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CSCM39/CSDM001: Human Computer Interaction

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PURPOSE OF

QUANTITATIVE
RESEARCH METHODS

Explaining phenomena by collecting numerical data that are analysed using mathematically based methods (in particular statistics), e.g., controlled experiment, surveys.

QUALITATIVE
RESEARCH METHODS

Discovering why and how people behave in the way that they do to provide in-depth information about human behaviour, e.g., observations, field studies, focus groups, interviews.

Surveys

What is a survey?

- A survey is a well-defined and well-written set of questions to which an individual is asked to respond

- Surveys are a very commonly used research method

- Surveys are often maligned because they are not done properly (no pilot testing is done, the wrong respondents are chosen, etc.)

- In HCI, surveys are appropriate for measuring attitudes, awareness, intent, feedback about user experiences, characteristics of users, and over time comparisons

- In HCI, surveys are often used in conjunction with other data collection methods

- Surveys are typically self-administered

What is a survey?

- Is a survey the same thing as a questionnaire?

- A questionnaire is the actual list of questions

- A survey is the complete methodological approach

- But the two terms are often used interchangeably

		Strongly agree						Strongly disagree		NA
	The Post-Study Usability Questionnaire Version 3	1	2	3	4	5	6	7			NA
1	Overall, I am satisfied with how easy it is to use this system.	o	o	o	o	o	o	o			o
2	It was simple to use this system.	o	o	o	o	o	o	o			o
3	I was able to complete the tasks and scenarios quickly using this system.	o	o	o	o	o	o	o			o
4	I felt comfortable using this system.	o	o	o	o	o	o	o			o
5	It was easy to learn to use this system.	o	o	o	o	o	o	o			o
6	I believe I could become productive quickly using this system.	o	o	o	o	o	o	o			o
7	The system gave error messages that clearly told me how to fix problems.	o	o	o	o	o	o	o			o
8	Whenever I made a mistake using the system, I could recover easily and quickly.	o	o	o	o	o	o	o			o
9	The information (such as online help, on-screen messages and other documentation) provided with this system was clear.	o	o	o	o	o	o	o			o
10	It was easy to find the information I needed.	o	o	o	o	o	o	o			o
11	The information was effective in helping me complete the tasks and scenarios.	o	o	o	o	o	o	o			o
12	The organization of information on the system screens was clear.	o	o	o	o	o	o	o			o
13	The interface* of this system was pleasant.	o	o	o	o	o	o	o			o
14	I liked using the interface of this system.	o	o	o	o	o	o	o			o
15	This system has all the functions and capabilities I expect it to have.	o	o	o	o	o	o	o			o
16	Overall, I am satisfied with this system.	o	o	o	o	o	o	o			o

*The "interface" includes those items that you use to interact with the system. For example, some components of the interface are the keyboard, the mouse, the microphone, and the screens (including their graphics and language).

Post-study usability questionnaire (PSSSUQ)

Benefits of surveys

- You can collect data from a large number of people and a geographically dispersed population, at a relatively low cost

- You can get an overview of a population of users in a short amount of time

- Surveys do not require any special equipment

- Surveys are generally approved by institutional review boards because they are typically non-intrusive

Drawbacks of surveys

- Surveys are good at getting shallow data from a large number of people, but are not good at getting "deep" data
- Since surveys are usually self-administered, it is usually not possible to ask follow-up questions
- Surveys can lead to biased data when the questions are related to patterns of usage, or feelings about a previous experience
  - E.g. how many times did you use this software application over 6 months?
  - What was your mood when you used the software application?
  - If there is a possibility of recall bias, time diaries or data logging (or a combination) may be a preferred method

The strategy for using a survey

Target user population

- The target population, or the targeted users, are the computer users who you want to study

- If it is a well-defined population of interest, the actual number of individuals in the population can be identified
  - Who are the targeted respondents for the survey?
  - Why are these people of interest?
  - Set some parameters:
    - Age, gender, education, computer experience, disability, geographic location, a specific profession?
    - Users of certain web sites, applications, OS?

Target user population

- How will you contact the members of the target user population?
    - Is there a directory of targeted users?
    - An e-mail distribution list?
    - A postal mailing list?
    - A web site they all visit?
    - A social networking group?
    - Face-to-face meetings?
    - Membership in a certain organization?
    - Job licensing or certification?

How to sample?

- Two major types of sampling methods:
  - Probabilistic sampling
    - Where there is a known probability of someone being chosen
  - Non-Probabilistic sampling
    - It is not exactly known what the likelihood of being chosen is
- Note that non-probabilistic sampling is considered valid in HCI research, although some social sciences are not as accepting of it

Probabilistic sampling

- A census
  - Where every single person in the targeted user population is chosen to take part in the survey

- A random sample
  - Where not all people are chosen to participate, but it is known what the likelihood is of being chosen to participate

Stratified sample

- A stratified sample is when you divide your entire population in separate subpopulations (strata) and a separate sample is selected from within each subpopulation.

- Example: a random sample of college students would not have an equal number of year 1-4 students

  - A stratified random sample could be setup so that it would have an equal number of college students from each class year

  - But it does not need to be equal; It would still be stratified if you took 40% year 4, 40% year 3, 10% year 2, and 10% year 1. The researcher decides what is the appropriate breakdown

Response size

- What response is considered to be sufficient for a random sample? It depends on the confidence level and margin of error that you consider acceptable

- For instance, to get a 95% confidence level and ±5% margin of error, you need 384 responses; to change the margin of error to ±4%, 600 responses are needed; for ±3% margin of error, 1067 responses are needed

- If the sample is large compared to the population size (more than 5% or 10%) , the margin of error is smaller

Potential sources of error and bias

- Sampling error (not enough responses), e.g., if 10,000 individuals are surveyed but only 100 responses are received

- Coverage error (not all members of the population of interest have an equal chance of being sampled), e.g., not all potential respondents are on the email or phone lists

- Measurement error (questions are poorly worded)

- Non-response error (major differences in the people who were sampled and the people who actually responded), e.g., 90% of responses are from males/females

Non-probabilistic sampling

- Non-probabilistic sampling is used when:
  - You do not or cannot use a strict random sample
  - You do not know the likelihood of an individual being selected
  - You are not interested in a population estimate
  - There may not be a clearly defined population of interest
- Non-probabilistic sampling is considered valid in HCI research, because typically:
  - The HCI researcher must collect their own data from users
  - A survey method is combined with another research method (e.g. diary studies, log analysis, interviews, and usability testing)
- Approaches include volunteer panels, self-selected surveys, and snowball recruiting

Demographic data

- Collecting demographic information is always important in survey data, but becomes more important when using non-probabilistic sampling

- The goal should be to demonstrate either:
  - Diverse, cross-section of respondents
  - A response that is somewhat representative of already-established, baseline data

Oversampling

- When there is not a well-defined list of users, no exact knowledge of population size, and random sampling is not possible, the number of survey responses becomes more important

- When the number of survey responses is large in proportion to the estimated or perceived population size, this is known as oversampling

- Having a large number of responses can reduce the likelihood of excluding any segment of the population

- 30 survey responses might be a baseline minimum for small estimated populations, while 500 or more might be considered minimum for larger estimated populations

Other techniques

- Random sampling of usage, not users
  - If a survey appears every 10th time that a web page is loaded, this is a random sampling of usage, not users. Users who visit the web page often will be over-represented (unless instructions or IP addresses are used to limit)
- Self-selected surveys
  - If a web page always has a link to a survey, everyone is invited to fill out the survey
  - Non-probabilistic surveys are frequently self-selected, not random
  - Self-selected, non-probabilistic surveys are often used as a first step in researching unknown research phenomena or previously uninvestigated user groups

Develop a survey tool

Developing survey questions

- The major challenge is to develop well-written, non-biased questions
- Since most surveys are self-administered, the questions need to stand alone, without any explanations
- You need to focus on both:
  - The overall structure of the entire survey
  - The structure of single questions
    - Open-ended
    - Closed-ended with ordered response categories
    - Closed-ended with unordered response categories

Types of questions

- Open-ended questions
  - Respondents can be flexible in their responses, and therefore may provide more information, but it can be harder to do data analysis
  - Make sure to ask specific, not general questions. The answer should be open-ended, but the question should not be

Why did you choose iPhone?

How did you feel about the usability (ease of use) of iPhone?

What barriers did you face, in attempting to use iPhone to complete your tasks?

Types of questions

- Closed-ended questions
  - Ordered response (e.g. ranking or Likert scale)
  - Unordered response (e.g. multiple choice)

When using my primary computer, I use the following input devices or methods on a daily basis (select as many as apply)

____Keyboard

____ Mouse

____Touchpad

____Trackball

____Voice recognition

___Multitouch screen

___Eye-tracking

Which application do you use most often for text editing? (please select only one)

___MS-Word

___WordPerfect

___Google Docs

___OpenOffice Writer

___WordPad

___QuickOffice

___Other (please specify)

Common problems with survey questions

- Asking two separate, and possibly related questions in one question (respondents often do not answer both questions), e.g., e.g., "How long have you used the Word processing software and which advanced features have you used?"

- The use of negative words in questions can cause confusion, e.g., "Do you agree that the e-mail software is not easy to use?"

- Biased wording in questions, e.g., Don't you agree that …"

- Identifying the position of a well-respected person or organization

- The use of "hot-button" words, such as "liberal," "conservative," "abortion," and "terrorism," can lead to biased responses.

Overall survey structure

- All surveys must begin with instructions
  - On paper, should checkboxes and ovals be filled in, checked, or have an "X" placed in them?
  - Should all respondents fill out all questions?
  - A reminder of who qualifies to participate, and who does not
- Each section of the survey should have a heading
- What path through the survey should the respondent take?

Overall survey structure

- If the survey is electronic, are help links provided?
- If a paper survey:
  - Is there enough white space?
  - Is white paper used? Are standard fonts used?
  - Do folds and staples interfere with any text?
- Is contact info (e-mail, phone, web site, etc.) provided if the respondent has any questions?

- If some questions are "contingent"
make that clear using arrows, boxes, and
indenting

Do you use, or have you used in the past, Microsoft Office 365 for e-mail?

[ ] Yes

[ ] No

If yes: Have you ever used the address book in Microsoft Office 365?
[ ] Yes
[ ] No

Overall survey structure

- Questions related to a similar topic should be grouped together
- It is generally NOT a good idea to randomize the order of the questions
- Provide interesting questions at the beginning of the survey
- Leave demographic questions until the end of the survey
- If there are any sensitive or objectionable questions, leave them until the end, when the respondent has become interested and committed to the survey!
- Be reasonable about the length of the survey

Existing surveys from HCI

- There are some existing surveys that have been tested and validated in the HCI literature, primarily for usability testing and evaluation:
  - Computer System Usability Questionnaire (CSUQ)
  - Interface Consistency Testing Questionnaire (ICTQ)
  - Perdue Usability Testing Questionnaire (PUTQ)
  - Questionnaire for User Interaction Satisfaction (QUIS)
  - Software Usability Measurement Inventory (SUMI)
  - Website Analysis and Measurement Inventory (WAMMI)

Paper or online surveys?

- How do researchers have the best access to the potential respondents?
  - Phone?
  - Postal mailing addresses?
  - E-mail addresses?
  - A social networking site?
- Find out if all potential respondents have internet/e-mail access
  - If not, you must use either paper surveys, or a hybrid approach

Paper or online surveys?

- Choose the most practical approach

- Using a hybrid design, with both paper and electronic surveys, can improve the number of responses and insure representation from different portions of the target user population
    - But make sure that the different forms of the survey are exactly the same!

- Paper surveys must be used to study questions such as "why don't people go online?"

Paper or online surveys?

- Copying costs, mailing, postage, and data entry costs can be eliminated with electronic surveys

- Initial set-up costs for web-based surveys are higher, but data entry can be automated, and error in data entry can be lower

- Paper surveys are often preferred by respondents, and response rates can be higher

- Responses are often submitted faster with electronic surveys

Paper or online surveys?

- Responses from paper and electronic surveys are considered to be equally valid

- In sensitive topical areas, people may feel more open about disclosing personal information using electronic surveys

- With either paper or electronic, you need to make sure that respondents/participants are made aware of their rights in the research (informed consent)

Pilot testing the survey tool

- You must test both:
  - The survey interface/structure
  - The survey questions themselves
- In an ideal world, you should:
  - Have experts review the survey tool
  - Have interviews with potential respondents to evaluate content/motivational qualities
  - Have a pilot study of the survey tool and implementation procedures
- Pilot studies of HCI surveys are often much simpler!

Response rate

- One of the main challenges of a survey is getting a high response rate
- Incentives for survey respondents are typically lower, with a higher number of participants needed, than with other forms of HCI research
- Because they are often self-administered, motivation is a factor

Response rate

- Techniques for improving the response rate:
  - Send an introductory letter from a respected member of the respondent community
  - Increase the ease of returning a survey (e.g. include a self-addressed envelope with postage paid)
  - Send out reminders
  - Send a replacement paper survey (or link to an electronic survey) 2-4 weeks after the initial one was sent out
  - Make a final contact using a different form of communication

Data analysis

- Separate the quantitative and qualitative data
- Clean the data, looking for:
  - Invalid responses where the values are not within the acceptable and logical range
  - Invalid responses because the individual does not meet the inclusion criteria
  - Repeats (the same person submitting the same survey twice)
  - Incomplete responses
- The quantitative data is ready to analyze, whereas the qualitative data must first be coded