Task Analysis Guide

Adapted from Prof. Jamie Ruiz
Task Analysis

• Contextual inquiry is all about understanding and redesigning a set of tasks

• Task analysis = a view of people interacting with technology to achieve change in an application domain

• Application domain = abstraction of real world
  – E.g. a database system, the cloud

• Definition of a task:
  – A goal together with some ordered set of actions
Goals

• A goal is a state of the application domain that a work system wishes to achieve. Goals are specified at particular levels of abstraction

• Work system = people plus technologies
  – E.g. a smartphone user and his or her phone

• Note:
  – Goals can be achieved in a variety of ways
  – Individual users can have goals, but so can groups, organizations, or even work systems (e.g. autonomous agents)
Tasks and Actions

• A task is a set of actions
• A task is typically an abstraction of the actions that are required to complete a task
  – i.e. a task has a level of abstraction associated with it
  – Examples
    • Get a cup of tea
    • Schedule a meeting
• An action is a low-level task
  – No problem solving
  – No control structure
User Modeling/Task Analysis

• Challenging issue due to wide variety of user tasks

• Many techniques for modeling user using a specific piece of software

• Two different alternative views
  – Action-centric, i.e. those concerned with the steps involved in completing a task
    • Hierarchical Task Analysis
  – Cognition-centric, i.e. how users think, solve problems, learn, remember, and visualize/model/understand to accomplish the task
    • Goals, Operators, Methods, Selection (GOMS)
Starting Work Redesign

• Need to pick a specific task that you want to redesign
  – You don’t want to solve every problem a subject has
  – You may have some idea of the problem you want to solve already

• Need to find the correct level of task
  – Not adding name to a form
  – Not providing the SAP version of pharmacy management tools
  – Somewhere in between
Task Decomposition

• Aims:
  – describe the actions people do
  – structure them within task subtask hierarchy

• Hierarchical Task Analysis (HTA)
  – text and diagrams to show hierarchy
  – plans to describe order
Textual HTA descriptions

• Hierarchy description ...
  0. in order to clean the house
  1. get the vacuum cleaner out
  2. get the appropriate attachment
  3. clean the rooms
     3.1. clean the hall
     3.2. clean the living rooms
     3.3. clean the bedrooms
  4. empty the dust bag
  5. put vacuum cleaner and attachments away
• ... and plans -- only the plans denote order
  Plan 0: do 1 - 2 - 3 - 5 in that order. when the dust bag gets full do 4

  Plan 3: do any of 3.1, 3.2 or 3.3 in any order depending on which rooms need cleaning
Generating the hierarchy

1. get list of tasks
2. group tasks into higher level tasks
3. decompose lowest level tasks further

Stopping rules - How do we know when to stop?
- Is “empty the dust bag” simple enough?
- Purpose: expand only relevant tasks
- Motor actions: lowest sensible level
Diagrammatic HTA

0. make a cup of tea

plan 0.
do 1
at the same time, if the pot is full 2
then 3 - 4
after four or five minutes do 5

1. boil water
2. empty pot
3. put tea leaves in pot
4. pour in boiling water
5. wait 4 or 5 minutes
6. pour tea

plan 1.
1.1 - 1.2 - 1.3
when kettle boils 1.4

1.1. fill kettle
1.2. put kettle on stove
1.3. wait for kettle to boil
1.4. turn off gas
Refining the description

Given initial HTA (textual or diagram)
  – How to check/improve it?

• Some heuristics:
  – paired actions
    • e.g., where is `turn on gas'
  – restructure
    • e.g., generate task `make pot'
  – balance
    • e.g., is `pour tea' simpler than making pot?
  – generalize
    • e.g., make one cup or two ..... or more
ANOTHER EXAMPLE
EXAMPLE Flow model (consolidated)

User role: Assistant
Responsibilities:
- manage calendar
- generate periodic reports
- “go to” person for manager

Primary stakeholders: Assistant
Secondary: Management (mgmt.)
**Sequence model**  
*(consolidated)*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Intent</th>
<th>Abstract Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get data for</td>
<td>Get raw data</td>
<td>Trigger: Arrive at office</td>
</tr>
<tr>
<td>periodic reports</td>
<td></td>
<td>- Login to Legacy System (LS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Download data from LS</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Sort downloaded data by date</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>View previous reports</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Compare report data &amp; downloaded data dates</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Decide which reports used older data &amp; therefore need to be replaced</em></td>
</tr>
</tbody>
</table>

** macros are complex – takes time**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Intent</th>
<th>Abstract Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create report</td>
<td>Transform data</td>
<td><em>Login to whichever system was used to create old report</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Start Excel on downloaded data</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <em>Open macros for each sheet automatically loaded</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- &quot;Master&quot; is opened, copied to new name &amp; data copied into it. *mash&quot; has x from macros</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Check macros for target system</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Xform data using macros</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <em>Save in comments &amp; remove un-needed elements</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <em>Copy Xform data &amp; unsubscribed</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Report as CSV</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- <em>Start report generator</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Upload data</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Check report</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Visualize on screen against old report on pp</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Print a screen against old report</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Print report</em></td>
</tr>
</tbody>
</table>
Vision

Assistants must generate reports for management that are “perfect”. Perfect mean that reports are accurate and in the exact format expected since they are passed up the management chain for review. Reports must use the latest data.

Assistants encounter problems because the raw data comes from a legacy system and the report generators (there can be multiple ones for a company) each require completely different data formats. Assistants must obtain raw data every day and determine what reports need to be regenerated, then perform complex transforms on the raw data to generate the reports. They must then verify that the reports are accurate and in the proper format.

We will improve this process by creating a system that preserves the data sources and report generators, but reduces the number of systems the assistant has to interact with directly, and significantly reduces the time required to check transformations and reports.
Re-design the work

EXISTING WORK

0. Decide reports to create
1. Sort downloaded data by date
   1.1 Open downloaded data in Excel
   1.2 Select all data and all columns
   1.3 Choose Filter-> Custom Sort -> sort on date column newest to oldest
2. View previous reports
   2.1 Get out latest hard-copy version of each report
   2.2 Open latest version of each report on computer
3. Compare report data and downloaded data dates
   3.1 Look at each report section and check date listed for data against date in spreadsheet
   3.2 Note every report that has a section where newer data is available
4. Decide which reports used older data and need to be replaced
   4.1 Record the name of each report that has newer data to remember what reports need to be regenerated

RE-DESIGNED WORK

0. Decide reports to create
1. Choose to decide by data date
   1.1 Indicate location of latest raw data
   1.2 Indicate location of latest versions of reports
2. View comparisons
   2.1 View section summary of report alongside date of newest data; sections where newer data is available are called out somehow
3. Decide which reports used older data and need to be replaced
   3.1 Select reports that should be recreated
   3.2 Confirm proposed selection of reports that should be recreated
   3.3 Verify names of each report to be recreated

Repeat HTA and re-design for Create report activity from consolidated sequence model
HTA – Decide reports to create

0. Decide reports to create
1. Sort downloaded data by date
   1.1 Open downloaded data in Excel
   1.2 Select all data and all columns
   1.3 Choose Filter–> Custom Sort –> sort on date column newest to oldest
2. View previous reports
   2.1 Get out latest hard-copy version of each report
   2.2 Open latest version of each report on computer
3. Compare report data and downloaded data dates
   3.1 Look at each report section and check date listed for data against date in spreadsheet
   3.2 Note every report that has a section where newer data is available
4. Decide which reports used older data and need to be replaced
   4.1 Record the name of each report that has newer data to remember what reports need to be regenerated

Task(s)?

Goal(s)?

Action(s)?

Plan 0: do 1-4 in numerical order
Plan 1: do 1.1 - 1.3 in numerical order
Plan 2: do either 2.1 or 2.2
Plan 3: do 3.1 and then 3.2
Plan 4: do 4.1
HTA – Decide reports to create

0. Decide reports to create

1. Sort downloaded data by date
   1.1 Open downloaded data in Excel
   1.2 Select all data and all columns
   1.3 Choose Filter-> Custom Sort -> sort on date column newest to oldest

2. View previous reports
   2.1 Get out latest hard-copy version of each report
   2.2 Open latest version of each report on computer

3. Compare report data and downloaded data dates
   3.1 Look at each report section and check date listed for data against date in spreadsheet
   3.2 Note every report that has a section where newer data is available

4. Decide which reports used older data and need to be replaced
   4.1 Record the name of each report that has newer data to remember what reports need to be regenerated

Plan 0: do 1-4 in numerical order
Plan 1: do 1.1 - 1.3 in numerical order
Plan 2: do either 2.1 or 2.2
Plan 3: do 3.1 and then 3.2
Plan 4: do 4.1
Using HTA

• Need a task at high enough level that it can be redesigned
  – But not too high

• Very domain dependent
  – If it feels difficult to re-engineer how something is done, move up
  – If it feels that your system is pervasive in work practice, move down