A Filed Study of Exploratory Learning Strategies by John Rieman

- "In exploratory learning, instead of working through precisely sequenced training materials, the user investigates a system on his or her own initiative, often in pursuit of a real or artificial task."
- However, it was found that exploration usually only occurs in an attempt to accomplish a current or pending task.

Background

- In the early 80's, people normally attended classroom training in order to learn how to use their software packages.
- The software usually had at most dozens of features
- Now people use several major pieces of interactive software every day, and they usually have to deal with a major software upgrade about every 6 months.
- Each piece of software may have many hundreds, or even thousands, or commands and options.

Exploratory Learning

- People now learn their software through

- This study investigates how people learn to use software that they need for their daily tasks.
- A benefit of this study: If we know why people prefer one method of learning over another, we should be able to create more effective systems, manuals, and on-line documentation.

The Diary Study

- Participants logged their daily activities into a diary.
- Even though the focus of the study was learning, the daily log sheets asked for a full report of activities in order to avoid biasing the study.
- Eureka slips did narrow the focus to learning.
  - description of problem
  - strategy used to solve it
    - read the paper manual, used on-line help, tried different things until it worked, stumbled onto it by accident, asked someone, sent email or posted news request for help, noticed someone else doing it, other
  - any additional comments
- At the end of every day, each participant met with an investigator to discuss the daily activities.

Participants

- 4 - Clerical
- 3 - Science Support
- 3 - Primary tool
- 4 - Work/Research

What techniques to users apply when learning about their systems?

- 3 dominant strategies:
- On-line help is occasionally used
  - It falls in middle ground and is more common for the aggressive explorers.
  - The results found that on-line help was never successful alone.

5 approaches to learning

- Reading the manual, usually done in conjunction with one of the other methods
- Exploring functionality, usually in the context of actual tasks
- Working through the supplied tutorial materials
- Having an experienced user demonstrate the package
- Learning the basics initially, then learning more as the task demands

Implications

- Implications for Exploratory Learning and Training
  - Designers should balance walk-up-and-use learnability against speed and ease of frequent operations.
  - On-line tutorials should not require stepping through from beginning to end, and they should not take over control of the primary application.
    - People often will not do supplied tutorials until driven to it by a real task. Then they will skim through the tutorial to acquire an overview.
- Implications for Documentation and Support
  - Global and overview materials should be provided for a conceptual framework, and detailed references should be supplied for instances when trial and error fails.
  - Sometimes 3rd party texts can provide an alternative view of the same material.

Implications (Continued)

- Implications for On-Line Help
  - Try to prevent the help window from obscuring the task window.
  - Make sure that trying things out and using on-line help can be done concurrently.
  - Try to make the on-line text as readable as possible.

Methodology

- Methodology
  - techniques used for measuring phenomena, manipulating phenomena, or controlling the impact of various phenomena
- Methods
  - the tools (instruments, techniques, and procedures) to gather and analyze information
  - each method can do different things
  - methods are inherently flawed, though each is flawed differently
  - use multiple methods can add strength by offsetting each other's weaknesses

credible empirical knowledge requires consistency or convergence of evidence across studies based on different methods

Research Strategies

- Research evidence in the social and behavioral sciences
  - *involves somebody doing something in some situation*
  - actors
    - who
    - humans (individuals, groups, organizations, communities) whose behaviour is being studied
  - behaviour
    - what
    - Properties of states and actions of the humans that might be of interest (attitude, cohesiveness, power, social pressure, status, etc.)
  - context
    - when & where
    - all relevant temporal, locational, and situational features of the environment

3 main criteria that you are trying to maximize

A. Generalizability
- How generalizable are your results to a population of actors?

B. Precision
- How precise is your measurement of behaviours? And how precise is your control over extraneous factors that are not being studied?

C. Realism
- How realistic is the situation or context of where you gathered the evidence in relation to the contexts to which you want your evidence to apply?

Try to maximize all three criteria, A, B and C

Field strategies

study "natural" behaviours

- Field study
  - make direct observations of "natural", ongoing systems, while intruding on and disturbing those systems as little as possible
    - i.e. case studies of organizations
- Field experiment
  - works within an ongoing natural system as unobtrusively as possible *except* it manipulates one major feature
  - manipulates one feature in order to assess effect on other behaviours of the system
  - a compromised strategy, the researcher gives up some of the unobtrusiveness of the plain field study, to gain more precision

Experimental strategies

Involves concocted rather than natural settings

- Lab experiment
  - deliberately constructs a situation or context, defines the rules, and then has individuals perform tasks related to the concocted system
  - can study behaviours with high precision by controlling extraneous factors
- Experimental simulation
  - construct a situation but make it closely resemble a real situation
    - flight simulators
  - fine line between precision and realism

Respondent strategies

Systematic gathering of responses

- Sample survey
  - obtain evidence to estimate distribution of some variables with a specific population
  - careful sampling of actors from that population and systematically eliciting responses about the material of interest
    - public opinion surveys
- Judgment study
  - researcher concentrates on obtaining information about the properties of a certain set of stimulus
    - psychophysics and psychology

Theoretical strategies

Non-empirical strategies, does not involve “actors behaving in context”

- Formal theory
  - researchers focuses on formulating general relations among a number of variables of interest
  - these hypotheses are intended to hold over a broad range of populations
- Computer simulation
  - attempt to model a real world system
  - the system is complete and closed, without any behavior by any participants
  - any behaviour outcomes are logical predictions from the theory the researcher built into the model

Strategic issues

- Each strategy has inherent weaknesses and potential strengths
- since all strategies are flawed, but flawed in different ways, need to use more than one strategy, carefully selected to complement each other in their strengths and weaknesses

Comparison techniques

- baserates
  - how often (at what rate or what proportion of time) does Y occur?
  - if you don't know how often Y occurs in the general case, then how can you decide whether the rate of Y is some particular case is notably high or low
    - rate of birth defects among infants born to women who worked jobs involving continual use of video display tubes
    - Baserate: rate of birth defects of pregnancies of working women of the same age, social class, etc. who do not work with video display tubes.

Comparison techniques (continued)

- correlations
  - asks whether there is a systematic covariation in the values of two (or more) properties
    - if X is high for some case, is it likely that Y will also be high for that case?
    - and if X is low for some case, is it likely the Y will also be low for that case?
  - a high, positive correlation between X & Y means that when X is high, Y is also likely to be high and when X is low, Y is also likely to be low
  - a high, negative correlation between X&Y means high X values will indicate low Y values and vice versa
  - low or no correlation implies that knowing X does not give any indication about the likely value of Y
    - X has no predictive power with respect to Y
    - X & Y do not covary
  - also possible to have a strong, nonlinear correlation
    - e.g. age and happiness

Randomization

- can't control **all** potential factors
- random assignment of cases to conditions
  - helps to control these extraneous factors
  - strengthen the credibility of the information
  - random allocation procedure: each case must be equally likely to end up in any given combination of conditions
- does not *guarantee* an equal distribution of any or all potentially extraneous factors, instead makes an unequal distribution *highly unlikely* (but not impossible)
- if you do end up with an unequal distribution, this could confound (or distort) your results

Sampling

- Basis for choosing the cases that are to be included in your study out of a larger population of potential cases
  - effects the credibility of your results
  - statistical reasoning requires that the cases in the study be a "random sample" of the population to which the results apply
- "do you have a random sample" vs. "what is the nature of the population of which you actually have a random sample"
- sample size is important for the credibility of experimental results

Validity

- Internal validity
  - the degree to which the results of a study permit you to make strong inferences about causal relations
    - did it occur by chance?
    - Are other factors causing the effects?
  - Depends on how well you can rule out all other plausible rival hypotheses
- Construct validity
  - How well defined are your theoretical ideas? And how clearly understood are the conceptual relations being explored?
- External validity
  - how confident you are that your results will hold upon replication and how generalizable are the results
  - impacted by features of the study (size, nature, sampling, setting, procedures, etc.)
  - no one study has external validity alone

Wednesday, July 7th

- Assignment 3, Part I due on July 7th.
- Readings
  - The usability methods toolbox (testing, inspection, and inquiry sections), James Hom