

DEPARTMENT OF COMPUTER SCIENCE  
UNIVERSITY OF TORONTO

## CSC 428F/2514F: **HUMAN-COMPUTER INTERACTION**

Fall Term, 1997-8

Assignment 2

### **DESIGN, EXECUTION, AND INTERPRETATION OF A USER/TASK ANALYSIS**

HANDED OUT: Wednesday, October 1, 4:00 p.m.  
RESEARCH PROTOCOL DUE BACK IN: Tuesday, October 14, 10:00 a.m.  
ASSIGNMENT 2 REPORT DUE BACK IN: Thursday, October 30, 4:00 p.m.  
VALUE: 15 points

#### **OBJECTIVES OF ASSIGNMENT**

In the course of their professional careers, computer scientists will often be faced with the task of gathering data from current users of computer systems that they are planning to improve, or from future users of computer systems they are planning to build. These instances of data gathering have grown as the use of computers has spread to a larger audience, as the tasks for which computers are used have become more complex, and as the requirements for well designed human-computer interfaces have grown. Without training in data gathering and interpretation techniques, computer scientists are left in a position of potentially designing data collection processes, questionnaires, and interviews that, at best, provide no useful data, and, at worst, give erroneous information.

This assignment is designed to give you practice in:

- determining what user information you need to capture for interface design and evaluation exercises which you will carry out in Assignments 3 and 4
- designing a user/task analysis to gather this information from a true user population
- carrying out the analysis on users and their tasks, and
- interpreting the results of the user/task analysis in order to apply them to your user interface design.

Although it does not train you in the very fine points of questionnaire design, task modeling, interviewing and data interpretation, it does give you experience in obtaining from human beings information that is useful for design.

#### **THE PROBLEM DOMAINS: LIBRARY INFORMATION SYSTEMS, UNIX NEWS AND CONFERENCING SYSTEMS**

The first task you need to do is to select the task domain in which you intend to work and the user interface you intend to develop. Once you have selected your design task, you will be in a position of collecting information about potential users of the interface.

Several methods for collecting this information have been and will be taught in this class. You will primarily use the *interviewing* technique, but will likely choose to augment it with elements of *questionnaire* design and administration, and *observation* of users carrying out tasks.

For example, if you were designing the interface to a microwave oven, you are probably faced with the design issues of what kinds of food heating functionality to provide the user and what types of things to put in the menu. You would then develop a questionnaire that would ask users to list the types of food they eat and how they obtain them, e.g., via restaurants, home-cooked meals, through their own preparation, etc. Their responses to the questions would tell you how much they know about cooking times and whether it is better to put times on the oven as food-related or not, e.g., a button which says "hamburger," another which says "coffee," etc. as opposed to an interface which requires the user to set a specific time.

In contrast, if you were devising an interface for handling book checkouts in a library, you are probably faced with design questions on what order the different steps in the checkout process are to be displayed on the screen. You would then use observation as your basic technique and generate a task decomposition of what the checkout clerk does with each patron, and confirm these task models and other aspects of the checkout person's work life in a detailed interview.

A list of two choices for the task domain follows. You must choose one of these two areas for your work in Assignments 2, 3, and 4. In each case, we begin with some existing technology, and seek to understand the current user experience with these technologies, and the underlying user needs for the services these technologies are intended to deliver.

**Pick one of the following for your 428/2514 project:**

1. **The University of Toronto Library's electronic catalogs:** UT/LINK is the traditional text-based interface to the University of Toronto Library's electronic catalog, which can be used to locate books and journals which are held anywhere within the many U of T libraries. UT/CAT is a modern Web-based interface to the electronic catalog.
2. **UNIX news/conferencing system:** UNIX newsgroups are widely used in the department primarily for the delivery of information but also occasionally for computer conferencing (especially CSC454), a form of electronic communications in which students can participate in extended electronic conversations with their entire class.

Half the class will work on each project, with Joanna taking the section for the electronic catalogs, and Jade taking the section for the news/conferencing system.

## **METHOD**

This assignment will have **eleven (11)** steps. They are:

1. Formation of a group.
2. Selection of an term project by your group. You will want to spend some time familiarizing yourself with the 2 options, in order to pick the one that has the greatest interest to you. Please have one group member email Joanna (joanna@dgp) anytime after Monday Oct. 6th at 9 a.m. to request a task domain. Selection will be granted on a first come first served basis. Include your group# if the group remains unchanged from Assignment #1. Otherwise, give names and email addresses of all group members.
3. Determination of the information you need to obtain from your users about the system being studied.
4. Selection of the user population to study. Your TA will discuss with you issues related to *sampling* of the population. Since you will only talk to a very few informants, you will want to spend some time thinking about dimensions under which users can vary, e.g., novices or experts, students or professional researchers, males or females. You could adopt a broad but

shallow strategy, trying for coverage across these dimensions, or a narrow but deep strategy, e.g., only talking to novice graduate student users, or experts users of UNIX news.

5. Selection of data collection mechanisms, i.e., what mix of interviews, questionnaires, and observations you want to use.
6. Design of the research protocol for data collection.
7. Submission of your research protocol to your teaching assistant to verify that it is consistent with the University of Toronto Guidelines on the Use of Human Subjects (see Appendices A-D)..
8. Pilot testing of your protocol.
9. Administration of data collection mechanisms on at least **three** informants for undergraduates, **four** informants for graduate students (see Hints on Talking to Users, which appears below). Although one of these informants may be another student in the class, most must be individuals not in the class. Students working on the library project will want to find informants at the 4th floor of the Robarts Library, in the Gerstein Science Information Centre of the Sig Sam Library, and in the Engineering Library. You will have copies of a letter signed by the Chief Librarian and myself endorsing the work. Students working on the news system will want to find informants using CDF. For example, you may want to try to reach them by posting notices on the newsgroup for CSC454.
10. Analysis and interpretation of the results from the data collection.
11. Write-up and presentation of the results of the user/task analysis.

### HINTS ON TALKING TO USERS

1. Approach potential informants gently and politely, explaining what you are doing and why, asking if they would be willing to contribute a few minutes of their time, and making clear that it is quite all right to decline participation for any reason whatsoever.
2. Try to be as quiet as possible and as non-disruptive to the environment in which the work is being conducted.
3. Indicate that responses will not be identified by name, that all data will be held confidential, and that it will only be used for the purposes of CSC428/2514.
- 4) Offer to answer questions before and during the study, and make it clear that either you or the informant is free to stop the interview at any time for any reason.
- 5) Read Appendices A-D for further information.

### SUGGESTED RESEARCH QUESTIONS TO INCLUDE IN YOUR STUDY

When you are designing and conducting a user/task analysis, you will want to consider trying to elicit answers to some of the following questions, which we illustrate in terms of the example of the design of the user interface to a microwave oven:

1. What will the users' goals be in using the interface, e.g., are they more interested in speed of initiating a cooking sequence, flexibility in its specification, or simplicity of operation?

2. What types of tasks do users expect to do with the system, e.g., do they want to specify the cooking of a particular food, or cooking according to a particular style, or cooking to a particular temperature or time, or all of the above?
3. What other requirements do users have for the things they want the user interface to do for them, e.g., detect obviously extreme settings and give warnings?
4. What kinds of similar interfaces have users had previous experience with and what were the problems they had with these systems, e.g., other microwave ovens, or convection ovens?
5. How easy will it be for users to learn the interface, that is, how do they do things now, how do they understand the task now and how different will the interface be from this? How much time will users spend learning the interface?
6. Is this an interface which they face only once in a while so that it must be completely obvious to them immediately, or can a more complex design be made because they will experience the interface frequently and have the time to learn it, as in the case of a microwave?
7. What are the special characteristics of user and environment in which the system will be used? E.g., a microwave may be used by children, adults, senior citizens, and individuals with special needs, or, to cite another example of electronic instruments for automobiles, driving a car requires attention to the road with as few distractions as possible.
8. What are the emotional or sensitive parts about doing the task, e.g., it may be important that my microwave stay clean, or, to cite another example in the domain of electronic commerce, do I trust the computer with my money? Issues of safety, trust, and privacy are critical in many application domains.

Sometimes the above questions can be asked directly, and sometimes they cannot, as a user cannot give you information about a new system they have not yet seen. It is up to you as the designer to generate questions that are easy for the user to answer yet give you valuable information about them and about the tasks that they do, information which you will later use in the design process. It is up to you as a designer to watch and write down how people perform tasks that are similar to the tasks they will have to perform with your new interface and to adapt these processes to your new design. It is up to you as a designer to document the type of environment the user will be working in and then determine how the interface will be affected by this environment.

## **DATA ANALYSIS, INTERPRETATION, AND PRESENTATION**

It is important to summarize clearly the data collected from your user/task analysis.

Interview data is most often presented as verbatim lists or summaries of the number of different functionality and interface issues that were mentioned, problems that were brought up, process step differences that were explained, and user suggestions about functionality or interface.

Questionnaire answers are usually presented as percentages, e.g., 25 percent responded "strongly disagree" to the question "Should the system always have menus available?" Often the percentages are presented across demographic data, e.g., "30 percent of the women and 35 percent of the men would like to have less commands to learn." A good way to present this information is in tables. Questions can also be open-ended. In this case, the list of answers is typed below each question.

Observation data is usually presented as metaphors that are in use, lists of events and objects, task models such as those discussed in class, environmental issues, and as well as anecdotal recounting of incidents of special interest that were seen.

You will use in Assignment 3 the results of your task analysis to suggest design specifications for a user interface that will make it easier for users to learn and use a system such as the one that you have studied. These can be recommendations for the manuals and training as well as a list of functions the interface is to perform and metaphors the interface should incorporate.

## WHAT YOU SHOULD HAND IN

Students will team up in groups of **three** or **four** for Assignments 2, 3, and 4. Teams need not be identical to those from Assignment 1, but **the teams for Assignment 2 will then work together for the remainder of the semester**. If there was a major task division in your teamwork, please indicate it in your report on the executive summary + table of contents page.

Your team needs to hand in your research protocol by October 14th and your report by October 30th. All documents must be typed and submitted on 8.5"x11" paper, and must consist of full English sentences and paragraphs. Structure and organization, spelling, grammar, word usage, and document appearance will count for roughly 20% of your grade. Drawings, tables, and charts must be clear and legible.

Each submission must include a title page with a meaningful title, all group members' names and student ID#, your tutor's name, the course name and number, and the date. The protocol will only be a few pages long. The report will contain as its second page a one paragraph executive summary of the document, and a table of contents. **The body of your report should be roughly 6 to 12 pages long, with roughly a 6-18 page Appendix containing supporting material.** This page count assumes a double-spaced presentation with a 10 or 12 point type face. **Note:** Points will be deducted for assignments that are needlessly long.

More specifically, the report should describe the execution and interpretation of the user/task analysis you conducted with the final portion describing concerns that should be addressed for the user population and recommending specific functionalities a new interface should have. The write-up should include, in order:

- an introduction explaining the purpose of the report and what you will cover in it
- a description of the system you are observing and its purpose
- a set of questions that you are seeking answers to
- a description of the user population you are studying and reasons why you chose them
- a description of the user/task analysis that was conducted, including observations, questionnaire administration, interviews conducted, other interfaces examined, etc.
- a presentation and interpretation of the information obtained from the user/task analysis.

*In assignment 3, you will continue by describing what this information means in terms of what one should provide in the way of functionality and interface, in other words, the design interpretations that are relevant to your Assignment 3 design..*

The Appendix to Assignment 2 may contain raw data, the structure of your interviews and partial transcripts from them, tables of questionnaire questions, and observation logs). It will also contain the results of your study, e.g., summaries of the results from the questionnaire, task decompositions, etc.

**Graduate students, please remember that you will be expected to pose deeper questions and to present more detailed analysis in your assignments.**

**RESEARCH PROCEDURES INVOLVING THE USE OF HUMAN SUBJECTS/INFORMANTS**

The University of Toronto, along with most other universities, has developed procedures to ensure that research involving the use of human subjects/informants is consistent with reasonable ethical guidelines for the conduct of this research. To ensure that this is the case for the work that you will do, you must write up the protocol (a description of the procedures you will use and the questions you will ask) and submit it for review by your TA before approaching informants outside of this class. What follows is:

- two descriptions prepared by the University of Toronto Office of Research Services describing the key issues in research with human subjects/informants (Appendices A,B)
- A description of the protocol format (Appendix C).
- A description of a consent form (Appendix D).

Sample outlines for C and D will be placed on the course Web page.

**Appendix A**  
**University of Toronto Review Committee on the Use of Human Subjects**  
**Protocol Cover Sheet (extract)**

<b>Identification:</b>	Is it clear who will carry out the research and who will be responsible for its supervision and conduct?
<b>Purpose:</b>	Are the purpose and justification clearly stated?
<b>Risk/Benefit:</b>	Are all the risks and benefits fairly stated? Will there be any direct benefits to the subjects or informants? If not, will this be clearly understood? Given consent, where there are risks are these outweighed by potential benefit(s)? Where risks exists, has every effort been made in the research design to minimize them? <u>Is there a need for monitoring of this study?</u>
<b>Procedures:</b>	Are they clearly set out and comprehensible to lay person and specialist alike?
<b>Population:</b>	Are the nature and the manner of obtaining the subject/informant population stated? Are special populations involved, such as minors? Is there justification for this?
<b>Relationship:</b>	Is it clear who will actually contact subjects/informants? Does any special prior relationship exist between subject and investigator such as doctor/patient? Does it require special procedures for obtaining free consent? Are adequate special procedures proposed?
<b>Informed Consent:</b>	Is it clear what information will be given subjects/informants? Is the information adequate as to the purpose, risks/benefits and procedures of the research? Is it expressed in lay terms? Is there any deception involved in the information given subjects/informants? If so, why is such deception felt to be necessary? Is it justified? Will the subject/informant be under any kind of pressure to consent? Are appropriate procedures for consent of special populations described? Is the subject/informant made aware he is free to withdraw or discontinue participation? If verbal and not written consent is proposed, is adequate justification given for this? Will subjects/informants be given a written information sheet to retain?
<b>Use of Existing Records:</b>	Is the nature of any data, their source and the method whereby they were obtained stated?
<b>Confidentiality of Data:</b>	Are there adequate safeguards: 1) to obtain the consent of both subjects/informants and/or others having authority over the data; 2) to maintain the confidentiality of the data?
<b>Compensation:</b>	If there is any, is it used in such a way or is the amount such that it can be construed as inducement of subject/informants?

## Appendix B

**University of Toronto Summary of Guidelines on the Use of Human Subjects (1979)**

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|--|---|
| <u>Definition</u>                              | 1. Research is any procedure carried out on a person for the purpose of advancing knowledge, and includes the asking of questions, written or oral, and the consultation of records (pp. 9-15).   |
| <u>Utility</u>                                 | 2. No research should be carried out unless the potential benefits of the research outweigh any risks to the subjects (pp. 6-8, 15-17, 20-24).  |
| <u>Consent<br/>General<br/>Principle</u>       | 3(a) Research may be carried out only with the free informed consent of all subjects (pp. 24-37).   |
| <u>Persons<br/>Incapable of<br/>Consenting</u> | (b) Persons deprived of their liberty or otherwise incapable of consenting by reason of age or physical or mental disability should only be used as subjects where the very nature of the research requires use of such subjects, the research involves no substantial risk to the subjects and adequate steps are taken to ensure that, so far as possible in the circumstances, consent is given (pp. 28-30).   |
| <u>Deception</u>                               | (c) Where the design of research requires a deception to be practised on the subjects, the research should only be permitted if there is no foreseeable risk of harm, psychological or otherwise, no infringement of privacy, if a full explanation is given soon after the experiment and if standards of good taste are maintained (pp. 34-36)  |
| <u>Subordinates</u>                            | (d) Special care should be taken to ensure that consent is freely given where the subjects are in a subordinate position to the researcher or the researcher's associates (pp. 30-33).  |
| <u>Patients</u>                                | (e) Ordinarily a physician should not conduct research on his or her own patients. Where, however, subjects suitable for the research are not reasonably obtainable except from among the researcher's own patients, the patients may be approached provided that appropriate steps are taken to enable the patient to exercise an independent choice (pp. 33-34).  |
| <u>Consent form<br/>and explanation</u>        | (f) The subject should be given both an oral explanation and a document containing a full, fair and comprehensible description of the purpose, design and procedures of the research and of its risks, discomforts and inconveniences. The document should also contain an explanation that the procedure is not primarily designed for the subject's benefit, and a statement to the effect that the subject is free to withdraw at any time before or during the research without prejudice to other rights, for instance to health care. Ordinarily, a consent should be signed by the subject (pp. 27-28, 48-52). |
| <u>Reward</u>                                  | (g) Any monetary reward offered to a subject for participating in research should ordinarily not exceed the minimum wage for the time spent (pp. 36-37).  |



- Confidentiality 4 All information obtained from the subject of research should be treated as confidential, and all reasonable efforts should be made to prevent its falling into unauthorized hands or inspection (pp. 37-41).
- Protection of Subject 5(a) All reasonable precautions should be taken in the design of the research to minimize the risk of harm to the subject and to remedy any harm that may occur (pp. 41-42).
- Termination of Experiment (b) If during the course of research it appears to the researcher that there is a greater risk of harm to the subject than appeared when the subject's consent was given, he should discontinue the research, taking whatever steps may be necessary to protect the subject. The study may continue only upon the subject's fresh consent to the greater risk (pp. 41-42).
- Protocol Requirements and Procedures 6. A protocol for the research must be approved by a Review Committee of the Human Subjects Review Committee prior to the research being done. The protocol must include information on all matters relevant to complying with these guidelines and should follow the format stated in Part VI of this booklet (pp. 45-48).

Appendix C  
**University of Toronto Research Protocol Format**  
(adapted and annotated for purposes of this class)

1. The title of the proposed research.
2. The names and departments of the investigators.
3. A statement of the purpose of the research. *(1 sentence)*
4. A detailed description of the procedures to be used in the conduct of the research, specifically stating particulars. *(1 or 2 paragraphs)*
5. A description of the subject population. *(1 sentence)*
6. A statement of the investigator's relationships to the subjects. *(1 sentence, probably indicating "none.")*
7. An assessment of the possible risks and benefits to the subjects. *(1 sentence each. Risks are loss of 30-45 minutes of time. No benefits accrue to the subject directly, although there is the intention that these projects contribute to the improvement of software being used by the Department of Computer Science and the University of Toronto Library.)*
8. A complete description of the procedures which will be followed to obtain informed consent. *(1 or 2 sentences)*
9. If information is to be collected, a description of the information sought and the sources to be used. *(List of questions to be asked, description of activities to be observed. This is the heart of your protocol.)*
10. If information is confidential, the safeguards to be provided a) to obtain the consent of both the subjects and any other persons having authority over the information, and b) to preserve the confidentiality of the data when collected. *(1 sentence each)*
11. The consent forms and accompanying documentation, such as information statements. *(see Appendix D)*

Appendix D  
**University of Toronto Human Subject/Informant Consent Forms**  
**(adapted for purposes of this class)**

**1. Principles of Drafting**

- a) The form is to be written in English
- b) It should use a simple and direct style, and not use technical jargon

**2. Contents (not necessarily in this order)**

- a) Statement on general purposes of the study (*1 sentence*)
- b) Statement of reasonably expected results of this study, including
  - i) benefits to the informant (*none*)
  - ii) general benefits to the departments involved (see Appendix C, #7. above)
- c) Expression of invitation to participate (*1 sentence*)
- d) Statement of why informant being invited (*e.g., typical user, novice user, experienced user*)
- e) Description of procedures involving the informant (see Appendix C, #4. above)
- f) Statement of provisions for confidentiality (*i.e., no identification by name, and data used only for purposes of this class*)
- g) Offer to answer questions before and during the study
- h) Reservation to stop the interview at your option at any time
- i) Statement that informant is free to withdraw from the study at any time.

**3. Formalities**

- a) Give the informant a copy of the consent form for his or her own reference
- b) The form should have a CSC428/2514 heading
- c) The consent form should be dated.