

Human Computer Interaction

UNIT-5

Lecture 1:

Task modeling and analysis

Mr. Nachiket Sainis/Ms.Reena Saini

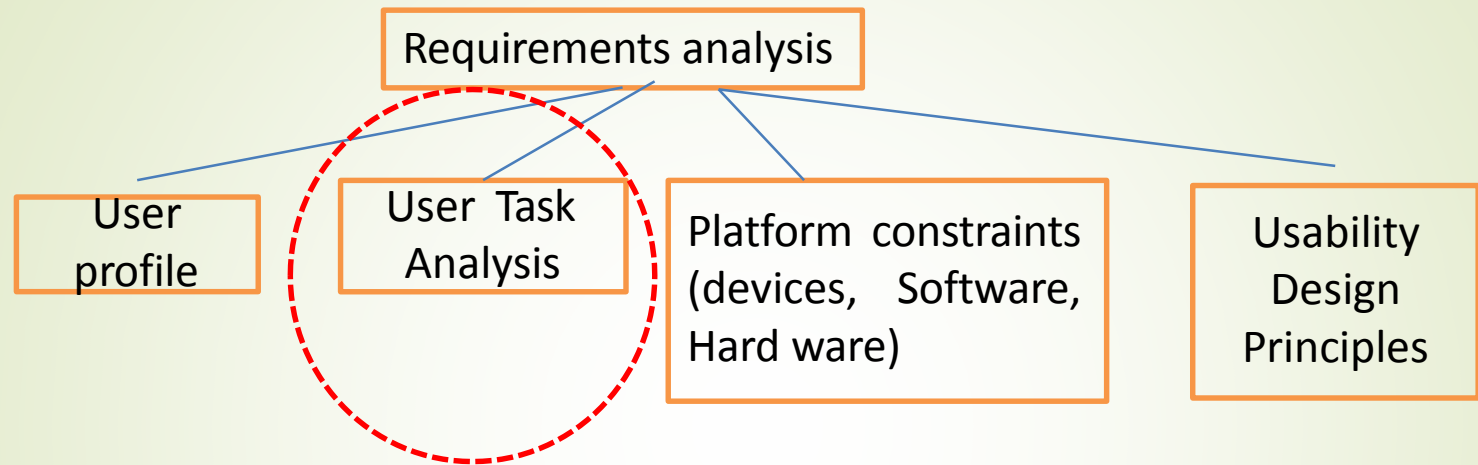


**B K Birla Institute of Engineering & Technology,
Pilani**

Lecture 1:

Basics of Hierarchical Task Analysis (HTA)

Task Analysis forms an important part of User Requirements Analysis.



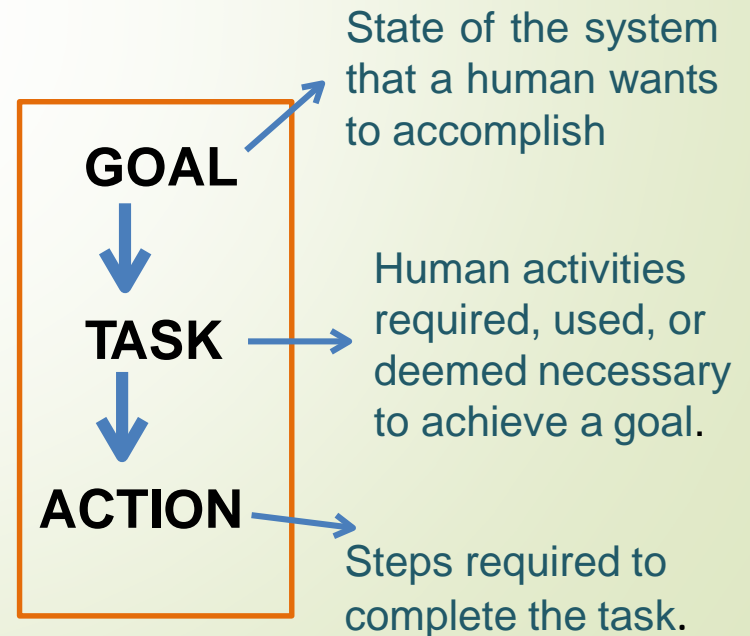
- Task analysis is a study of users, work flow patterns, conceptual frame works, & sequential execution of interaction with the GUI.
- Task analysis results in an user's mental map of how he / she breaks down 'goals' into a series of smaller tasks & sequences them.

Task analysis focuses on understanding 'User'

- Users' goals and how they achieve them
- Personal, social, and cultural characteristics, users bring to their tasks
- Physical environment's influence on users
- The influence of previous knowledge and experience on:
How users think about their work. The workflow users follow to perform their tasks

What is a 'TASK' ?

- A set of human actions that contributes to a functional objective and to the goal of the system.
- **Task analysis defines performance of humans & not computers.**



Task Analysis means understanding User's needs, sequencing them into a series of hierarchical acts (interactions) so as to facilitate the achieving of the goal.

Illustration: Making a phone call

User's need : To communicate with a particular individual
Goal is to inform & seek feed back from that individual in a particular context.

Actions: Putting 'ON' the Phone; dialing the number; communicating; ending the call.

There is a sequence and a hierarchy of actions to be followed.

One cannot go to the next step in making calls unless the previous one is complete.

Task Analysis includes :

- User's goal ; user's need ; user's intentions.
- Understanding user's environment – context of use.
- Planning for the 'actions'

Task analysis has direct implications in software design

Hierarchical Task Analysis is decomposing tasks into subtasks & analyzing the logic of sequence needed to execute the task to achieve the set goal (state) in an optimal way.

Techniques for analysis

- Task decomposition
(split tasks into subtasks in sequence)
- Knowledge-based techniques (what users need to know)

"A **hierarchy** is an organization of elements that, according to prerequisite relationships, describes the path of experiences a learner must take to achieve any single behavior that appears higher in the hierarchy" .

Involves description of tasks in terms of

- Goals (or states) they achieve after execution
- Steps involved
- Relevant contextual information

Task decomposition example

(Split tasks into subtasks in sequence)

- HTA provides a consistent logical description of the interdependencies of tasks and therefore forms a rational framework for description of possible user interface architecture based on which a GUI is visualised.

Full Name:

Address Line 1:
(or company name) House name/number and street, P.O. box, company name, c/o

Address Line 2:
(optional) Apartment, suite, unit, building, floor, etc.

Town/City:

County:

Postcode:

Country:

Phone Number:



Task 1: Feed in Address information to order book

Locate the **Full Name** field.
Move the insertion point to the field.

Sub task 1.1

Type the full name.

Action 1

Locate the **Address Line 1** field.

Action 2

Move the insertion point to the field.

Action 3

Type the address.

Optional: Locate the **Address Line 2** field.

Action 4

Move the insertion point to the field.

Action 5

Type the address.

Full Name:

Address Line 1:
(or company name) House name/number and street, P.O. box, company name, c/o

Address Line 2:
(optional) Apartment, suite, unit, building, floor, etc.

Town/City:

County:

Postcode:

Country:

Phone Number:



The diagram shows how the high level steps of a task relate to one another. The structured breakdown of the task into its subtasks describes each interaction in detail.

Sub Task 1.2

Locate the **Town/City** field.

Move the insertion point to the field.

Type the **Town or City**

Sub Task 1.3

Locate the **County** field.

Move the insertion point to the field.

Type the **county**.

Sub Task 1.4

Locate the **Postcode** field.

Move the insertion point to the field.

Type the **postal code**.

Sub Task 1.5

Locate the **Country** field.

Move the insertion point to the field.

Select the country from the drop-down list.

Sub Task 1.6

Locate the **Phone Number** field.

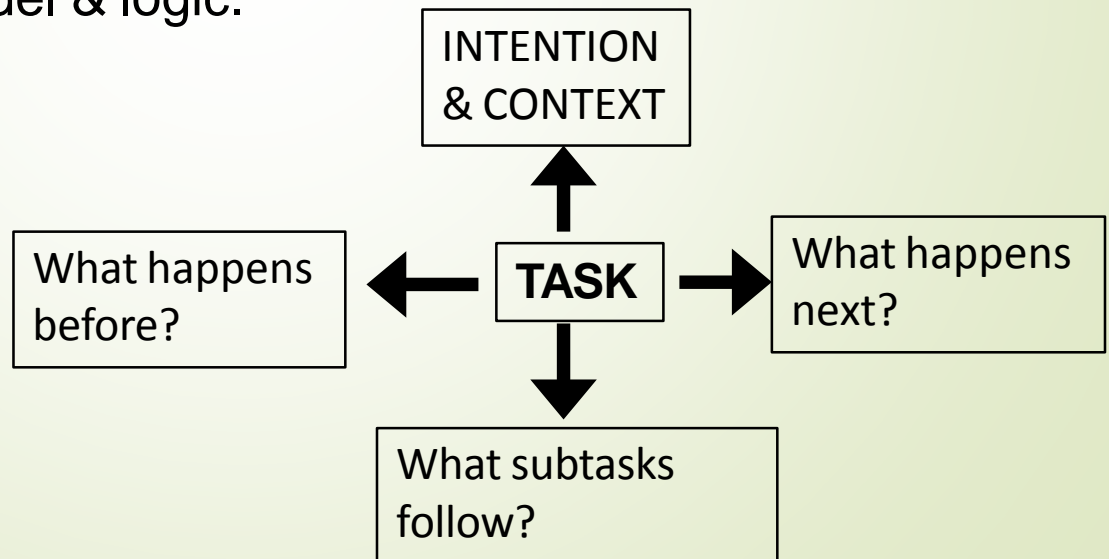
Move the insertion point to the field.

Type the **phone number**.

Collecting user data for Task Analysis

Starting point for Task analysis is the 'User'

- **Ethnography:** Observing and noting users behavior in the use context
- **Protocol analysis:** Observing and documenting actions of the user by validating user's mental thinking .
- Making the user *think aloud* to understand the user's mental model & logic.





Methods for recording user actions include the following:

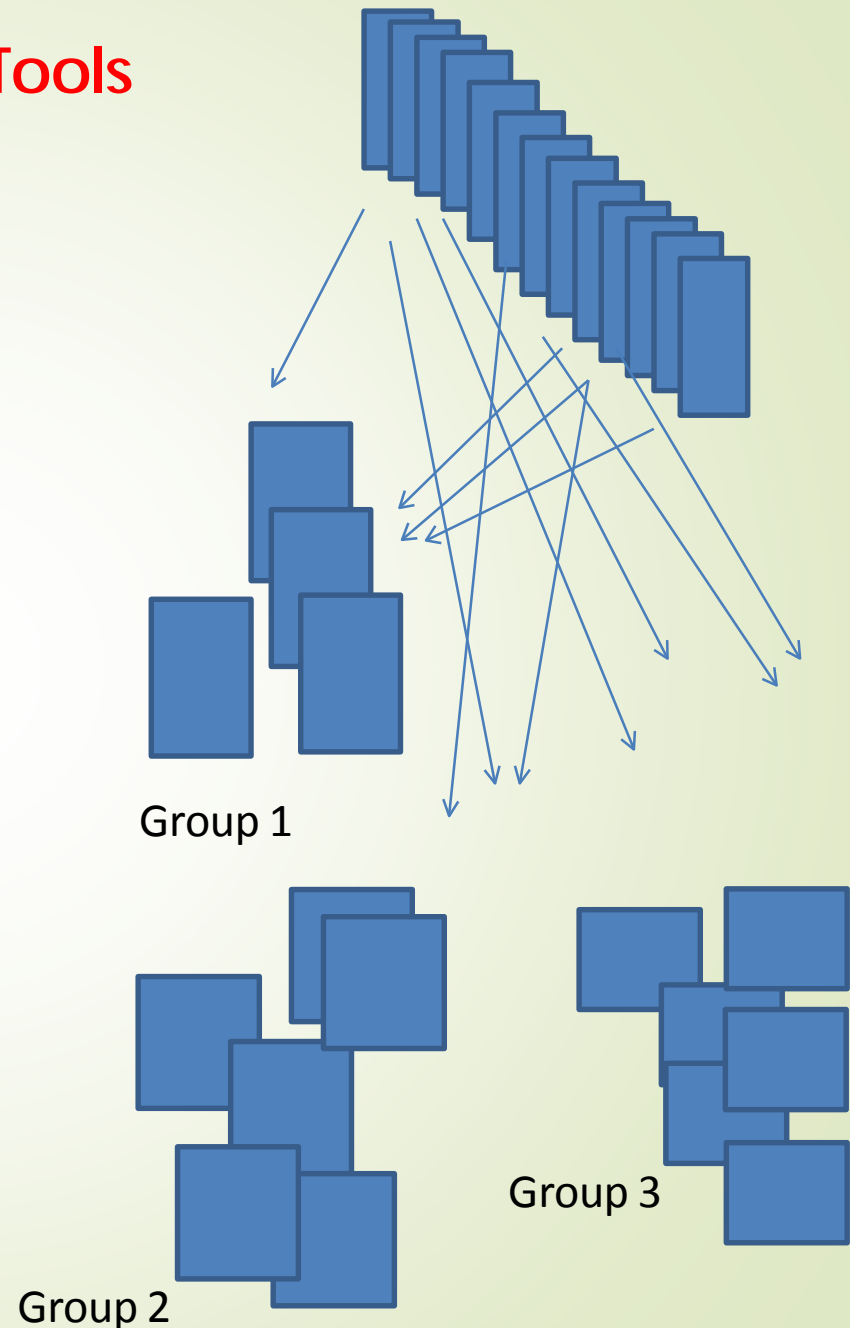
- **Paper and pencil:** This is primitive, but cheap, and allows the analyst to note interpretations and extraneous events as they occur. However, it is hard to get detailed information, as it is limited by the analyst's writing speed.
- **Audio recording:** This is useful if the user is actively 'thinking aloud'. However, it may be difficult to record sufficient information to identify exact actions in later analysis, and it can be difficult to match an audio recording to some other form of protocol (such as a handwritten script).
- **Video recording:** This has the advantage that we can see *what* the participant is doing (*as long as* the participant stays within the range of the camera).
- **Computer logging:** It is relatively easy to get a system automatically to record user actions at a keystroke level, particularly if this facility has been considered early in the design.

Methods for recording user actions include the following:

- **Think aloud and cooperative evaluation:** Think aloud is a form of observation where the user is asked to talk through what he is doing as he is being observed; for example, describing what he believes is happening, why he takes an action, what he is trying to do.
- **Interviews :** Interviewing users about their experience with an interactive system provides a direct and structured way of gathering information. Interviews have the advantages that the level of questioning can be varied to suit the context and that the evaluator can probe the user more deeply on interesting issues as they arise.
- **Questionnaires:** An alternative method of querying the user is to administer a questionnaire. This is clearly less flexible than the interview technique, since questions are fixed in advance, and it is likely that the questions will be less probing. There are a number of styles of question that can be included in the questionnaire. These include the following: **General, Open ended, Scalar, Multi choice, Ranked.**

Modeling user data for HTA : Tools

- **Affinity Diagrams:** Similar data or similar actions are grouped together into categories till a pattern emerges in the form of a diagram.
- **Stick notes or cards** are used to scribble labels. These are grouped and regrouped till a pattern that shows affinity of different groupings becomes evident.
- The degree of affinity is used while determining hierarchy of actions or hierarchy of information.



Affinity diagrams



Modeling user data for HTA : Tools

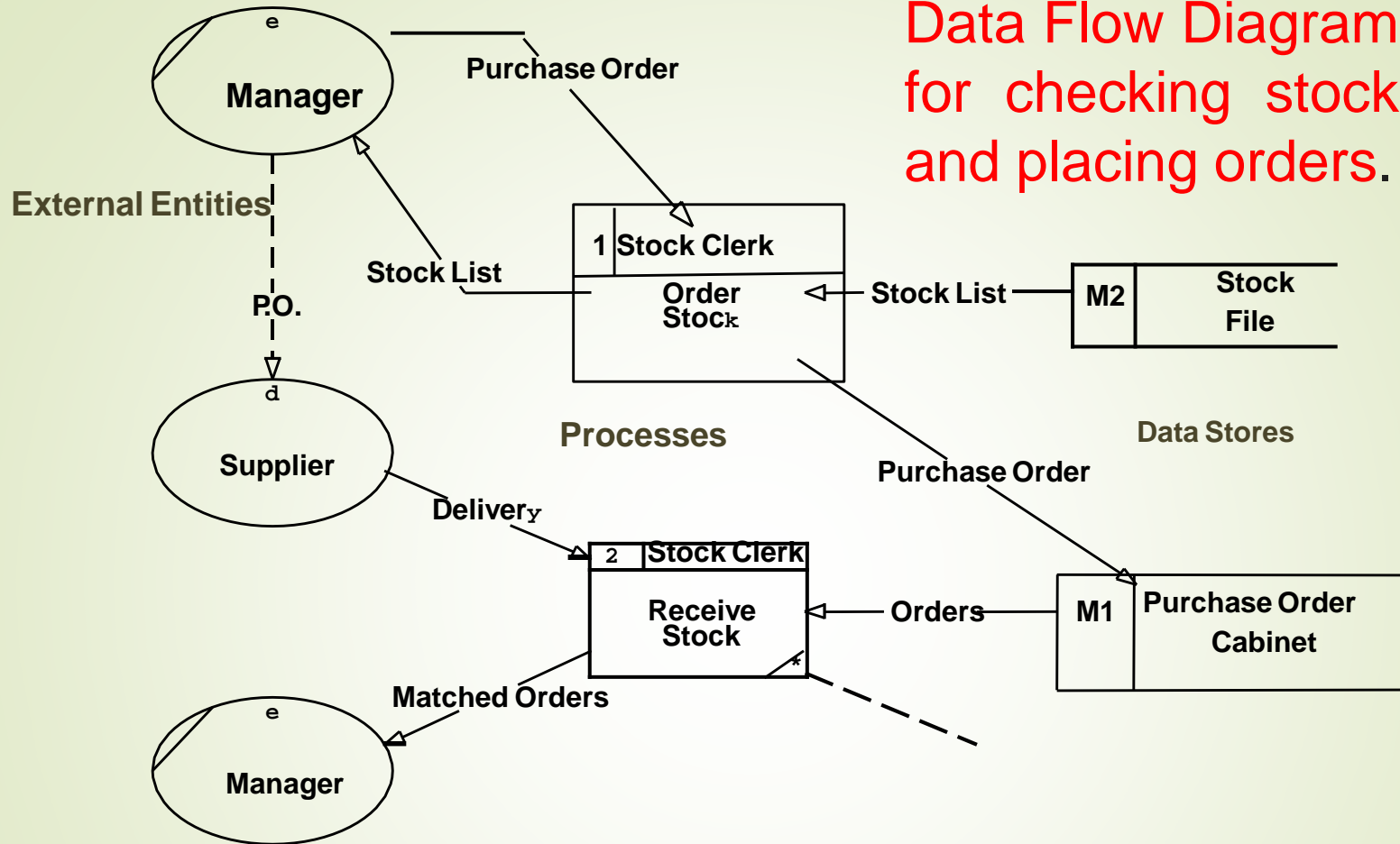
Flow Diagrams: Indicate flow of information through a system. They illustrate dependency of system elements (states) and how information moves - one from another.

They can also be indicative of roles that are assigned within an organisation and how data moves between these assigned roles as well as between organisation as a whole & the outside world.

The diagram is called as DFD- short for Data Flow Diagram and is a standard form of depiction used in Information Systems Design in Systems Engineering.

An example of a Data Flow Diagram showing flow of information in an organisation executing the task of checking stock and ordering supplies is shown in the next slide.

Data Flow Diagram for checking stock and placing orders.



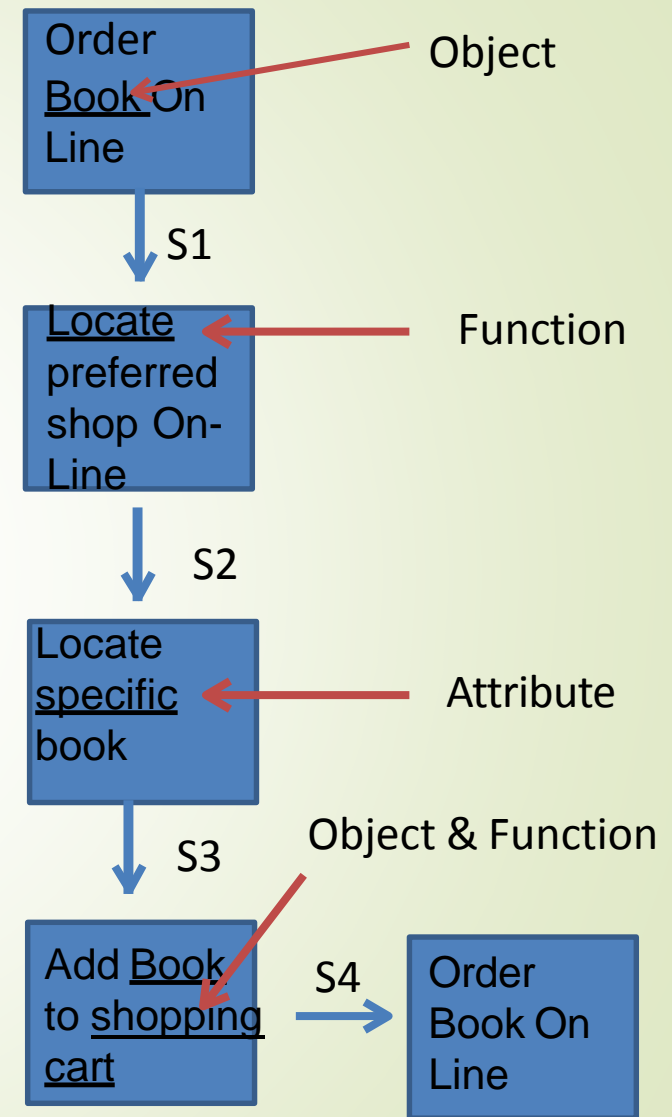
Data Flow in the above (part) diagram depicts a Manager calling for Stock list from the stock clerk who gets it from the database M2. Purchase order is placed and filed in Database M1. Clerk 2 receives stock from supplier and acts further (dotted line).

Modeling user data for HTA : Tools

Sequence Diagrams :

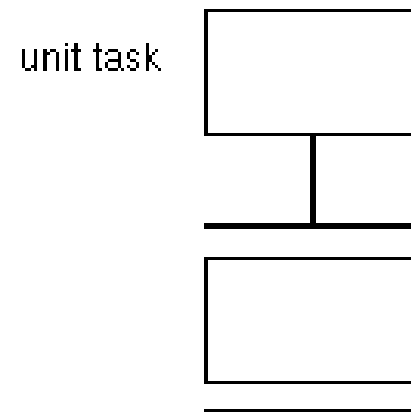
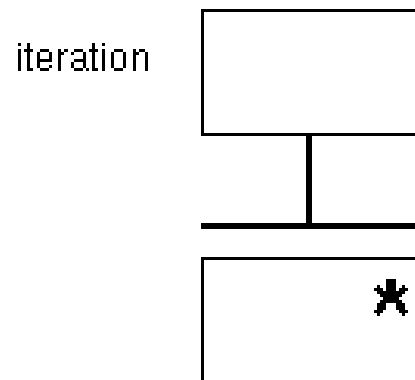
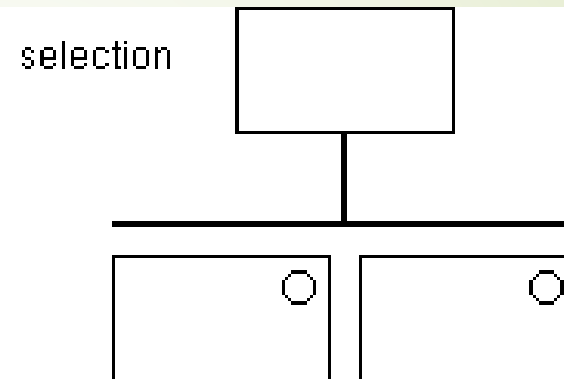
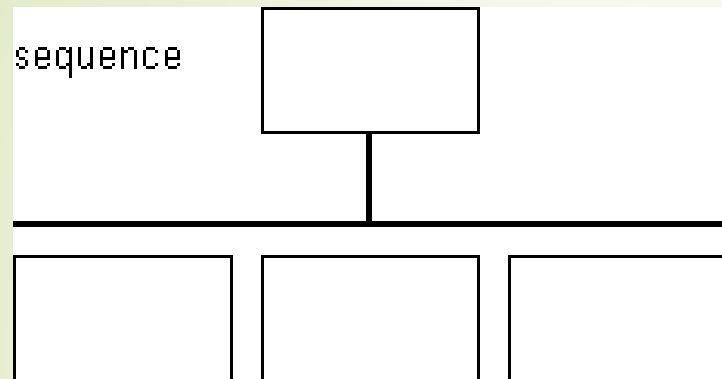
Sequence diagrams are procedural analysis diagrams. While flow diagrams track work through a system, a sequence diagram uses TIME to track actions & decisions.

Sequence diagrams are critical because they give the **OBJECTS**, **FUNCTIONS** & **ATTRIBUTES** of a system which in turn are used to derive the UI information Architecture.




TABLES are also, sometimes, used to indicate sequences

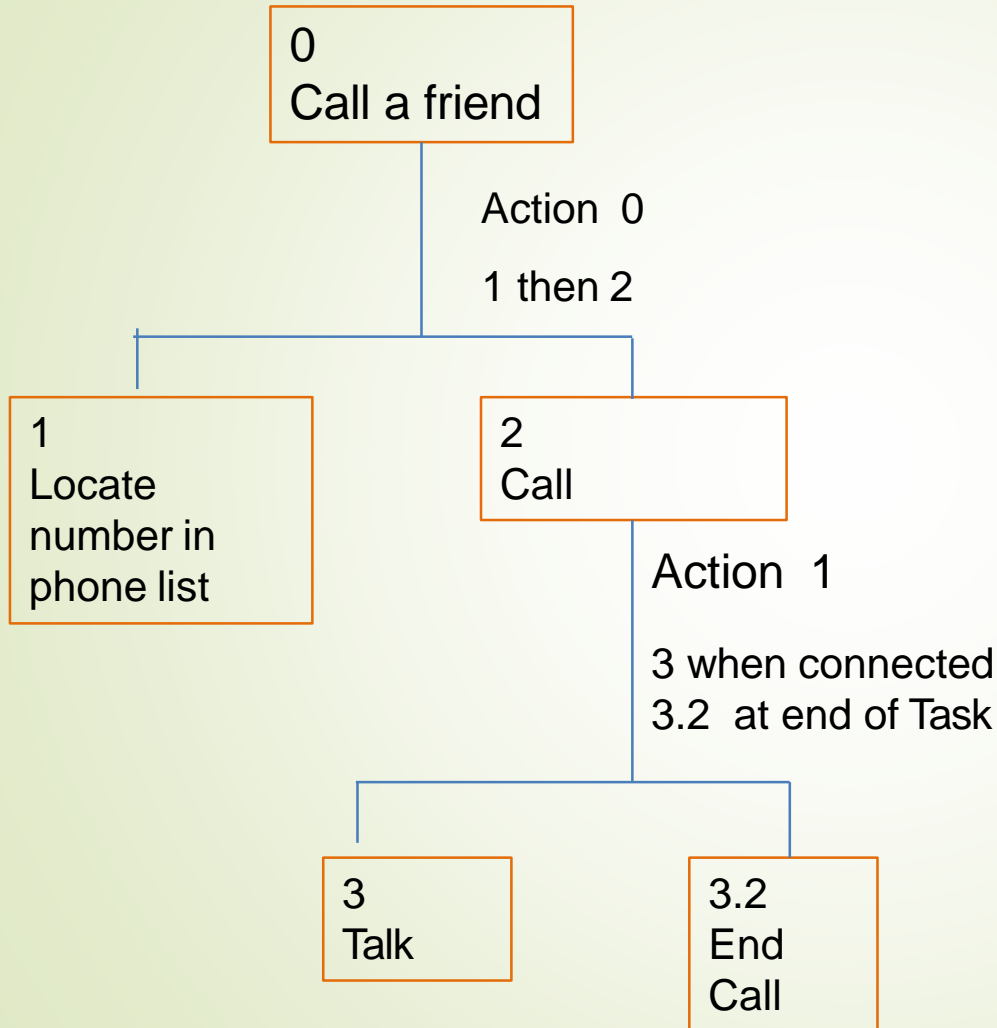
HTA Structure Chart Notation



HTA Structure Chart Notation

- Activities 
- Flow of control (Downward)
- Sequencing (Left to Right)
- Repetition (*)
- Selection (0)

HTA Diagram for making a Phone Call



Task name

Task goal/output

Task steps (Sub Tasks)

Task frequency

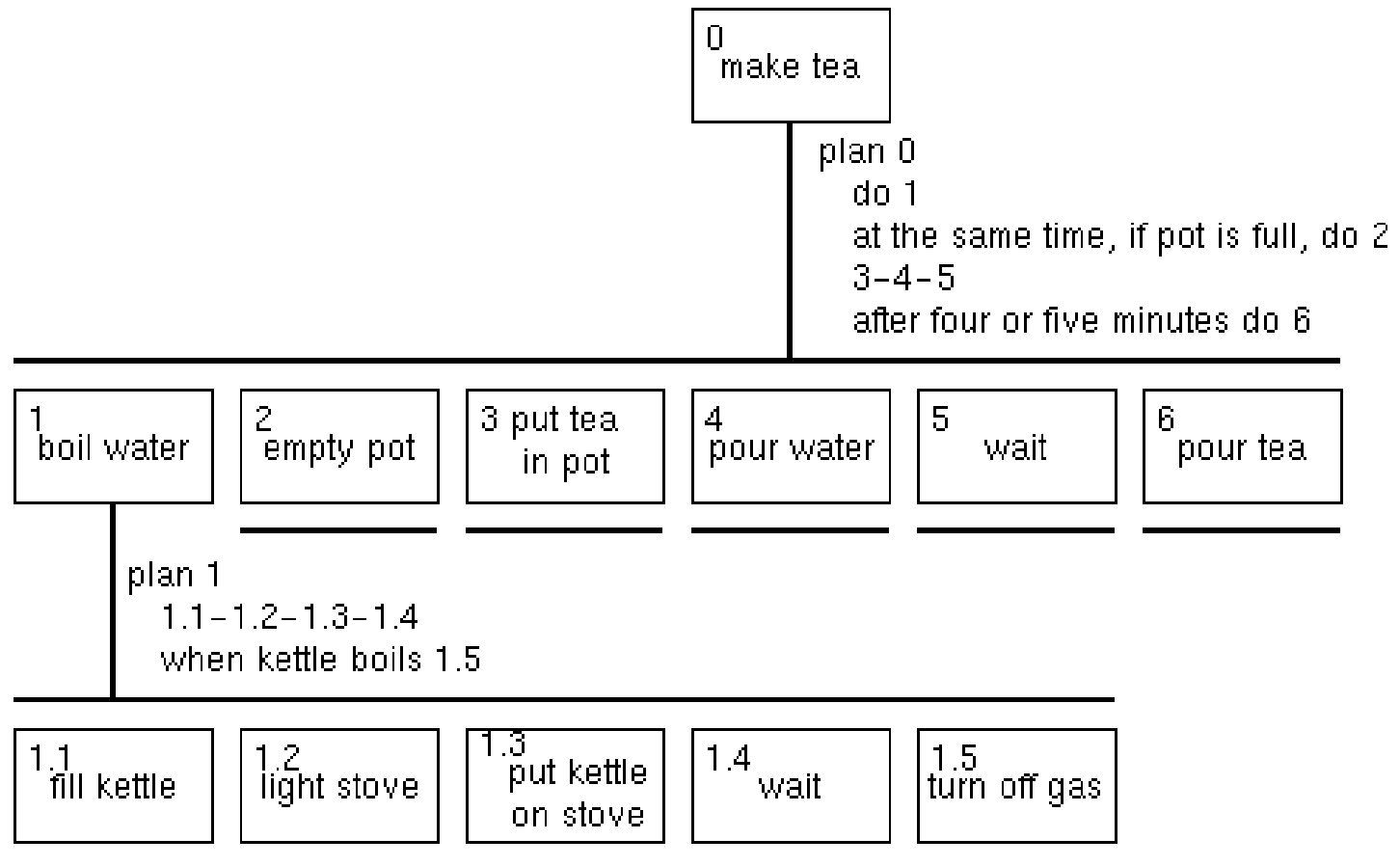
Task flexibility

Task dependencies

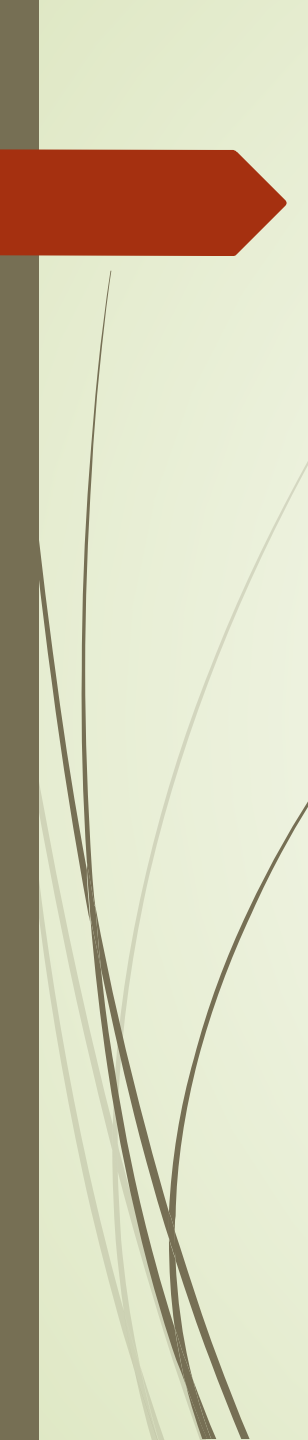
Physical and mental demands

Task output

Example 2: HTA Diagram for Tea-making (Structure chart notation)



Tea-making Structure Chart



```
0. make tea
  1. boil water
    1.1 fill kettle
    1.2 light stove
    1.3 put kettle on stove
    1.4 wait
    1.5 turn off stove
  2. empty pot
  3. put leaves in pot
  4. pour water
  5. wait
  6. pour tea
```

```
Plan 0: do 1.
        if pot is full,
          then do 2 at the same time
        do 3-4-5
        when tea is brewed, do 6
```

```
Plan 1: do 1.1-1.2-1.3-1.4
        when water is boiling, do 1.5
```

Tea-making HTA model in textual notation

HTA Advantages

- HTA is a simple and flexible method that does not depend on a methodological context.
- HTA enables the representation of a task hierarchy that could be further detailed.
- Although HTA is task oriented and to some extent user oriented it still maintains a strong relationship with traditional software engineering.
- HTA provides information, inefficiencies in tasks that can be used for developing product requirements.



HTA Disadvantages

- There are no strict rules for creating an HTA diagram so different analysts will generate inconsistent hierarchies at varying levels of detail.
 - HTA requires both training and experience. It is not a tool that can be applied immediately.
 - HTA is not a predictive tool. It focuses on existing tasks.
 - HTA diagrams can become quite complex.
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