Notes Week 3

Requirements analysis (Dix Ch. 13 & 15). HCI for older adults (Hawthorne on Blackboard).

-- NANDA KISHORE BHAT

Spring 2012

Computer/Human Interaction

CS 5340 College of Computer and Information Science

Socio- organizational issues and stakeholder requirements

I. Introduction
    a. People affected by the introduction of the system are known as stakeholders.
II. Organizational Issues
    a. Computer-supported cooperative work CSCW - But people in organizations and groups have conflicting groups, systems that ignore are likely to fail.
    b. Power structures
        i. Physical layout of an organization reflects the workflow.
        ii. Physical proximity of co-workers can foster loyalty.
        iii. However, Managerial authority is difficult to exercise in a computer based communications, in contrast to face-to-face communication.
        iv. Must make sure that the system is not misused.
    c. Social and managerial relationships exceed technological considerations.
    d. To create a computer based system, there has to be some benefits over traditional methods, like faster UI, else not the best option.
    e. Free Rider problem: Contribution vs. benefits. More likely in electronic based system. Can be tackled by showing statistics like contributions etc..
    f. Critical Mass. Cost vs benefit. If the number of subscribers are more, than cost is less and more benefits, else cost becomes high and less benefits.
    g. Automating process:
        i. Workflow: very structured and pre-defined, but does not encourage informal and less structured patterns.
        ii. BPR: (Business process re-engineering)-structures of the organizations can be modified based on the support for key processes.

III. Capturing requirements
    a. Stakeholders do not only include the end-user. Is defined as anyone who is affected by the success or failure of the system.
        i. Primary: End-Users.
        ii. Secondary: People who receive output and produce input to it.
        iii. Tertiary: Who is affected by the success or failure of the system and is not primary and secondary.
        iv. Facilitating: involved with design, development and maintenance.
    b. Socio-technical models: Work-systems are composed of both human and machine elements.
        i. *CUSTOM* Methodology:
            1. Based on user skills and task match approach.
            2. Initial stage of design when product opportunity has been identified.
            3. Form based methodology.
            4. Describe org. context, goals, and backgrounds.
            5. Identify and describe stakeholders.
            6. Identify and describe work-groups.
            7. Identify and describe task-object pairs.
            8. Identify stakeholder's needs.
            9. Consolidate and check stakeholder's requirements.
        ii. Open System Task Analysis:
            1. Like CUSTOM focuses on the issues of introduction of technical systems in work environments.
            2. There are 8 stages.
            3. Technology support based on the user's goals.
            4. Task inputs must be identified.
            5. External environments must be identified.
            6. Transformation process.
            7. System is analyzed considering work-groups.
            8. Technical system is described in terms of integration.
            9. Performance satisfaction criteria are established.

10. System is specified.

c. Soft System methodology
    i. Definition of problem situation -unstructured.
    ii. Detailed description of problem situation.
    iii. Generate root definitions for the systems.
    iv. Conceptual Models.
    v. Compare 4 and 2 stage.
    vi. Determine feasible changes.
    vii. Identify actions for these changes.
        1. Root definition of systems are CATWOE.
        2. Clients
        3. Actors
        4. Transformations.
        5. Weltanschauung (view)
        6. Owner
        7. Environment.

d. Participatory design.
    i. Users are consulted not only for experiments but also based on each tasks.
    ii. Users are therefore collaborators.
    iii. Stages:
        1. Brainstorming: informal and unstructured.
        2. Storyboarding: users day-to-day activities.
        3. Workshops: Focus on design and opportunity to step under others shoes.
        4. Pencil and paper exercises. Walk through to the users.

e. Ethnographic Methods.
    i. Based on the real actions, which are situational actions.
    ii. Actions in place and social situations and the time it occurs in.
    iii. Un-biased and open-mind to the situations.
    iv. Report and not speculate based on observations.
    v. Contextual enquiry:
        1. User in context.

2. Verbal and non-verbal communications are studied.
3. 2-3 hour interview with the user in the work place.
4. The data is consolidated with other users and stakeholders.

Task Analysis

I. Introduction
    a. Task decomposition: tasks into sub tasks in which they are performed.
    b. Knowledge based technique: what users need to know about the objects and actions involved.
    c. Entity-relation-based analysis: identifying the actors and objects. Relationships and actions between them.
II. Difference between task analysis and others.
    a. More wide.
    b. Looks more at the observable behavior of users rather than mental state.
III. Task decomposition
    a. Hierarchical Task analysis: output of this is hierarchy of tasks and sub tasks and plans describing order and conditions to perform those.
    b. Fixed sequence: perform the same sequence of tasks.
    c. Optional tasks: choice of sub-tasks.
    d. Waiting for events
    e. Cycles: repeating of tasks.
    f. Time-sharing: tasks that are performed together.
    g. Discretionary: tasks in any order to perform.
    h. Mixtures.
IV. Knowledge based analysis.
    a. Listing all objects and actions involved, and building taxonomies on them.
    b. For the taxonomies, can ask the domain expert directly.
    c. We can also pile them into bunch of similar tasks.

d. Task descriptive hierarchy: based on their individual tasks.
e. Tasks produced from TDH, we can order based on generic descriptions.

V. Entity-relation-based techniques.
   a. Usually associated with database and OOP.
   b. Listing all objects in the domain of interest.
   c. Classify these objects: concrete, actors and composite.
   d. Goal is not to produce machine representation of objects, but to describe the participation of humans and composite tasks.
   e. Actions change the state of something. Tracing the agent performing action is a way of classifying actors.
   f. One sort of action is message.
   g. Finally we consider the relationships between objects, actions and events.

VI. Sources of Information and data collection.
   a. Documentation:
      i. It is the easiest source of data to analyze, like manuals, training materials, etc., for the task.
      ii. Corporate rulebook and job descriptions provide wider context.
      iii. Structure of the manuals and other material might be misleading.
      iv. Rule books and job descriptions can used in the form of interviews.
   b. Observations:
      i. Formal and informal
      ii. This could be in a field or a lab. Observations in the field is ideal as it is real., however there could be better recording facilities in the lab.
   c. Interviews:
      i. Questioning domain experts.
      ii. Quickest way of obtaining information.
      iii. Appropriate if the questioning is done after a formal or informal observation phase.

iv. HTA.

d. Initial Analysis:
    i. Simplest way is to highlight the nouns (objects) in the document data and verbs (actions).
    ii. Building relations amongst these.
e. Sorting and classification.
    i. Arrangement of tasks and actions.
    ii. Iterative approach.
    iii. Production of taxonomies.

VII. Uses of Task Analysis.

a. Manuals and tuition:
    i. Training purposes.
    ii. Can help a user transfer from one system to another.
b. Requirement capture and systems design:
    i. Guide to design new systems.
    ii. Improves or makes strong contribution to existing or new requirements.
    iii. Predictions of the use of the new system.
c. Detailed Interface design:
    i. Used to design menus.
    ii. Top-level menus can be labeled after top-level decomposition.
    iii. Sub-menus as next level decomposition.
    iv. Menu layout can be based on the roles and then the tasks on those roles.
    v. If OOP, then associations of objects with actions may be useful.
    vi. Default actions can be chosen from the frequency of those actions.

Possible implications of aging for interface designers - Hawthorne

I. Introduction:
    a. Populations of the developed countries are becoming older while computer use is affecting increasingly wide aspects of life.
    b. Software must be accessible to older adults.
    c. Study on 45 year plus group.
    d. Not the study on senior citizens, but the second half of lives, which is nearly half the workforce.
II. Methodological Issues:
    a. Based on the volunteers.
    b. Cross-sectional studies - older vs younger statistics, but cannot be linear over the same age difference.
    c. Longitudinal studies- observation on same people over long time, but does not consider, if certain other people could be more motivated.
III. Psychological findings on aging and ability
    a. Younger people can have multiple abilities used simultaneously.
    b. It is a matter of doubt, on how much of the cognitive abilities, older people can use simultaneously.
    c. How should this be tackled in UI.
IV. Vision and aging.
    a. Difficulty in focus is an issue.
    b. Visual acuity, and ability to see fine details declines.
    c. Reduced sensitivity for color and contrast.
    d. Reduction in visual field for ages 60 and older.
    e. Slight decline to detect depth after 40, but then the decline is steep till 70.
    f. Processing of visual information appears to be slower with age.
    g. Decline in the ability to detect fragments or incomplete objects.
V. Vision in older people and implications for HCI design:

a. Problems with partial or embedded figure recognition may mean that multiple overlapping windows disadvantage older users and also support simplicity of icon design.
b. The distance from eye to screen typically falls into the range which bifocals leave blurred.
c. This increases squinting of eyes over fuzzy screens.
d. to avoid moving text, so that there is ample time to focus.
e. Avoid glare and rapid change of brightness, when shifting from windows.
f. Designs that use depth perception to convey information should provide additional cues in the case of older users.

VI. Speech and hearing in older people

a. Must consider the fact that hearing abilities decline with age.
b. Older adults cannot focus on high frequency sounds.
c. Also reduced ability to localize sounds.
d. Problems dealing with background noises.

VII. Speech and hearing in older people and HCI design

a. Interfaces that use sound to get the users attention will need to use lower frequency sounds for older users
b. Might increase the problems related with implementation of hearing interfaces, as an alternative to less use of keyboard.
c. Computer generated speech might be a problem as it was less intelligible.
d. Brief spoken words are useful to replace action with mouse and buttons.
e. Speech interfaces must consider disrupted, slower speeches, more hesitations, audible breathing etc., for older adults.

VIII. Psychomotor abilities and older people

a. With age comes lengthening of response times on more complex motor tasks.
b. Older adults are less able to cope with demands for repetitive speed.
c. The degree of choice required also affects response time and highly predictable responses may show little age differential.

d. Older adults show poorer performance when asked to track a target.
e. Older adults are reported as having less ability to control and modulate the forces they apply

IX. Psychomotor abilities in older people and HCI design
a. Older people can be expected to be slower in use of a mouse and to require larger targets to be comfortable.
b. revisiting standards for double-clicks.
c. Holding the mouse still while clicking or controlling dragging on scrollbars could be a problem.
d. Handwriting recognition software may have problems coping with older users' shakier writing.

X. Attention, automated responses and aging
a. Tasks requiring rapid or continuous scanning are particularly fatiguing for older adults.
b. Selective attention: older adults are less able to inhibit response to the presence of distractor items
c. Divided attention: reductions in the capacity of older individuals to direct attention to support complex tasks but that this does not apply to tasks, which, through training, have become automated.
d. Automated response: automated responses led to higher levels of disruption for an older group on new tasks that made the automated response inappropriate.

XI. Attention and automated responses in older people—HCI design issues
a. Can expect that older users will be more easily distracted by extraneous design detail or background noise.
b. Graphics must be used for relevance rather than decoration.
c. Must consider the effects of changing the existing interface.
d. There should be backward compatibility with the new interfaces.

XII. Memory and learning in older people
a. Short-term memory is used to hold the events of the immediate past.
b. Working memory covers simultaneously holding and using short-term information.
c. Older adults appear to perform worse on spatial memory tasks.

d. Prospective memory seems to be reduced in elderly people only where there are complex tasks involved.

XIII. Memory and learning in older people and HCI design

a. Must reducing interface demands on working memory.
b. Should also allow users to process concrete representations of items rather than relying solely on working memory.
c. our interfaces should provide opportunities for users to off-load memory requirements to the program.
d. Lists are easier to work with than paragraphs.
e. Successful learning for older users will involve a lot of practice.
f. Some idioms appear slower to master and are less readily generalized.
g. Large jumps while scrolling might leave older adults disoriented.

XIV. Intelligence, expertise and aging

a. There is some decline in intellectual ability with age.
b. Individuals maintain the ability they had in their 20s until their mid-60s.
c. high levels of education predicted that individuals' intellectual ability would decline more slowly.

XV. Expertise

a. Expert performance is maintained only over narrowly specific areas as skilled people age.

XVI. Intelligence in older people and HCI design

a. Older workers are more likely to benefit from interfaces that reduce the complexity of the task the user is attempting.
b. Older users will function best in a stable well-known interface environment.