/in/ponguru/)

[fb/ponnurangam.kumaraguru](https://www.facebook.com/ponnurangam.kumaraguru), [@ponguru](https://twitter.com/ponguru)



Deciding on Data to Collect

- Two types of data
 - process data
 - observations of what users are doing & thinking
 - bottom-line data
 - summary of what happened (time, errors, success)
 - independent and dependent variables

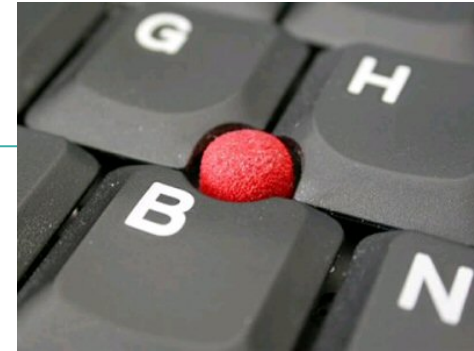


Which Type of Data to Collect?

- Always focus on process data first
 - gives good overview of where problems are
- Bottom-line doesn't tell you where to fix
 - just says "too slow", "too many errors", etc.
- Hard to get reliable bottom-line results
 - need many users for statistical significance

Comparing Two Alternatives

- *Between groups* experiment
 - two groups of test users
 - each group uses only 1 of the systems
- *Within groups* experiment
 - one group of test users
 - each person uses both systems, randomized ordering
 - can't use the same tasks or order (learning)
- Between groups requires many more participants than within groups



Discount Usability Engineering

- Reaction to excuses for not doing user testing
 - “too expensive”, “takes too long”, ...
- Cheap
 - no special labs or equipment needed
 - the more careful you are, the better it gets
- Fast
 - on order of 1 day to apply
 - standard user tests may take week or more
- Easy to use
 - some techniques can be taught in 2-4 hours

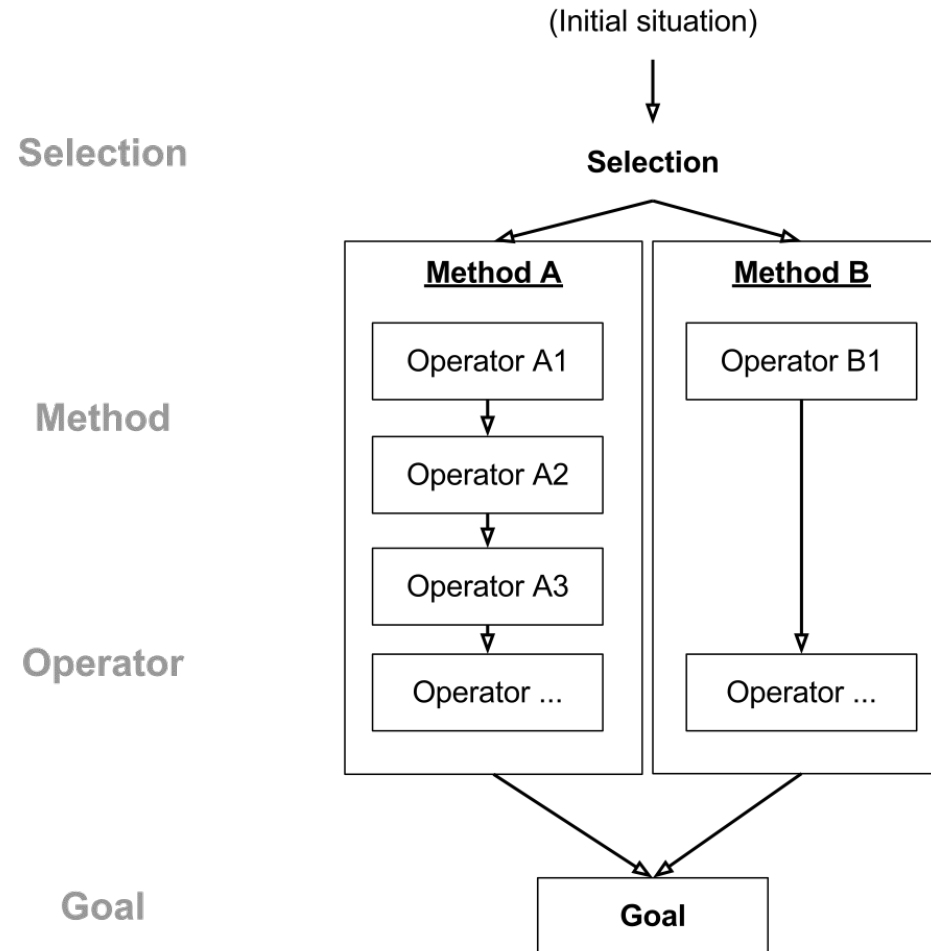
Examples of Discount Usability

- Low-fi prototyping
- **Action analysis (GOMS)**
- Heuristic evaluation
- On-line, remote usability tests
- Walkthroughs
 - put yourself in the shoes of a user
 - like a code walkthrough

Action Analysis & GOMS

- Basic idea: uses a cognitive model to predict quantitative (time) and qualitative use for expert users
- GOMS stands for
 - Goals – high level goal (and subgoals) in layman terms
 - Operators – low level, e.g. button press, menu select
 - Methods – well-learned sequences (e.g., delete para)
 - Selection – rules for deciding which method to use
- Input: detailed description of UI / task(s)
 - list steps hierarchically
- Output: quantitative time measures

Stuart Card, Thomas P. Moran and Allen Newell, 1983



Non-Computer Example of GOMS

- Goal (the big picture)
 - go from hotel to the airport
- Operators (specific actions)
 - locate bus stop; wait for bus; get on bus; ...
- Methods
 - walk, take bus, take taxi, rent car, take train
- Selection rules (choosing among methods)
 - Example: Walking is cheaper, but tiring and slow
 - Example: Taking a bus is complicated abroad

GOMS Output

- Execution time
 - add up times from operators
 - assumes experts (mastered the tasks)
 - error free behavior
 - absolute accuracy $\sim 10\text{-}20\%$

Using GOMS Output

- Ensure frequent goals achieved quickly
 - If you want to make sure that a highly repetitive task is done as quickly as possible, use GOMS
- Making hierarchy also of value
 - functionality coverage & consistency
 - does UI contain needed functions?
 - consistency: are similar tasks performed similarly?
 - operator sequence
 - in what order are individual operations done?

Applications of GOMS

- Comparing different UI designs
 - Estimating number of steps it will require
 - Estimating amount of time
- Profiling an existing UI
- Building a help system
 - Modeling makes user tasks & goals explicit
 - Can suggest questions users will ask & the answers

Tradeoffs of Using GOMS

- Advantages
 - Gives quantitative measures
 - In some cases, can be less work than user study
 - Easy to modify when UI is revised
- Disadvantages
 - takes lots of time, skill, and effort
 - research: tools to aid modeling process
 - only works for goal-directed tasks
 - not problem solving or creative tasks (design)
 - assumes expert performance w/o error

Heuristic Evaluation Process

- Evaluators go through UI several times
 - inspect various dialogue elements
 - compare with list of usability principles
 - consider other principles/results that come to mind
- Usability principles
 - Nielsen's "heuristics"
 - supplementary list of category-specific heuristics
 - Ex. competitive analysis & user testing of existing products
 - Ex. privacy, social media, mobile

Heuristics (Original)

- | | |
|-----------------------------------|---|
| H1-1: Simple & natural dialog | H1-6: Clearly marked exits |
| H1-2: Speak the users' language | H1-7: Shortcuts |
| H1-3: Minimize users' memory load | H1-8: Precise & constructive error messages |
| H1-4: Consistency | H1-9: Prevent errors |
| H1-5: Feedback | H1-10: Help and documentation |

More Heuristics

- H2-1: Visibility of system status
- H2-2: Match between system & real world
- H2-3: User control & freedom
- H2-4: Consistency & standards
- H2-5: Error prevention
- H2-6: Recognition rather than recall
- H2-7: Flexibility and efficiency of use
- H2-8: Aesthetic and minimalist design
- H2-9: Help users recognize, diagnose, and recover from errors
- H2-10: Help and documentation

Gestalt principle – Visual design

Thank you note...

- Thank you for taking the course..
- Good luck..
- Was great to meet some of you in person in the last 10 weeks.
- Hope to see you in future courses or in person...

Ponnurangam Kumaraguru (“PK”)
Associate Professor
Indraprastha Institute of Information Technology
New Delhi – 110078
pk@iiitd.ac.in
precog.iiitd.edu.in