Chapter 15

Analytical evaluation

Aims:

- Describe the key concepts associated with inspection methods.
- Explain how to do heuristic evaluation and walkthroughs.
- Explain the role of analytics in evaluation.
- Describe how to perform two types of predictive methods, GOMS and Fitts' Law.

Inspections

- Several kinds.
- Experts use their knowledge of users & technology to review software usability.
- Expert critiques (crits) can be formal or informal reports.
- Heuristic evaluation is a review guided by a set of heuristics.
- Walkthroughs involve stepping through a pre-planned scenario noting potential problems.

Heuristic evaluation

- Developed Jacob Nielsen in the early 1990s.
- Based on heuristics distilled from an empirical analysis of 249 usability problems.
- These heuristics have been revised for current technology.
- Heuristics being developed for mobile devices, wearables, virtual worlds, etc.
- Design guidelines form a basis for developing heuristics.

Nielsen's original heuristics

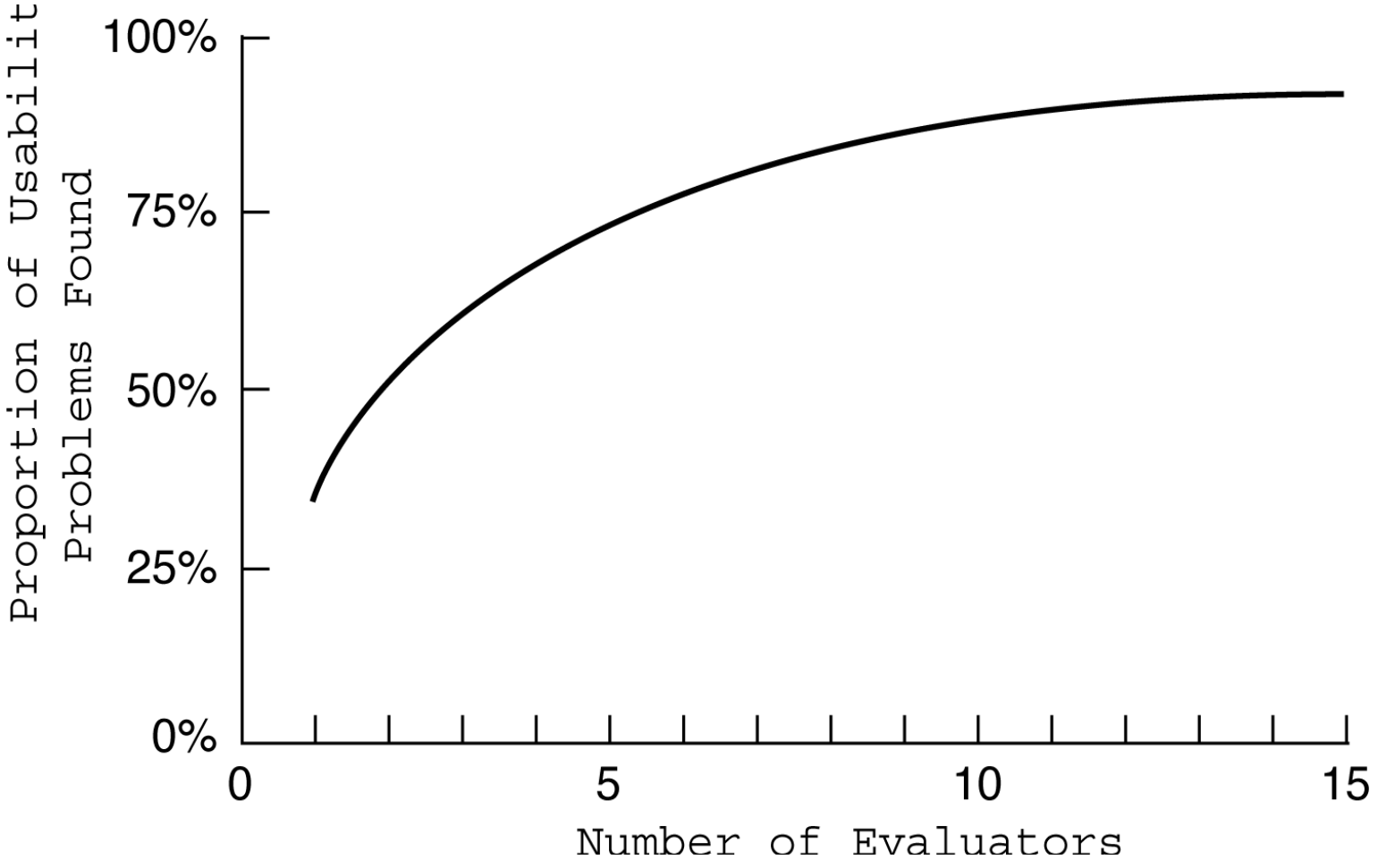
- Visibility of system status.
- Match between system and real world.
- User control and freedom.
- Consistency and standards.
- Error prevention.
- Recognition rather than recall.
- Flexibility and efficiency of use.
- Aesthetic and minimalist design.
- Help users recognize, diagnose, recover from errors.
- Help and documentation.

Discount evaluation

- Heuristic evaluation is referred to as discount evaluation when 5 evaluators are used.

- Empirical evidence suggests that on average 5 evaluators identify 75-80% of usability problems.

No. of evaluators & problems



3 stages for doing heuristic evaluation

- Briefing session to tell experts what to do.
- Evaluation period of 1-2 hours in which:
  - Each expert works separately;
  - Take one pass to get a feel for the product;
  - Take a second pass to focus on specific features.
- Debriefing session in which experts work together to prioritize problems.

Advantages and problems

- Few ethical & practical issues to consider because users not involved.
- Can be difficult & expensive to find experts.
- Best experts have knowledge of application domain & users.
- Biggest problems:
  - Important problems may get missed;
  - Many trivial problems are often identified;
  - Experts have biases.

Heuristics for websites focus on key criteria (Budd, 2007)

- Clarity
- Minimize unnecessary complexity & cognitive load
- Provide users with context
- Promote positive & pleasurable user experience

Cognitive walkthroughs

- Focus on ease of learning.
- Designer presents an aspect of the design & usage scenarios.
- Expert is told the assumptions about user population, context of use, task details.
- One or more experts walk through the design prototype with the scenario.
- Experts are guided by 3 questions.

The 3 questions

- Will the correct action be sufficiently evident to the user?
- Will the user notice that the correct action is available?
- Will the user associate and interpret the response from the action correctly?

As the experts work through the scenario they note problems.

Pluralistic walkthrough

- Variation on the cognitive walkthrough theme.
- Performed by a carefully managed team.
- The panel of experts begins by working separately.
- Then there is managed discussion that leads to agreed decisions.
- The approach lends itself well to participatory design.

A project for you …

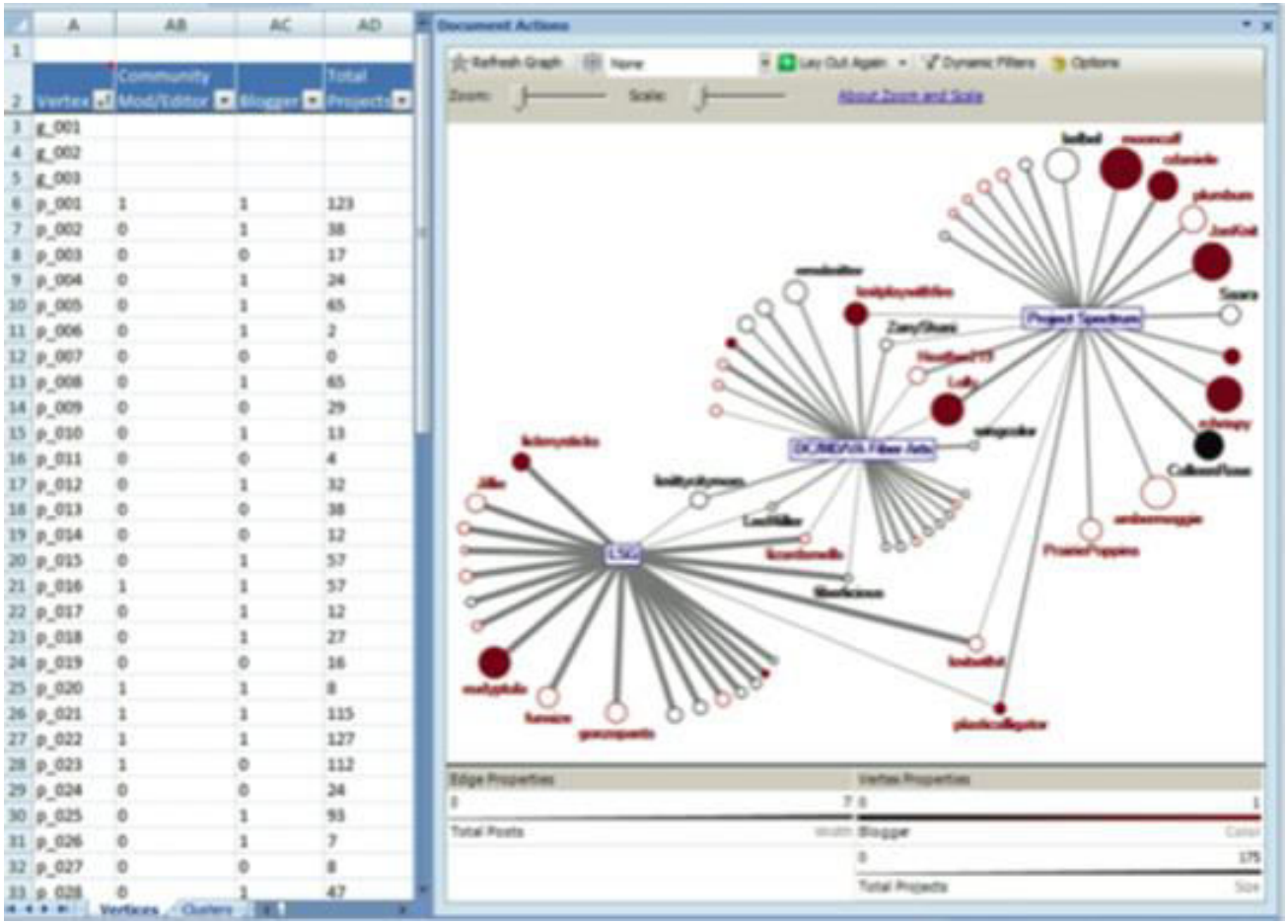
http://www.id-book.com/catherb/

- provides heuristics and a template so that you can evaluate different kinds of systems.
- More information about this is provided in the interactivities section of the id-book.com website.

Analytics

- A method for evaluating user traffic through a system or part of a system
- Many examples including Google Analytics, Visistat (shown below)
- Times of day & visitor IP addresses

Social action analysis
(Perer & Shneiderman, 2008)



Predictive models

- Provide a way of evaluating products or designs without directly involving users.
- Less expensive than user testing.
- Usefulness limited to systems with predictable tasks - e.g., telephone answering systems, mobiles, cell phones, etc.
- Based on expert error-free behavior.

GOMS

- Goals – what the user wants to achieve eg. find a website.
- Operators - the cognitive processes & physical actions needed to attain goals, eg. decide which search engine to use.
- Methods - the procedures to accomplish the goals, eg. drag mouse over field, type in keywords, press the go button.
- Selection rules - decide which method to select when there is more than one.

Keystroke level model

- GOMS has also been developed to provide a quantitative model - the keystroke level model.
- The keystroke model allows predictions to be made about how long it takes an expert user to perform a task.

Response times for keystroke level operators (Card et al., 1983)

Operator	Description	Time (sec)
K	Pressing a single key or button	
	Average skilled typist (55 wpm)	0.22
	Average non-skilled typist (40 wpm)	0.28
	Pressing shift or control key	0.08
	Typist unfamiliar with the keyboard	1.20
P	Pointing with a mouse or other device on a display to select an object. This value is derived from Fitts' Law which is discussed below.	0.40
P1	Clicking the mouse or similar device	0.20
H	Bring 'home' hands on the keyboard or other device	0.40
M	Mentally prepare/respond	1.35
R(t)	The response time is counted only if it causes the user to wait.	t

Summing together

$$T_{\text{execute}} = T_{\text{K}} + T_{\text{P}} + T_{\text{H}} + T_{\text{D}} + T_{\text{M}} + T_{\text{R}}$$

Using KLM to calculate time to change gaze (Holleis et al., 2007)

Fitts' Law (Fitts, 1954)

- Fitts' Law predicts that the time to point at an object using a device is a function of the distance from the target object & the object's size.
- The further away & the smaller the object, the longer the time to locate it & point to it.
- Fitts' Law is useful for evaluating systems for which the time to locate an object is important, e.g., a cell phone, a handheld devices.

A project for you …

- Use the web & other resources to research claims that heuristic evaluation often identifies problems that are not serious & may not even be problems.
- Decide whether you agree or disagree.
- Write a brief statement arguing your position.
- Provide practical evidence & evidence from the literature to support your position.

A Project for you …Fitts' Law

Visit Tog's website and do Tog's quiz, designed to give you fitts!

http://www.asktog.com/columns/022DesignedToGiveFitts.html

Key points

- Inspections can be used to evaluate requirements, mockups, functional prototypes, or systems.
- User testing & heuristic evaluation may reveal different usability problems.
- Walkthroughs are focused so are suitable for evaluating small parts of a product.
- Analytics involves collecting data about users activity on a website or product
- The GOMS and KLM models and Fitts' Law can be used to predict expert, error-free performance for certain kinds of tasks.