

PhD Qualifying Examination: Human-Computer Interaction

University of Wisconsin–Madison, Department of Computer Sciences
Spring 2017 — Monday, January 30, 2016

General Instructions

- This exam has **7** numbered pages including this page.
- Answer each question in a separate book.
- Indicate on the cover of each book the area (HCI) of the exam, your code number, and the question number answered in that book. Do not write your name on any answer book.
- Return all answer books in the folder provided. Additional answer books are available if needed.

Specific Instructions

- Answer all 6 questions.

Policy on Misprints and Ambiguities

The Exam Committee tries to proofread the exam as carefully as possible. Nevertheless, the exam sometimes contains misprints and ambiguities. If you are convinced that a problem has been stated incorrectly, mention this to the proctor. If necessary, the proctor can contact a representative of the area to resolve problems during the *first hour* of the exam. In any case, you should indicate your interpretation of the problem in your written answer. Your interpretation should be such that the problem is nontrivial.

Question Topics

1. Ethnography
2. Grounded Theory
3. Foundations of Human-Computer Interaction
4. Methodological Fit
5. Measurement
6. Survey Design

Question 1. *Ethnography*

You are hired as a consultant to a startup company that wants to develop a messaging app for senior citizens¹. You are asked to advise them on conducting an *ethnographic study*² to discover their needs in messaging and the contexts in which they might use the messaging app.

- (a) How do you recommend selecting participants for the ethnography? Briefly describe at least three common sampling methods with pros and cons, and which you would recommend for the given ethnography.
- (b) What considerations do you take into account when deciding on how to conduct field observations? Describe at least three options with pros and cons and what you would recommend for the given ethnography.
- (c) The startup wants to conduct interviews in addition to field observations. What type of interview technique do you recommend and why? What advice do you have on how to conduct the interviews?

¹ The legal definition of senior citizens in the United States is people over 60 years of age. Commonly, senior citizens are defined elderly persons who are retired and living on a pension.

² Blomberg, J., & Burrell, M. (2009). *An ethnographic approach to design*. *Human-Computer Interaction*, 71-94.

Question 2. *Grounded Theory*

Paul Slogin, the mayor of the City of Madison, put together a council that will provide advice on whether or not to authorize driverless cars in the city. You are part of a team that was hired to conduct interviews with citizens on their perceptions of risks and benefits of driverless cars. Interviews with a randomly chosen representative sample of citizens have been conducted. Interviews were video-taped and have been transcribed. Your task is to analyze the interview transcripts. The interviews transcripts have been anonymized and associated with demographic data (e.g., age, gender, income).

- (a) Explain why *Grounded Theory*³ provided an appropriate approach to analyzing these interview transcripts.
- (b) Describe the steps of the Grounded Theory approach to developing a *coding scheme*⁴ using this example. For each step, discuss whether specific considerations need to be taken into account given the nature of the interview data you have available.
- (c) The mayor asks you what outcome he may expect of your analysis. How do you respond?
- (d) After you've completed the analysis, the interview team decides they want to conduct additional interviews with another representative sample of citizens. They ask you whether your analyses can be used to update the interview protocol. How do you go about utilizing your findings to update interview questions?

³ Olson, J. S., & Kellogg, W. A. (2014). *Ways of Knowing in HCI*. Springer, New York, NY.

⁴ Saldaña, J. (2009). *The coding manual for qualitative researchers, Chapter 1*. Sage Publications Limited.

Question 3. *Foundations of Human-Computer Interaction*

You are preparing a lecture on the *history* and *foundations* of the field of human-computer interaction (HCI) and would like to cover the following key materials:⁵

- (a) *Fields out of which HCI grew.* List the four fields with significant HCI research threads, as outlined by Grudin,⁶ and briefly describe their differential perspectives.
- (b) *Theoretical frameworks in HCI.* List three theoretical frameworks HCI research follows, as proposed by Rogers,⁷ and very briefly describe the main premise of each framework.
- (c) *Methodology.* Whittaker and colleagues⁸ provide a summary of research on computer-mediated communication that illustrates how HCI research combines qualitative and quantitative methods. List two common qualitative methods and two common quantitative methods in HCI research on computer-mediated communication and provide an example study for each.

⁵ Limit all your descriptions to two-to-three sentences.

⁶ Grudin, J. (2012). A moving target: The evolution of human-computer interaction. In J. Jacko (Ed.), *Human-Computer Interaction Handbook* (3rd Edition), Taylor & Francis, 2012.

⁷ Rogers, Y. (2004). New theoretical approaches for human-computer interaction. *Annual Review of Information Science and Technology*, 38(1), pp. 87–143.

⁸ Whittaker, S. (2003). Theories and methods in mediated communication. In Graesser, A., Gernsbacher, M., and Goldman, S. (Ed.) *The Handbook of Discourse Processes* (pp. 243-286). Mahwah, NJ: Lawrence Erlbaum Associates.

(d) Question 4. *Methodological Fit*

You and your graduate student have identified a set of research questions that you are both interested in. Now, you are planning research studies for your student's dissertation for the next few years. Draw on McGrath⁹ to advise your student on how to identify appropriate methodologies for the following research questions. For each, explain your rationale.

- (a) How do foreign students use technology to identify social club on campus? To the best of your knowledge, no prior research has investigated this question.
- (b) Emergent research suggests that foreign students are more comfortable reaching out to social groups via email rather than in person because it allows them for more time to prepare their introduction. This seems to be particularly important to students who experience strong language barriers. Are students more likely to join a social club if they can make first contact online? To the best of your knowledge, no prior research has investigated this question.
- (c) Much evidence exists that foreign students who join a social club in the first weeks of their freshman year are better integrated, have a stronger social network, and higher GPAs at the end their freshman year. Is this true irrespective of their language skills?
- (d) Your graduate student wants to gain experience in conducting an *experimental simulation*, but none of the research questions seem to fit this method. Given the research questions above, can you advise the student on an additional, related research question that would lend itself well to using an experimental simulation?

⁹ McGrath, J. E. (1995). Methodology Matters: Doing Research in the behavioral and social sciences. In R. M. Baecker, J. Grudin, W. A. S. Buxton, S. Greenberg, (eds.), *Readings in Human-Computer Interaction: Toward the Year 2000*, pp. 152–169.

Question 5. *Measurement*

Answer the following questions by drawing on Olson and Kellogg¹⁰.

- (a) Define validity.
- (b) Define reliability.
- (c) Olson and Kellogg describe eye tracking as a method to assess users' visual attention. List and briefly describe two *eye-tracking measures*, the constructs they are intended to assess, potential validity issues and potential reliability issues.
- (d) Discuss strategies to address one validity issue and one reliability issue for each of the two eye-tracking measures you listed under (c).

¹⁰ Olson, J. S., & Kellogg, W. A. (2014). *Ways of Knowing in HCI*. Springer, New York, NY.

Question 6. *Survey Design*

You have been hired by the University of Wisconsin – Madison to help them design a new course management system, for your expertise in user research. As you learn more about the design process, you notice a lack of an appropriate survey instrument to gather information from targeted user populations (i.e., undergraduate students, graduate students, lecturers, faculty, staff). None of the established survey instruments seem appropriate. You decide on developing a new *questionnaire* to gather information from users and consider the following facets of survey design, according to Müller et al.¹¹

- (a) List five examples of the *types of information* about users that can be captured with surveys.
- (b) When is it appropriate to use *open-ended* vs. *close-ended* questions? Briefly discuss.
- (c) List and briefly describe three *types of biases* that are common in questionnaires.
- (d) Describe three *types of questions* that must be avoided in designing questionnaires.
- (e) What are *signals of poor data quality* and appropriate *mitigation strategies*? Describe three.

¹¹ Müller, H., Sedley, A., & Ferrall-Nunge, E. (2014). Survey Research in HCI. In J. S. Olson, & W.A. Kellogg (Eds). *Ways of Knowing in HCI*. Springer, New York, NY.