HCI Guidelines: Contextual Inquiry and Cognitive Walk Through

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HCI Guidelines:
Contextual Inquiry

Introduction

Contextual Inquiry is a field-based data collection technique employed to capture detailed information about how users of a product interact with the product in their normal work environment or in other words - interact with the product in its **context of use.**

Contextual Inquiry is a prototyping and user testing dominated method.

In Human Centered Designing (HCD) methodology, understanding the users, their needs, the context in which these needs raise and the context in which the user attempts to fulfill needs - is the first step

Specific techniques have been developed to identify and specify the context of use.

This process is called "Contextual Inquiry".

Contextual Inquiry is a scientific way of understanding users needs, their intentions and their practices.

Definition: Contextual inquiry is the systematic analysis based on observations of users performing tasks / activity in a context.

Hypothesis is made linking cause (effect) based on these observations. The hypothesis is tested in discussion with the users. As a result of this the context itself gets understood in all the dimensions.

By ‘Context’ is meant the anchoring environment / situation / reference / work activity - with respect to which a designing process (solving a problem or conceptualizing a new product) is underway.

Contextual Inquiry is predominantly a qualitative method. In some cases it is a qualitative cum quantitative method of research. The techniques used in Contextual inquiry are rooted in Ethnography, Psychology, Ergonomics & Design.

Results of Contextual Inquiry are used to formulate the Users' *conceptual model* based on visulaisation of the users' *Mental Maps* of tasks, intentions, interpretation and action.

Advantages of the Contextual Inquiry method over other user data collection methods.

Marketing based data or information on the user as a ‘customer’ or ‘consumer’ is of limited use for a HCI designer as it does not give mental & psychological insights while the user is using the device .

This method being open ended makes it valuable deep-mining of tacit knowledge from the user. Tacit knowledge is that knowledge which normally the user is not consciously aware of themselves.

It helps to develop a shared understanding between the device interface creator and the user.

Even though both qualitative as well as quantitative data is involved, this method is reliable and scientific.

Disadvantages of the Method

Disadvantages are few. Since majority of information is qualitative it is not provable statistically significant.

The inquirer needs to be highly skilled in multiple disciplines such as Ethnography, Psychology, Culture, Design and HCI.

Some field based difficulties:

Gaining confidence of shy and suspicious users can pose a problem

Users may not want to be seen as stupid and hence may exhibit extra smartness (mislead). It is well known that when observed humans do things different from the way when alone.

Methods

In short the method involves:

- Going to the user's environment
- Observe real work in natural conditions
- Seek clarifications and confirmations through questions.
- Conceive the field observed data into a model.

The user is treated as an expert.

Interviewer observes users I real time as they perform the tasks. Questions on the users' actions are asked so as to understand their motivations and approach to a given set of interactions with the interface.

Care is taken NOT to 'lead' the user by prompting while inquiring or assisting them in completing their answers.

Interviews /observations are conducted at the users actual work place /environment.

Data gathering processes

Inquiry alternates between observing and discussing / clarifying from the user as to what the user did and why.

In this technique the researcher interprets and shares insights with the user during the interview / discussions.

Often the researcher's understanding stands corrected by the user.

Researcher needs to take care that the discussions do not move away from the focus of the contextual inquiry.

Planning for a Contextual Inquiry

Define the issue / problem /context as well a suppose well for which the Inquiry is being planned.

Plan for identifying users, their location, their numbers, and their willingness to cooperate.

Work on the briefing that will be given to the participating users. Prepare a list of possible questions to start the dialogue with the users.

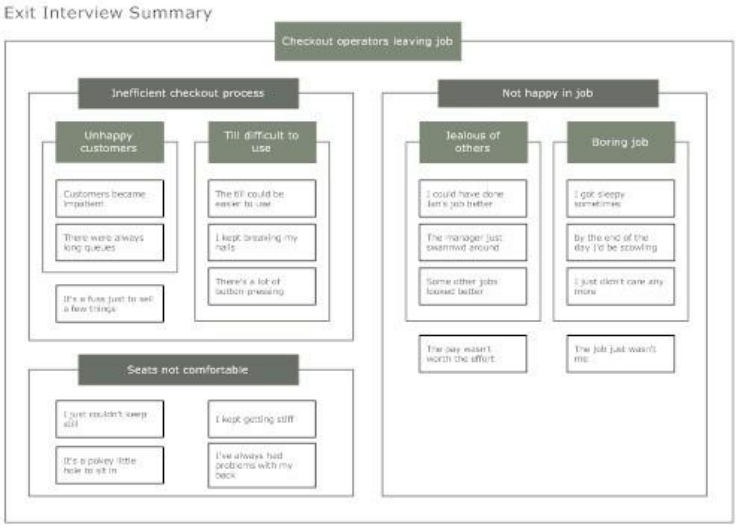
Prepare documenting mediums such as cameras, voice recorders etc.

Tools / Instruments used in Contextual Inquiry

- Open ended questioning based on observations
- Pre-prepared Questionnaire (User Survey)
- Ethnographic observation dairy with notes

(These notes are converted into Affinity diagrams)

- Focus group interviews
- Structured discussions
- Photo / video documentation.
- Hierarchy diagrams
- Story boards
- Mind maps

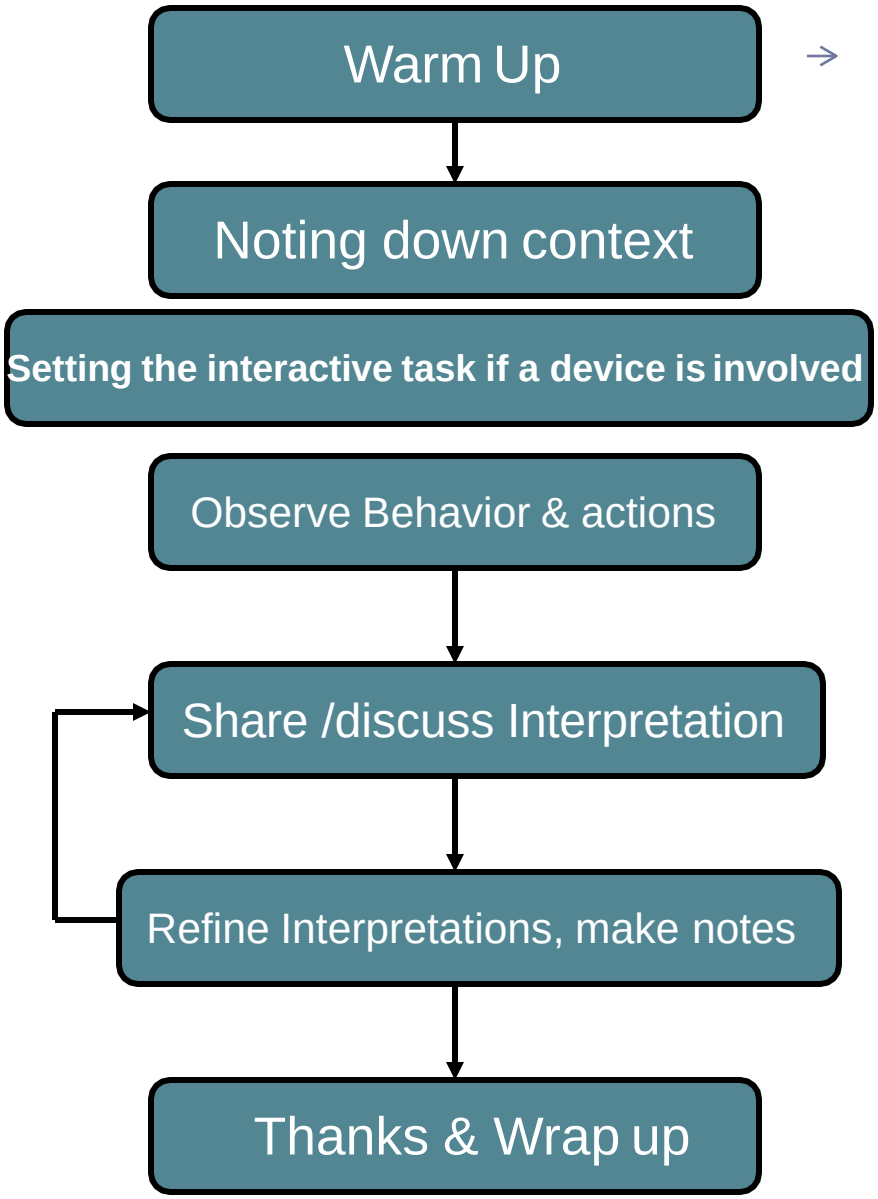


•Affinity diagrams: Data that have affinity to each other based on are grouped together to form a category.

•Affinity diagram contains one or more categories.

•Cards on which labels / words describing a characteristic are moved around on a board to ultimately result in 'groups'. Groups are given labels.

Stages of a Contextual Interview



Greetings. Explaining the purpose. Rights of the subjects for protection of personal information.

Prejudging the user. Gathering the usage data of the user and the experience data of the user.

Analyzing the data collected in Contextual inquiry

Data collected from contextual inquiry is analyzed, interpreted and finally visualized and represented by the researcher using one or all the following models which are part and parcel of the HCD process.

- Flow Model
- Sequence Model
- Cultural Model
- Artifact Model
- Physical Model

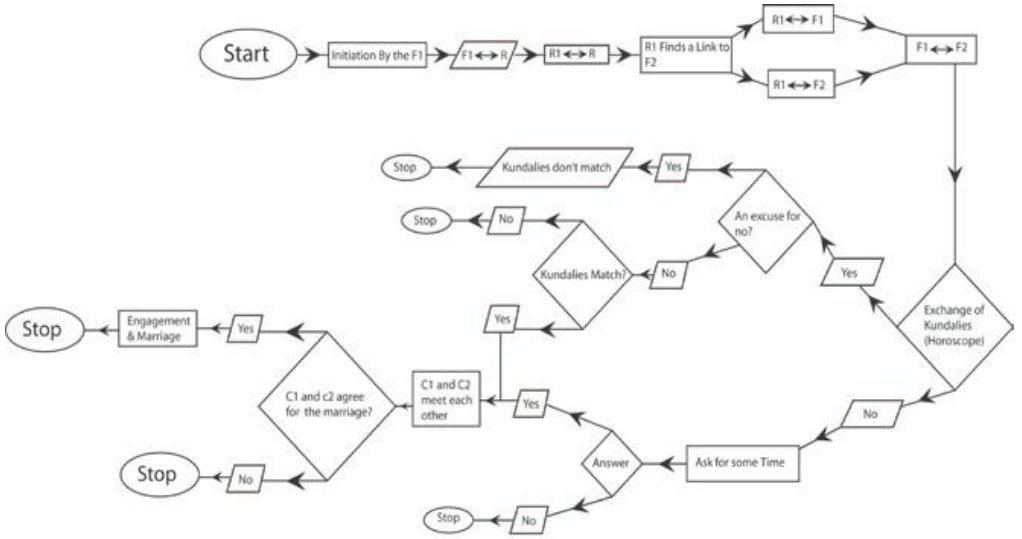
Descriptions of these models follow in the following slides.

Descriptions of the Models

- Flow Model

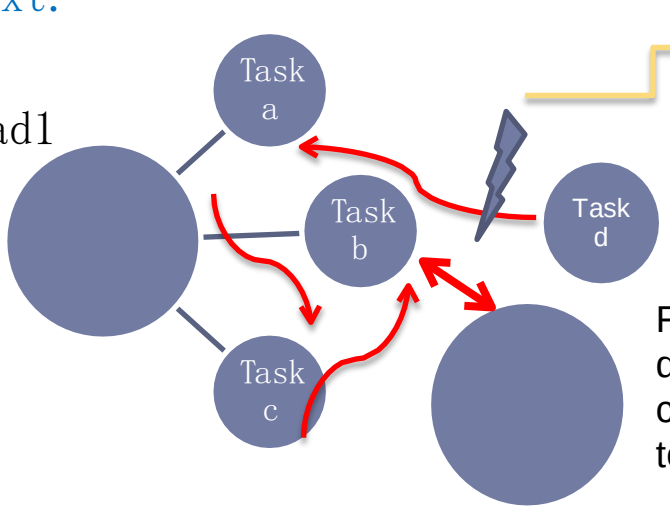
Flow model represents the coordination, communication, interaction, roles, and responsibilities of the people in a certain work practice.

It is based on the logic of flow of information between different entities making up the system within the context.



Flow chart for the Arranged Marriage Process in Rajasthan

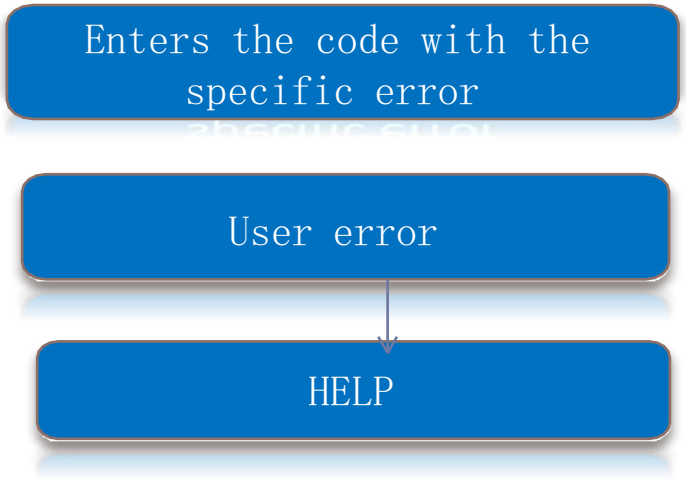
This model is mainly use to depict the logic behind the flow of information

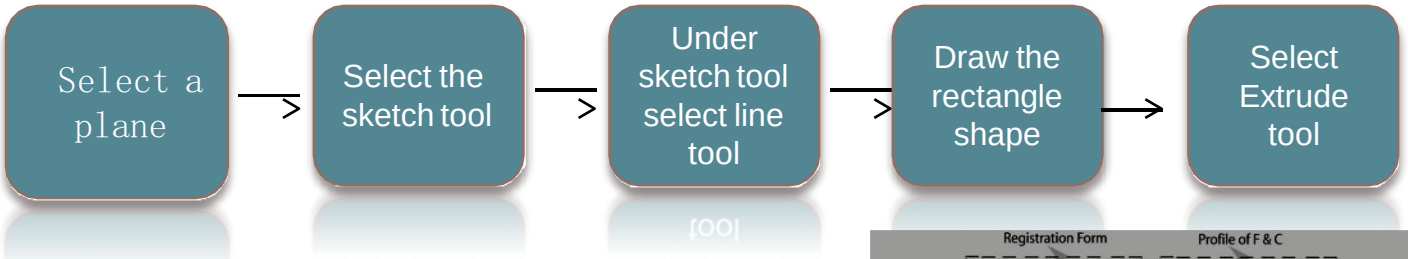


Critical commn. link
Team Lead 2 is missing

Focuses on the *roles* of different users, and how they communicate and coordinate to get work done

Sequence model - represents the steps users go through - to accomplish an activity. Sequence models are linear and sequential in nature. Sequence models of a number of smaller tasks when integrated represent the interconnected sequence within a larger system as shown in figure:

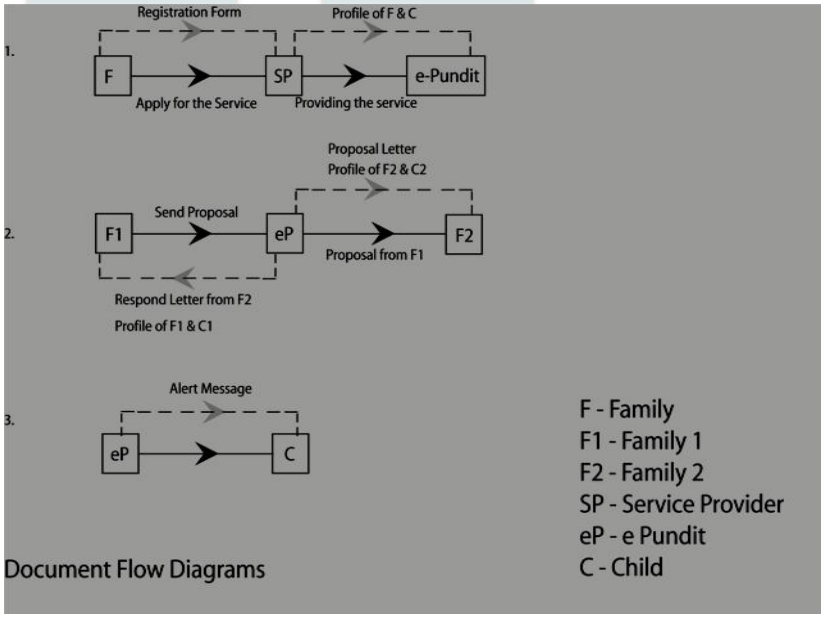




Low-level, *step-by-step* information on how work is actually done"

Includes the *intent* behind the action, the *trigger* that led the user to this action, and *breakdowns* that create problems

Document flow in an Indian Matrimonial pre-exchange is shown on the right.

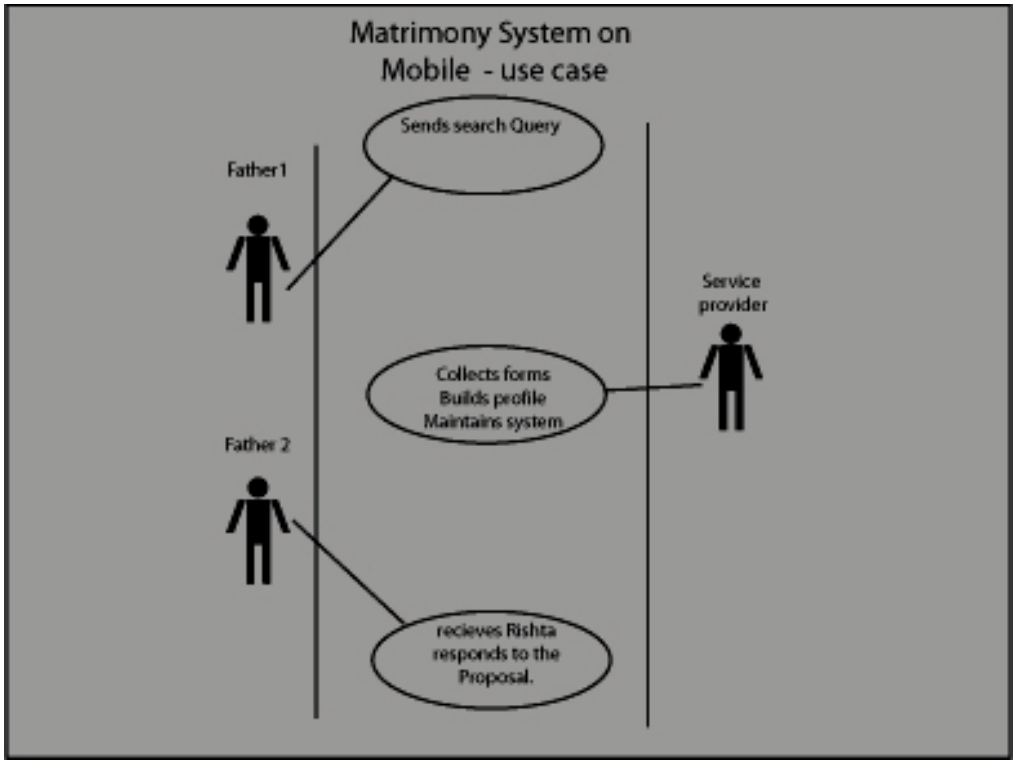


Cultural model -

represents the norms, influences, and practices that are present in the work environment and which are specific to a particular region or are traditionally followed as local norms.

Often culture specific comments or differences are mentioned using either flow diagrams or sequence diagrams or both.

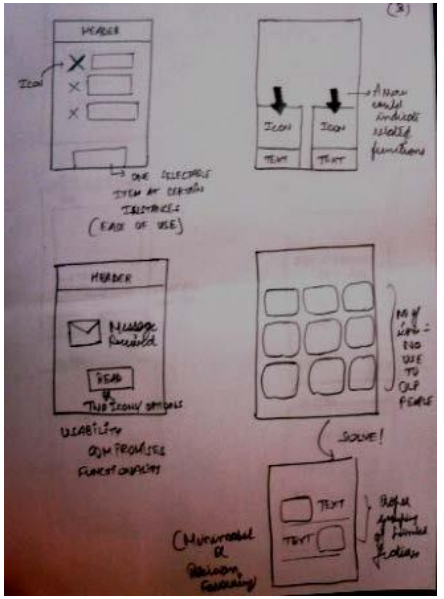
Language for example is a Culture model variable.



In Indian culture parents are the ones who establish the first contact and collects the information of a prospective son-in-law /daughter-in-law.

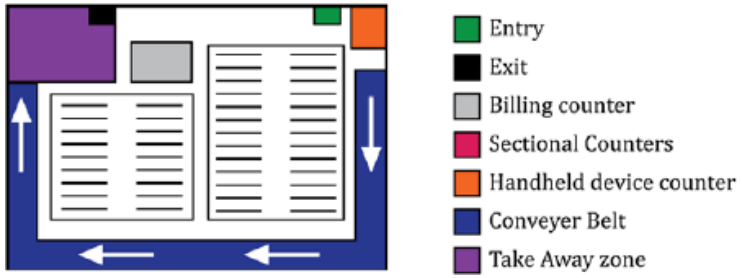
This flow model is not evident for a person from another culture.

Artifact model - represents the documents or other physical things that are part of the work / task execution. These artifacts are aids to the tasks created while working or are used to support the work. Example would be a Paper based voucher simultaneously filled up in a particular step of a sequential task flow.



Interviewers should inquire into the *structure*, *content*, *presentation* and *usage* of the artifact.

Physical model - represents the physical lay out of the environment where the work tasks are accomplished.



Simple examples would be office layout, network topology, or the layout of icons on a computer display environment.

The flow of work as it moves in the physical environment is represented as a map. Example would be of a retail shopping.

Selects, Pick → Hands over to Counter → Who weighs and enters item code → Packs / Seals → Sticks Label → Hands Back to Customer → Who puts it in his trolley

Includes the *organization* of space, the *grouping* of people, and their *movement* in the space

Consolidating Work Models :

All flow models are taken for each user and their interconnectedness to form a whole system is attempted. The groups are formed based on roles played by individual users. Extracts from the flow models represent abstracts of communications, responsibilities and constraints. The same thing is done with other models.

A report on the contextual inquiry is generated for designing team.

Model	**Group**	**Abstract**
Flow	Roles	Responsibilities, Communications, Constraints.
Sequence	Tasks	Triggers, Activities, Intents
Artifact	Role	Parts, Structure, Intent, Usage
Physical	Work Spaces	Places, Structure, Movement Patterns
Cultural	Influencers	Influences

Assignment:

Form a Group (3-4 people)

Choose a Project for Contextual Inquiry.

(Example: Course registration system at the beginning of the semester)

Identify Users' / Stakeholders' categories.

Conduct a Contextual Inquiry and draw the Flow, and other models.

Draw Affinity Diagram

Generate Five Work Models

HCI Guidelines:
Cognitive Walk Through

Introduction

Cognitive Walk Through (CWT) is a usability method that focuses on evaluating a design (existing or proposed) for ease of learning particularly through explorations by the User.

Cognitive Walk Throughs [CWTs] are :

- Usability Inspection Methods [UIM]
- Focus on Evaluating a Design's navigation.
- Basis is 'Ease of Learning' by self exploration by the user

Background

Cognitive Walk Through (CWT) has the same basic structure and rationale found in software walkthroughs (Yourdon 1989).

In the software **code** walk through, the sequence represents a segment of the program code that is 'walked through' by the reviewers to check certain characteristics (e.g., that coding style is adhered to, conventions for spelling variables versus procedure calls, and to check that system wide invariants are not violated).

- In cognitive walk through [CWT], the sequence of actions refers to the steps that a user will require to perform on the interface so as to accomplish a task.
- The evaluators then 'walk through' that action sequence to check it for potential usability problems.
- Focus of the cognitive walkthrough is to establish how easy a system is to learn by operating it. The focus is on learning through exploration.

Ref: Yourdon .E "Structured Walk Throughs", (4th edition) Englewood cliffs, NJ Yourdon Press.

CWT Questions: (Wharton et al 1994)

1. Will the user try to achieve the right effect ?

2. Will the user notice that the correct action is available ?

3. Will the user associate the correct action with the effect that the user is trying to achieve ?

4. If the correct action is performed will the user see that progress is being made towards solution of the task ?

Significance

Walk Throughs help answer interfaces design questions like:

- How will the user approach a task ?
- What is the correct action sequence for each task and how it needs to be described to the user.
- How to achieve the desired action sequence form the user with minimum human cost and maximum efficiency
- How quickly will the user learn & becomes comfortable with the interface?

Example of where CWT is useful

When ATMs were first introduced one of the questions on the design of operational sequence was –

Should balance in account be displayed simultaneously every time the user access the ATM ? (Or) Is it better to display balance after the transaction is over.

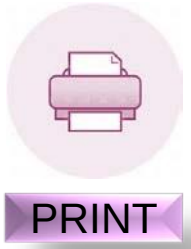
A walk through reveled both the above assumptions are out of sequence as far as the user is concerned.

Seeking 'Balance' is a sub goal either before starting of a transaction or after a transaction is over. In either case it needs to be an independent Goal by it self rather than a sub goal of accessing the account. Users approach ATM more often for Withdrawal than for knowing Balance.

In hindsight – this *wanting to know the 'balance'*, though seems to be implicit - is not necessarily so.

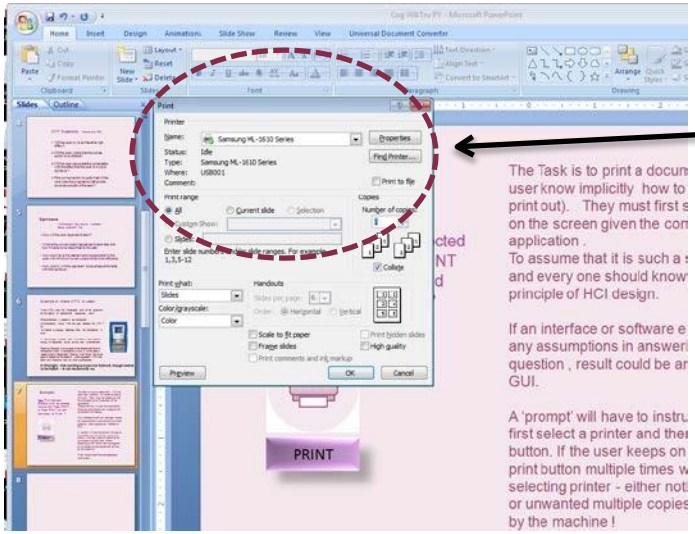
Example 2

<u>Task:</u> Print Document. Should a printer be selected first and then Press PRINT or Press PRINT first and then chose the Printer ?



The Task is to print a document. Will the user know implicitly how to do so (take a print out). They must first select a printer on the screen given the context of the application .
To assume that it is such a simple action and - *every one should know* - is against the principle of HCI design.

If an interface or software engineer makes any assumptions in answering this simple question, result could be an ineffective GUI.



A 'prompt' will have to instruct the user to first select a printer and then press print **button**. If the user keeps on pressing the print button multiple times without selecting the printer - either nothing happens or unwanted multiple copies are spit out by the machine !

Walk through identifies such gaps and prevent errors.

Cognitive Walk Through has two phases:

Preparation phase

i) Building A prototype { paper; mock up; screen based } with description. It need not be perfect or complete in all request.

ii) Making a list of selected tasks you want the user to 'walk through' the interface along with you. The task should have ready well defined sequences for Goals and sub goals with written actions used to complete each individual task.

iii) A clear understanding of the user, his /her background; level of expertise in the domain; prior experience of using similar software etc.

Evaluation phase

i) Conducting the Walk through session

ii) Recording the Observations

i) Analysis

i) Inferences

i) Recommendation to Interface Team

The evaluator should prepare to look for answers to Questions in Table:

The purpose of conducting the walk through must be clear to the evaluator prior to starting the walk through.

Question	
Can the users understand & reach the goal –the very purpose of the assigned task?	This will yield what the user is thinking once a task is assigned. Most of the time users do not think or act the way as the interface designer expects or wants them to
Will users be able to locate the buttons / GUI elements for the action they are supposed to perform given the task?	Often it is very difficult for the user to find the control/element to start . This is even more confusing to the user when there are several or multiple possibilities to start the sequence - on the GUI.
Does the interface provide understandable feed back at every action in the task sequence?	Often even if the users are able to locate the right GUI control /element can they tell with high degree of confidence that this is the right control for the action they want to perform and that they will indeed reach the goal. Intermittent feed back assures users that they are indeed proceeding in the right direction. Feed back can be in the form of sound or labels or motion or change in status.

Over view of the actual Walk Through Processes

Pre-preparation:

1. Define Users : Who are the users. Identify them.
(Catagorise them as Novices, Intermittent & Experts)

2. Identify the tasks for the evaluation

Ex: Evaluation for “Checking out Balance on an ATM”
Prepare notes on what the user must know prior to performing the task and what the user should be learning while performing the task.

3. Prepare action sequences for completing the Tasks

Make a “AND THEN“ list of Goals & sub goal.
Ex: Overall Goal: Find out balance from the ATM
Subgoal1 : Activate ATM [Physical action Insert Card]
Subgoal2: Identify self [Input pin code]
Sub goal 3 : Get balance [press action button with label]
Sub goal 4: Get a print out [if required]
Sub goal 5: Log out from ATM .

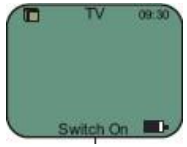
4. Conduct the Walk Through Session

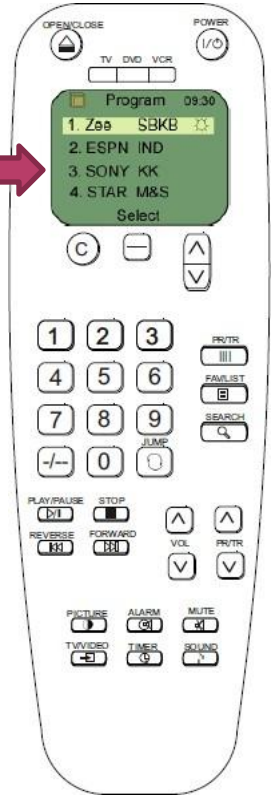
Conducting the Walk Through Session

- Using the mock up prototype ask the user to perform a task. See Example of a mock up bellow
- Make the user walk through the action sequences for each task. See Example in next slide
- Make a recording of observations in a Recording Sheet .

Paper mock up cut outs of screens are kept ready. User is asked to operate the remote control for a given task.

Depending on what the user presses, the corresponding paper display is slipped on the cardboard / mock up of the remote controller.





Make the user walk through the action sequences for each task

Example of an Action sequence for forwarding Calls on a telephone.

Task: Forward phone calls to my office assistant / friends desk while I am out for a short period and reset it back to original state.

A1. Activate call interface.
R1. Sound feed back of activation done by tone 1
A2. Press #2 (Command to cancel call forwarding)
R2. Sound of registering press command by tone 1.
A3 . Listen to sound feed back confirming completion of action.
Time lapse Second Tone 2

Reverse cycle

A4. Activate call interface
R1. Sound feed back of activation done by tone 1
A6. Press *2 (Command to cancel forwarding)
R2. Sound of registering press command by tone 1.
A7. Listen to sound feedback confirming completion of action. Tone 2
End of sequence
End of Task.

Observation during the Walk Trough

- The above task is assigned to a user. The user is asked to proceed executing the task on a mock up / paper prototype / wire frame prototype.
- The user is asked to achieve a goal (of forwarding a call in his absence and informed about the sequence of actions.
- The sequence of inputs as carried out by the user are observed.
- The errors committed (deviation from the expected sequence and corresponding action) are noted.
- The difficulties are mutually discussed with the user. Why a user acted in particular way and did not act in ways that was expected is explored.

Make a recording of observations in a Recording Sheet .

Description of step. 	Did the user try to achieve the end goal or did he give up At the start itself.	Did the user notice that the correct action choices are available. Yes – PARTLY-No	Did the user confidently know that the choice being made by him/her is the right one ? Yes No	Did the user understand the feedback after every action	Did the user Complete the Task With satisfaction Yes PARTLY No	Comments / Alternative suggestions / solutions / discussion points.
A1. Activate call interface.	YES	PARTLY	YES	YES	YES	
A2. Press #2 (Command to cancel call forwarding)	YES	YES	YES	NO	PARTLY	Was not paying attention to sound feedback as it was not expected.

Analysis & Inference

Evaluators Rating Sheet

Action in Sequence	System mismatch question	Potential Problem & Design solution	% Mismatch to ideal situation (**qualitative estimation**)
 A1. Activate call interface.	Is it clear to the user that system has taken input	Low clarity of sound. Ambient Noise. Increase volume	30%
	Can the user resume control for the next action	YES	
	Are the systems response visible & interpretable	No	
	Is the end of the system action clear	YES	
A2. Press #2 (Command to cancel call forwarding)	Is it clear to the user that system has taken input	PARTLY	50%
	Can the user resume control for the next action	NO	
	Are the systems response visible & interpretable	PARTLY	
	Is the end of the system action clear	NO	

Summarize the findings:

Percentage of mismatch 50%
The Interface needs improvement.
Sound Tone to be changed
Sound Volume to be increased
Additional Feed back to be incorporated in A2

End of Walk Through Testing Report

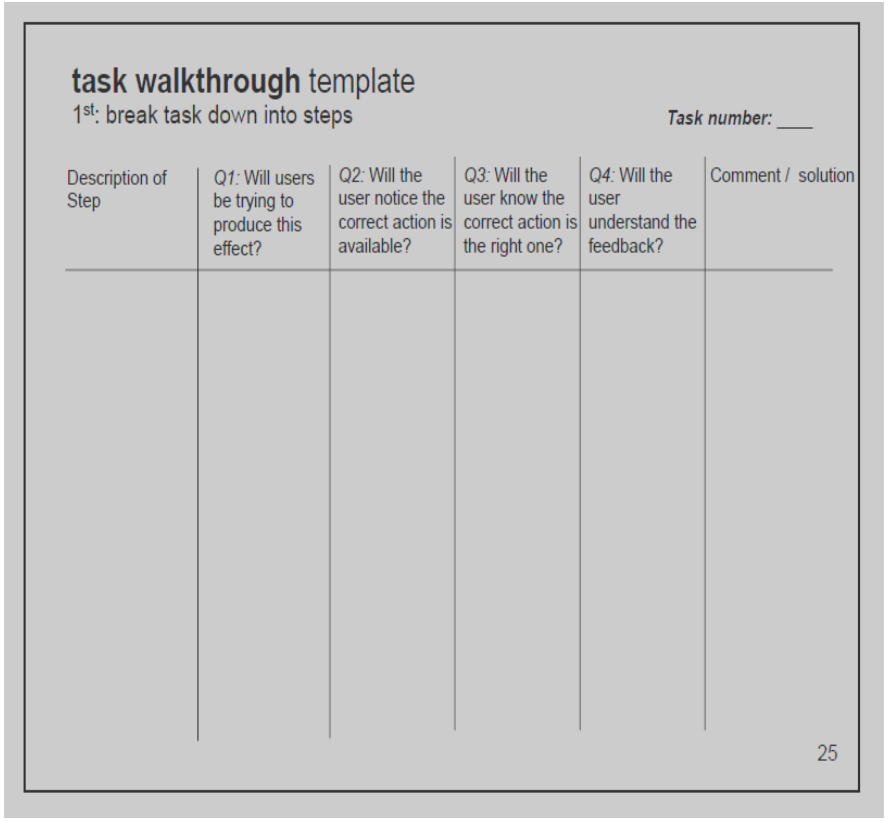
Assignment:

What's the difference between a Heuristic Evaluation and a Cognitive Walk Through?

Conduct a Walkthrough for a new product being designed to train Computer servicing technicians.
Users: College dropouts (education upto Plus 2 + - 1)
Context: Undergoing training for routine computer maintenance Job : Running Virus Scans in a Computer service centre.
Level of expertise: Novice. Users knowledge of computers includes starting a computer accessing files and folders, opening and closing files.

Task:
Schedule a virus scan of System Files for a given time and date.
List of Actions: As given bellow in sequence.

1. Select target Scan from Virus scan Software files on computer
2. Select & Open MY Computer
3. Select Windows Folder
4. Select OK
5. Select Schedule
6. Select Enable
7. Determine Time for Scan
8. Set Weekly as Schedule
9. Select Tuesday
10. Select OK to complete task
11. Check if Scan is Scheduled as per settings



task walkthrough template

1st: break task down into steps

Task number: ___

Description of Step	*Q1:* Will users be trying to produce this effect?	*Q2:* Will the user notice the correct action is available?	*Q3:* Will the user know the correct action is the right one?	*Q4:* Will the user understand the feedback?	Comment / solution

25

References:

C. Wharton, J Rieman , P. Polson & C Lewis ; The Cognitive Walkthrough Method : A Practitioner's Guide. In J. Nielsen & R.L.Mack (Editors) , Usability Inspection Methods, John Wiley & Sons, New York.

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