Digital Interaction Design IS-104

TASK ANALYSIS

MOHAMMAD TAFIQUR RAHMAN

NOVEMBER 06, 2019

UiA University of Agder
Norway

Recap from last lecture

Evaluation:

- central to the whole design process

- just not for finished systems – exists right from the earliest idea

- criteria can be derived by formal design principles, standards, customer defined requirements and recommendations, in-house defined guidelines, or any combination of them

- used to rework parts of the design or to decide between options

- dependent on the form of envisionment – only available system version or its imitation (mock) can be evaluated

Main types of Evaluation:

- Expert-based evaluation
  - inspection methods
  - usability experts, or interaction designers evaluate some envisioned version of a design
- Participant-based evaluation
  - user testing methods
  - people from the anticipated user groups evaluate some envisioned version of a design
- Data Analytics
  - gather data on system performance when it is deployed

- Expert evaluation is not a substitute to asking real users to participate in evaluation but can be useful particularly early in the design process.

Goals for today

Task Analysis
(chapter 11)

- Understanding the topic

- Learn about goals, tasks and actions

- Methods for task analysis:

  - Hierarchical task analysis (HTA)
 - Procedural cognitive task analysis using GOMS

Task Analysis

Digital interaction designs envision:

- a new system to **replace** an existing manual system
  - e.g., an appointment booking system to replace a paper agenda.

- an existing computer system being **redesigned**
  - functionality remains the same
    - e.g. a new appointment booking system to replace the existing one.
  - functionality is extended or changed in some way
    - e.g. a new appointment booking system to replace the existing one and extend with direct booking over the web.

- a completely new system without some **manual or digital equivalent** (rare)

Task analysis helps in getting a good understanding of the existing users and the usage of the system.

What is Task Analysis?
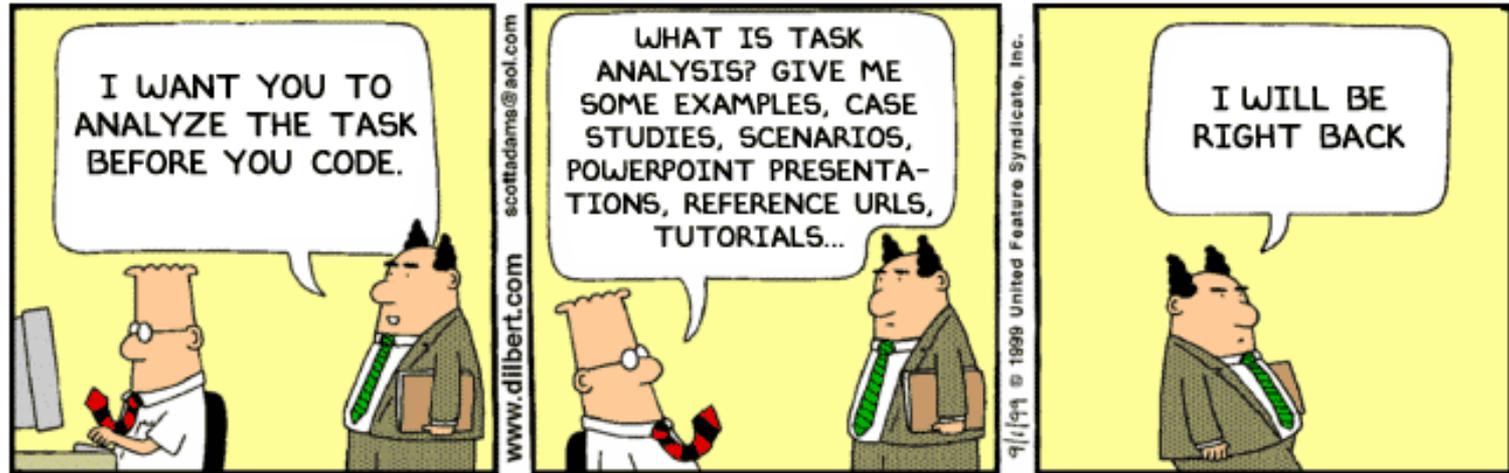
Task analysis is a way of identifying important actions in executing tasks and sub-tasks towards achieving specific goals.

Task Analysis

Why doing it:

- What your users' goals are; what they are trying to achieve
- What users actually do to achieve those goals
- What experiences (personal, social, and cultural) users bring to the tasks
- How users are influenced by their physical environment
- How users' previous knowledge and experience influence:
  - How they think about their work
 - The workflow they follow to perform their tasks

Link: https://www.usability.gov/how-to-and-tools/methods/task-analysis.html

UiA University of Agder Norway

Task Analysis Elements

Goals: is a state of application domain (of real world) that a work system (combined with people/agent and technologies) tries to achieve.

Tasks: set of structured activities (or sequence of actions) required, used, or believed to be necessary for achieving specific goals – performed by agents using particular technologies.

Subtasks: tasks can be decomposed up to a standard levels of description – depth of detail

Actions: decomposition can be done until we reach the level, where further broken down is not possible.

Goal

Tasks

Subtasks
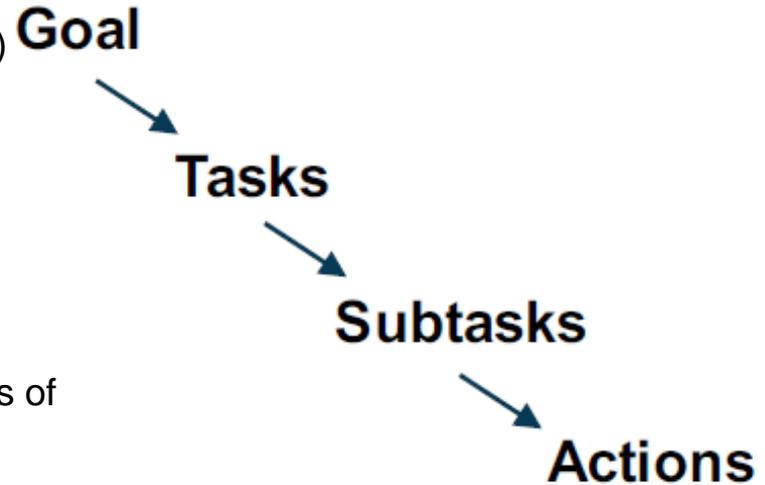
Actions

Task Analysis

Benyon says:

A task is a goal together with some ordered set of actions.

Procedural knowledge encompasses:

- Goal-task mapping
  - knowing what to do to achieve some goal
- Task-action mapping
  - knowing how to do it
- Goal formation stage
  - knowing that you can do something in the first place

Task Analysis

How to do it:

- Identify the task to be analyzed.

- Break this high-level task down into 4 to 8 subtasks. The subtask should be specified in terms of objectives and, between them, should cover the whole area of interest.

- Draw a layered task diagram of each subtasks ensuring that it is complete

- Produce a written account as well as the decomposition diagram.

- Present the analysis to someone else who has not been involved in the decomposition but who knows the tasks well enough to check for consistency

Link: https://www.usability.gov/how-to-and-tools/methods/task-analysis.html

University of Agder
Norway

Task Analysis Approaches

Two selected approaches for task analysis:

- Hierarchical task analysis (HTA)
    - concerned with logic of a task
    - focus on physical and observable actions
    - how tasks are structured to achieve a goal
- Cognitive task analysis (CTA)
    - concerned with a cognitive analysis of tasks
    - focus on cognitive aspects of tasks
    - procedural knowledge needed to achieve a goal

Hierarchical Task Analysis

- Hierarchical Task Analysis:
  - Graphical representation of a task structure
    - Based on structure chart notation
  - Represents a sequence of tasks, subtasks and actions
    - sequence is usually shown by ordering the tasks, subtasks and actions from left to right.
  - Maintains a hierarchy
  - Notation for iterations and alternative selections
  - Annotations can be included to indicate plans (indicating sequence and timing).

University of Agder
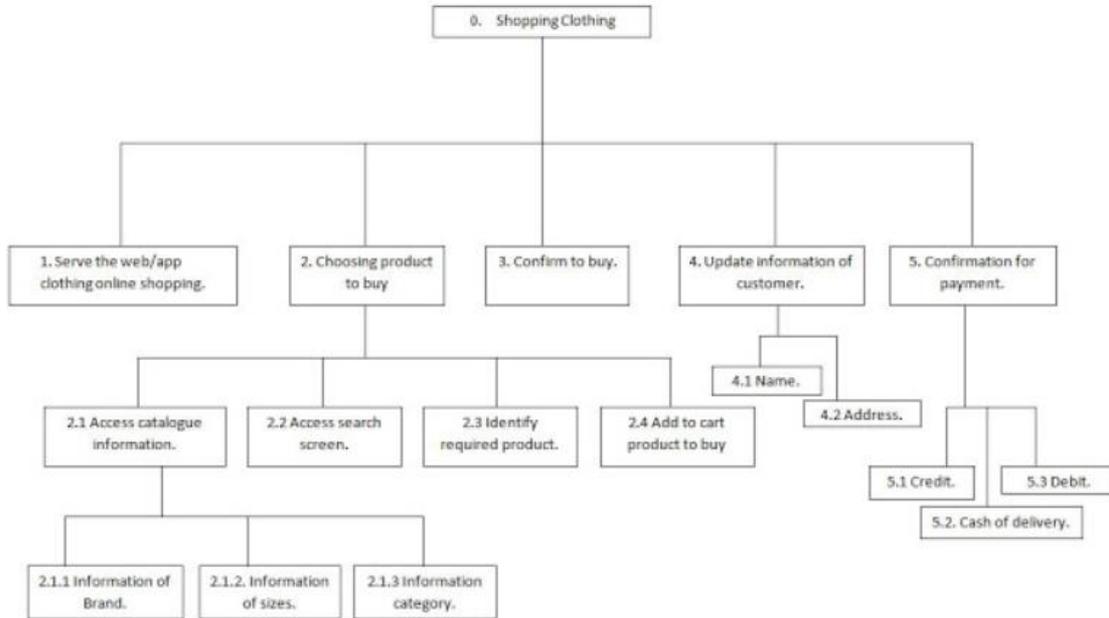Norway
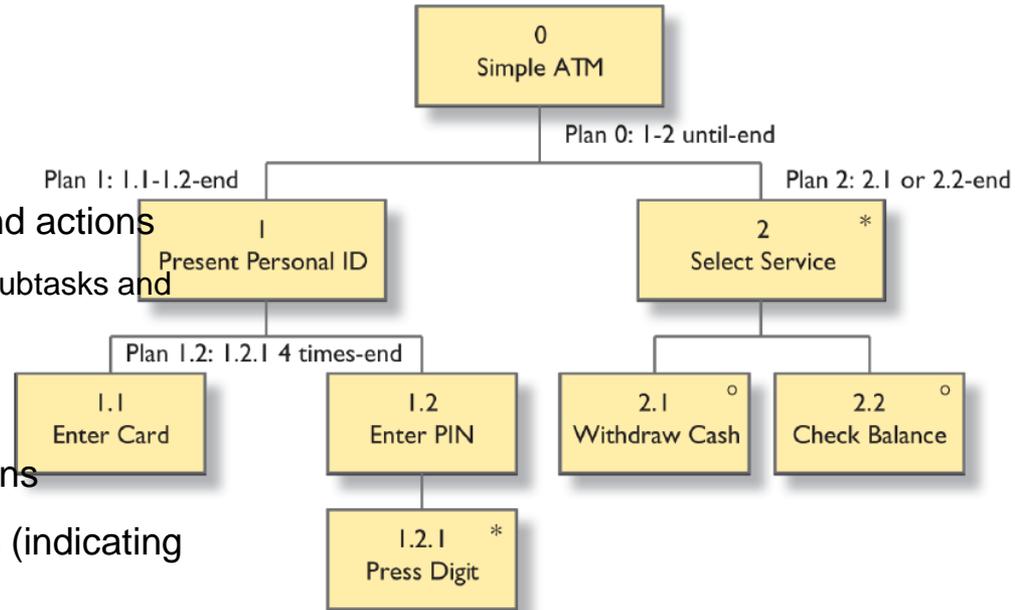
Hierarchical Task Analysis

How to do it:

- Start with a user goal which is examined and the main tasks for achieving it are identified

- Tasks are sub-divided into sub-tasks

- Subtasks are grouped as plans which specify how the tasks might be performed in

HTA focuses on physical and observable actions.

Includes looking at actions not related to software or an interaction device.

University of Agder
Norway

Hierarchical Task Analysis

- Textual representation of the tasks (or task sheet)
- Example of Shopping Clothing online:

Plan 0: do 1,2,3,5, when payment proceed for buying, do 4.
Plan 2: do 2.1, 2.2 in any order depending on choosing and then 2.3, 2.4,
     do 2.1.1, 2.1.2, 2.1.3 on needed.

0. To shopping clothing outline.

1. Serve the web/app clothing online shopping.

2. Choosing product to buy

   2.1. Access catalogue information.

      2.1.1.   Information of brand.

      2.1.2.   Information of sizes.

      2.1.3.   Information category.

   2.2. Access search screen.

   2.3. Identify required product.

   2.4. Add to cart product to buy.

3. Confirm to buy.

4. Update information of customer.

   4.1. Name.

   4.2. Address.

5. Confirmation for payment

   5.1. Credit.

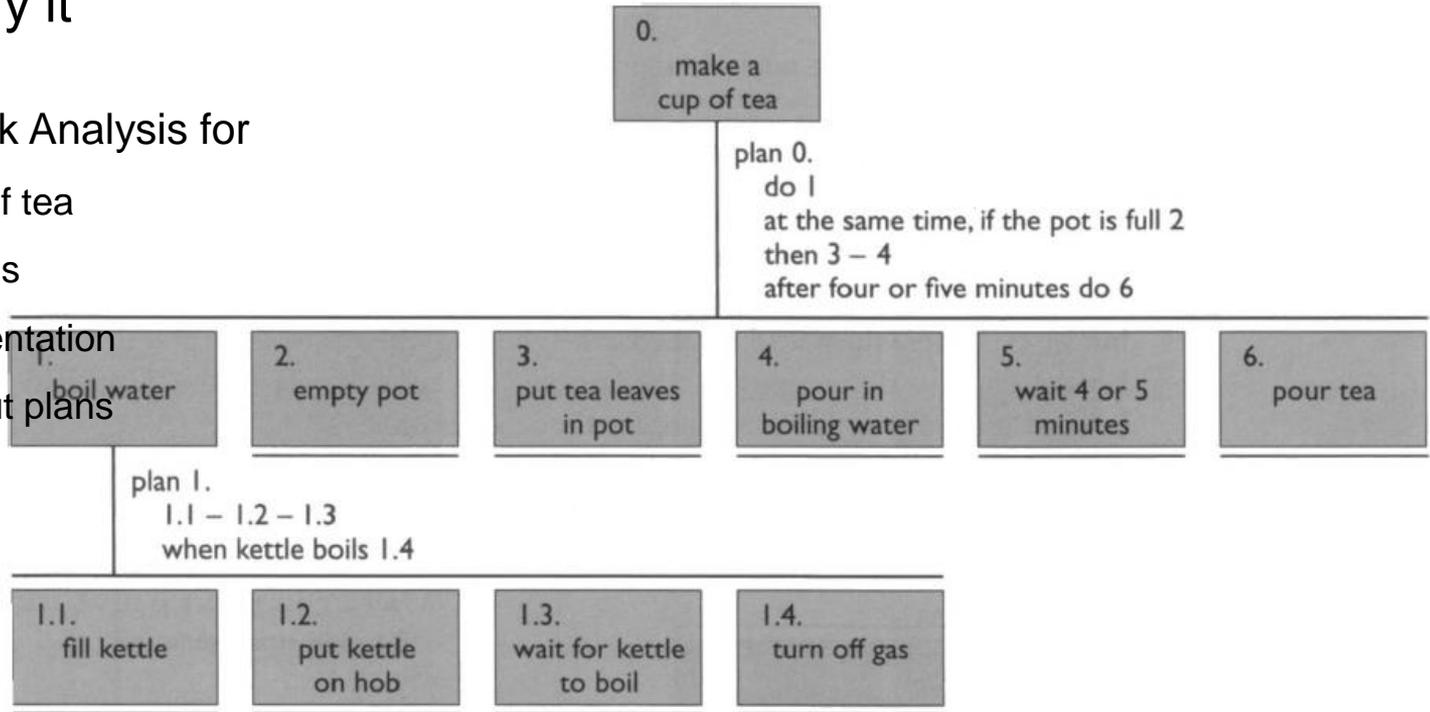   5.2. Cash of delivery.

   5.3. Debit.

Let's try it

Hierarchical Task Analysis for

- Making a cup of tea
- Take 15 minutes
- Textual representation
- Also think about plans

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 6

| 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 hob | 1.3. wait for kettle to boil | 1.4. turn off gas |

Hierarchical Task Analysis

HTA considerations:

- The analyst must spend time getting the description of the tasks and subtasks right, so that they can be represented hierarchically.

- Like most things in interactive systems design, undertaking a hierarchical task analysis is highly iterative and you will not get it right first time.

- The analyst should return to the task list and try to redefine the tasks so that they can be represented hierarchically.

- When the problem-solving process is well understood, HTA modeling is relatively straightforward.

Cognitive Task Analysis

Cognitive Task Analysis (CTA):

- Aims at understanding and defining the breakdown of task completing mental process and demands.
  - decision-making, problem-solving, memory, attention and judgement.
- Analyzes and represents the cognitive activities users utilize to perform certain task.
  - the mapping of the task, identifying the critical decision points, clustering, linking, and prioritizing them, and characterizing the strategies used
- Examines:
  - performance differences between novices and experts
  - mental workload associated with complex controls and displays
  - decision-making of experts
  - the development and evolution of mental models.
  - information requirements for command and control systems
  - troubleshooting, fault isolation, and diagnostic procedures

Link: https://www.usabilitybok.org/cognitive-task-analysis

University of Agder Norway

Cognitive Task Analysis

When to perform CTA:

- At the beginning of the design process

- When little is known about the cognitive demands imposed by the system

- Assist identifying

  - problem areas for which an increased cognitive load exists

  - System components which are heavily taxing on human attention, working memory and other cognitive process

  - Unwanted results: human error

- Times can be associated with the various cognitive and physical actions and hence one can derive predictions.

University of Agder Norway

Cognitive Task Analysis

How to perform CTA: GOMS method

- The most well-known and long-lasting among a large number of cognitive task analysis methods.
  - **G**oals, **O**perators, **M**ethods, **S**election Rules
- GOMS focuses on the cognitive processes required to achieve a goal using a particular device.
- Underlies the physical actions a user must perform.
- Represent human problem-solving behavior.
- Decomposes a task flow into atomic pieces.
- Helps analysts to eliminates unnecessary dependencies in the task flow.
- Facilitates redesigning the flow for fewer interactions to achieve the goal.
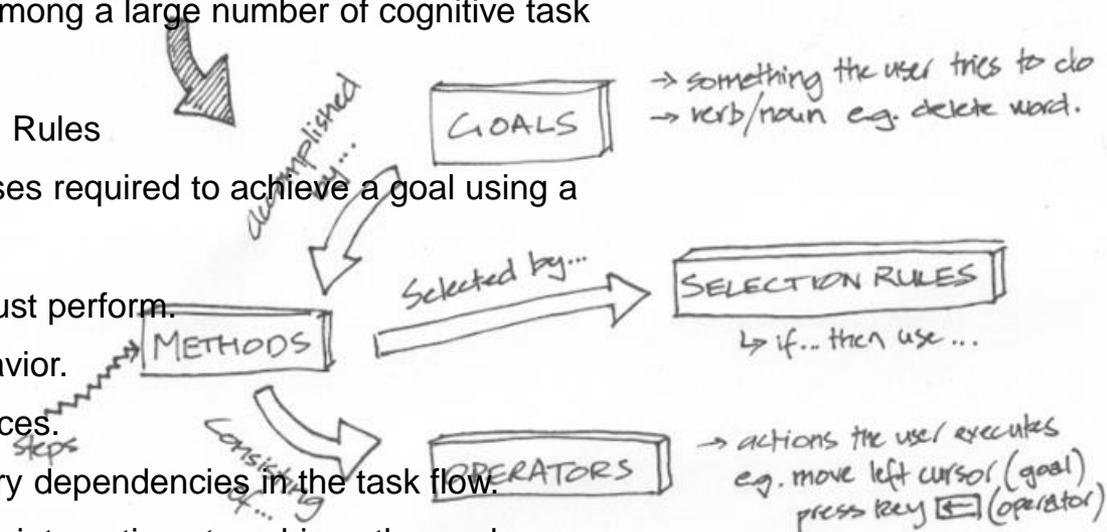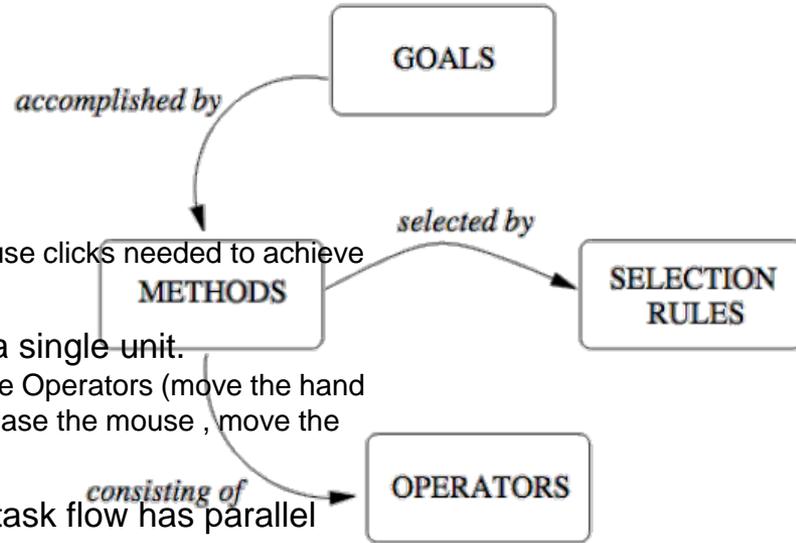
Cognitive Task Analysis

Definitions for GOMS terms with examples:

- A Goal is defined as the successful end state for the task.
  - For example, "Update my mailing address."

- An Operator is an action performed on the machine.
  - On a computer, this essentially breaks down into keystrokes and mouse clicks needed to achieve the goal of "Update my mailing address."

- A Method is a series of Operators chained together to form a single unit.
  - A single method might be "Click on the OK button," which contains the Operators (move the hand to the mouse, point the mouse to the OK button, click the mouse, release the mouse , move the hand back to keyboard)

- A Selection is a decision made, and this is required when a task flow has parallel actions.
  - For example, the user might "Click on the OK button" using the chain of Operators above or might simply press the ENTER key. The ENTER key is obviously much more efficient, but users may or may not be aware that this path through the task flow exists, hence a selection is needed.

GOALS

accomplished by

METHODS

selected by

SELECTION RULES

consisting of

OPERATORS

UiA University of Agder Norway

Cognitive Task Analysis

GOMS considerations:

• GOMS can be linked to nominal times for actions. The detailed analysis in terms of goals and operators can be used to give accurate estimates of task duration and help designers think about different designs.

• Undertaking a GOMS analysis shares with HTA the need to describe, organize and structure tasks, subtasks and actions hierarchically.

• This is not always easy to do.

• However, once a task list has been formulated, working through the model is quite straightforward.

Summary of Task Analysis

- Task analysis is

  - A source of generating documentation: structuring the understanding

  - A source of designing tutorial material: helps users learn to use a product

  - Guiding system design: can be used to design new interactions

  - Requirements capture: what to stay the same as well as what should change

  - necessary for

    - bringing domain knowledge into the design
    - making new design or procedure as familiar and sensible and hence learnable as possible