



Welkom in de wondere wereld van Usability

Tobias Heffelaar

TestNet

Wageningen, 28 September 2005

Before we start



Usability definition

ISO 9241-11 standard:

The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

Effectiveness

Efficiency

User Satisfaction

Functional vs Usability

Functional Testing	Usability testing
Does it work?	Can users use it?
Does it crash?	Will users use it?
Focus in system (i.e. technology)	Focus on user (interaction with the system)
Functional design	Task model
In-house testing	On-site (or simulated environment)
System + tester	(future) Users required

Task modelling: example

Make a martini

- **Place two martini glasses in the freezer for a minimum of 15 minutes.**
- **Place ice cubes into cocktail shaker.**
- **Pour four ounces of Beefeater gin in the cocktail shaker.**
- **Pour a quarter teaspoon of the vermouth into the cocktail shaker.**
- **Stir with stainless steel spoon or stirrer.**
- **Remove martini glass from the freezer.**
- **Impale one Spanish olive on a toothpick.**
- **Place the Spanish olive into the glass**
- **Pour the contents of the cocktail shaker through strainer to catch the ice (into glass #1).**
- **Repeat steps 2-9 to make a martini for Dr. Mac (and add a touch of Kir for flavoring)**
- **Sit back and sip slowly.**

Task modelling: example

Chatting with MSN messenger

- 1. Start MSN messenger**
- 2. Log on**
 - 1. Enter email adress**
 - 2. Enter password**
- 3. Open buddy list**
- 4. Select buddy**
 - 1. Check if buddy is online**
- 5. chat**

User-Centered Design

Observing (and listening) to the user at 'work'

- Users specify Functionality
- Context of use important

Usability

what to look for?

- Learnability
- Flexibility
- Robustness

Usability: learnability

- **predictability**
- **Synthesizability**
- **Familiarity**
- **Generalizability**
- **Consistency**



Usability: flexibility

- **Dialog initiative**
- **Multi-threading**
- **Task migratability**
- **substitutivity**
- **customizability**



Usability: robustness

- **Observability**
- **Recoverability**
- **Responsivenss**
- **Task conformity**

What skills are required?

- Knowledgeable in Human factors, cognitive sciences (often psychologists do usability testing)
- Communicative
- Flexible
- Comfortable with ambiguity
- Good listener
- Open minded
- Quick learner

Technical

Not much (Basic computer skills, Video recording knowledge)

Usability testing

Types of tests

- Heuristic evaluation
 - Ask HCI experts
- Formal analysis
 - Cognitive Task Analysis (CTA)
 - Goals Operators Methods Selection rules (GOMS)
- **Usability testing**
 - 'ask' real users
 - Different stages (prototypes, finished products)

How to set up a test?

- Set goals
- Identify relevant user characteristics
- Recruit participants
- Choose test equipment:
 - Video equipment
 - Coding scheme
 - Test site
- Design and verify scenarios
- Practice coding scheme
- Test run the total setup
- Carry out the tests
- Analyze and report

Analyzing a test

Common types of analysis

- Video highlights
- Effectiveness
- Efficiency
- User satisfaction

Video highlights

- Illustrate your findings: seeing is believing!
- Add video and audio clips to slideshows, documents and web pages
- Create video library of behavior for research and training

A video clip says more than a thousand statistics!



Usability metrics: Effectiveness

Purpose

- Measure the effort a user will need to put in to achieve desired results with an application

Common measures

- Frequency of assists
 - Assisted task performance
 - Unassisted task performance
- Frequency of resource usage, e.g. (online) help
- Percentage task completion (% of participants that achieved a goal, sometimes weighted)
- Frequency of errors

Product: Example

Dealing room software

What's the key?

Sell/buy quicker than the competition

Effectiveness



Usability metrics: Efficiency

Purpose

- Measure the level of effectiveness in relation to the quantity of resources expended

Common measures

- Time-on-task (task completion time)
 - Mean
 - Standard deviation
 - Standard error
- Completion rate (#tasks completed/unit time)

Interval	Mean duration (mm:ss.d)
task 1	17:19.2
task 2	09:42.0
task 3	13:20.4
task 4	10:23.0

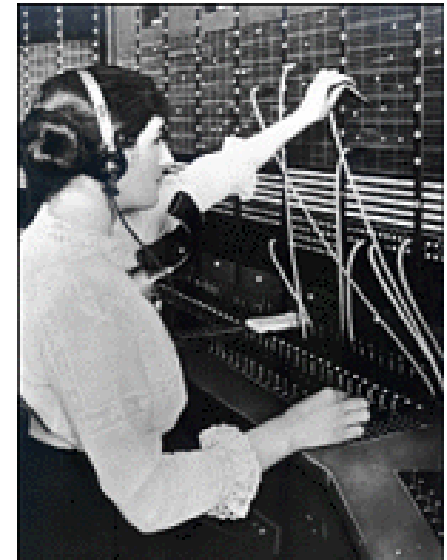
Product: Example

Phone operators

What's the key?

Connect callers as quickly as possible

Efficiency



Usability metrics: User satisfaction

Purpose

- Measure to what extent users liked interacting with the application

Ingredients

- Satisfaction
- Usefulness
- Easy of use



Product: Example

Cars

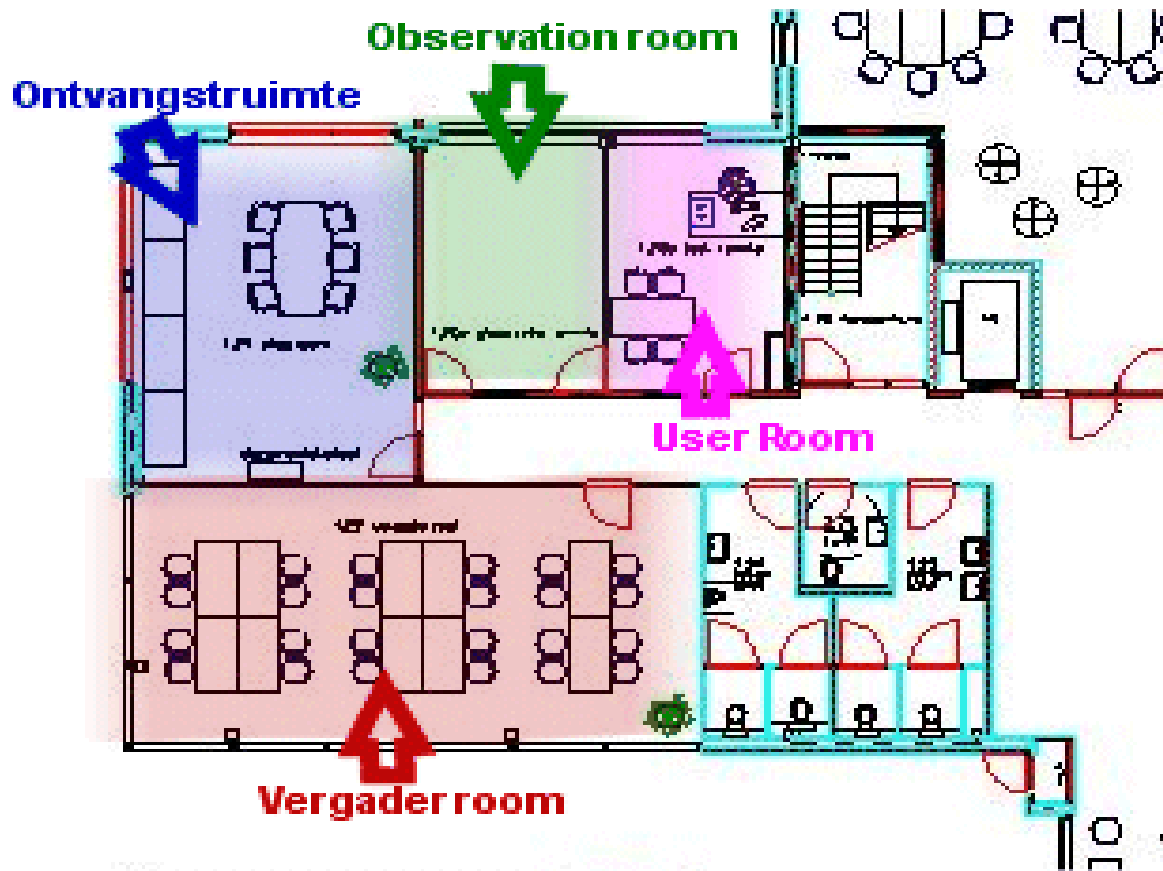
- They all drive (too) fast
- They all can be used (more or less) the same way

What's the difference?



User satisfaction

Noldus Experience Lab



© 2010 Noldus Information Technology. All rights reserved.

Experience Lab

4 rooms:

- User room: where the tests take place
- Observation room: where data collection and analyse happens, contains all equipment
- Vergaderzaal: large observation room or large user room
- Ontvangstruimte: 'waiting room' for participants

Experience Lab

Equipment:

- Video camera's
- Audio equipment
- Screen capture technology
- Recording equipment
- Annotation software
- Analysis software
- Network technology

Multimodality in the Lab

The Observer XT: Core of the lab

- Integration of multiple types of data

The screenshot displays the Observer XT software interface. The main window is titled 'The Observer XT - Discussion'. It features a menu bar (File, Edit, View, Setup, Observe, Select, Visualize, Analyze, Export, Window, Help) and a toolbar. The interface is divided into several panels:

- Left Panel:** A tree view showing the project structure, including 'Discussion', 'Setup', 'Coding scheme', 'Independent Variables', 'Default observation settings', 'Observations', 'Boss-employee', 'Observation settings', 'Event files', 'Media files', 'External data', 'Data profiles', 'Default Data Profile', 'Analysis settings', and 'Export settings'.
- Top Center:** A 'Playback Control' window with standard media controls (play, stop, previous, next, full screen) and a 'Timer' window showing 'h:m:s:ms' (h:mm:ss.ms) with fields for Start, Current, Stop, Observed, Elapsed, Maximum, and Remaining.
- Center:** Two video playback windows labeled 'Boss.mpg' and 'Employee.mpg' showing a scene with two men in an office setting. Below the videos are 'Position' and 'Elapsed Time' fields.
- Right Panel:** An 'Event Log' window titled 'Boss-employee - Event Log' containing a table with columns for Event Time, Subject, Behavior, and Comment. The table lists 19 events with timestamps and descriptions of interactions.
- Bottom Center:** A 'Physiological Data' window showing two line graphs over a time interval from 0:00:00 to 0:00:07. The top graph is labeled 'BPM' (Beats Per Minute) and the bottom graph is labeled 'HRV' (Heart Rate Variability).
- Bottom Right:** A 'Codes' window showing a list of behaviors and modifiers with columns for Status, Start, and Stop.

Multimodality in The Observer XT

Synchronizing and integration of different data sources

- **behavior**
- **Live video**
- **Digitale VCR**
- **Media files**
- **Screen capture**
- **Physiological signals**
- **Eye tracker**
- **Log files**
- **Key presses, mouse clicks**
- **Live observaties from handheld computer**



Coding observed behavior

Behavior Name			Properties			Col...
Task 1	t	t	State Event	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Assist 1	e	e	State Event	<input type="checkbox"/>	<input type="checkbox"/>	
Resource	h		Point Event	<input type="checkbox"/>	<input type="checkbox"/>	
Error	b		Point Event	<input type="checkbox"/>	<input type="checkbox"/>	
Task 2	a	a	State Event	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Assist 2	s	s	State Event	<input type="checkbox"/>	<input type="checkbox"/>	
Click here to add new el...				<input type="checkbox"/>	<input type="checkbox"/>	

Screen capturing

The screenshot shows a web-based training module interface. At the top left, there is a Shell logo and 'OPEN UNIVERSITY' branding. The main title is '1.3 Completing the WSA Table'. Below the title are three tabs: 'INPUT', 'PROCESS', and 'OUTPUT', with a 'Print' button to the right. The 'PROCESS' tab is active. The main content area features a photograph of three people in a meeting, with the caption 'Identifying the HFE Scope of Work' below it. To the right of the photo, there is instructional text: 'This task requires the PT to **identify the HFE scope of work** for the project. You can do this by filling-in the WSA table. The remainder of the Concept Modules will support the decisions that are made in this Task. Therefore, you are recommended to visit the Concepts section and read the modules. Please click on the **Concepts** button below to learn about the relevant concepts.' At the bottom of the main content area, there is a navigation bar with buttons for 'EXIT', 'GLOSSARY', 'ROADMAP', 'HELP', 'USEFUL LINKS', 'CONCEPTS', 'BACK', and 'NEXT'. The 'CONCEPTS' button is highlighted. In the bottom right corner, there is a small inset video frame showing a man in a white shirt looking at a screen.

Picture-by-picture

Electromyogram

- EMG measures contraction of muscles
- Electrodes applied to skin surface
- Can be used to measure difficulty of motor tasks, e.g. UI operations: cursor positioning, drag & drop, resizing windows
- But: rather laborious and obtrusive



Photo: Ab de Haan, University of Nijmegen, The Netherlands

Other signals

Finger clip

- Skin temperature
- Skin conductance
- Pulse frequency
- Pulse amplitude

Objective assessment of feeling
(stress, fear, anger, relaxation,
concentration)



BioMedical

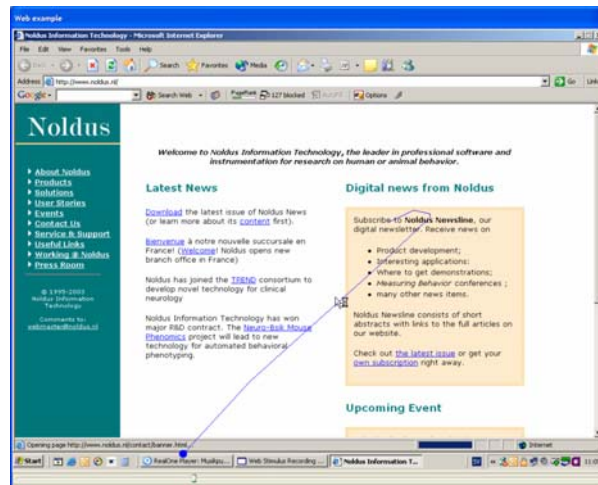


*TIM-Lab, Danube University
Krems, Krems, Austria*

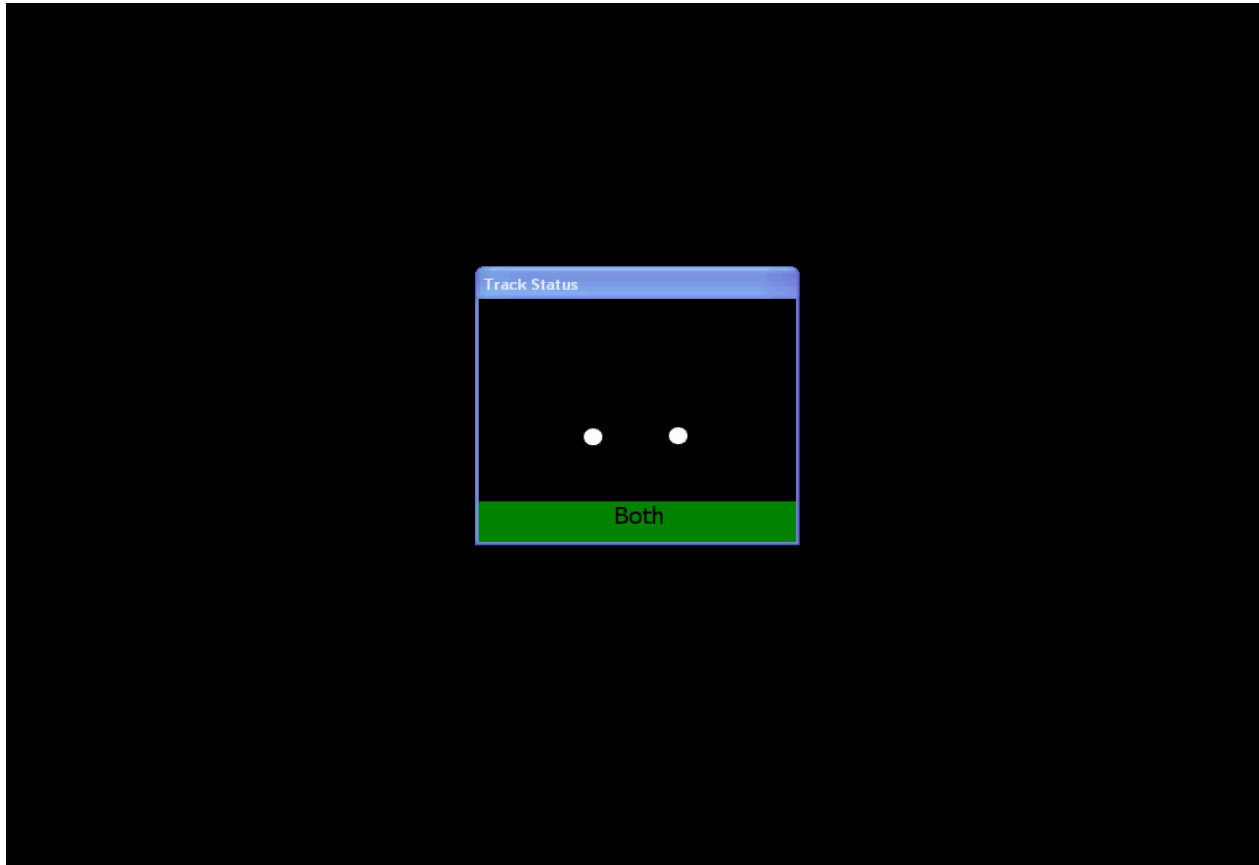
Eye tracking



- Infrared camera records eye movement - measure attention
- Head mounted, in computer screen, or stand alone
- Analysis: eye tracks, hotspots, fixations, areas of interest



Eye tracking



Emotions

- Mark expressions of emotion
- Questionnaires
- 'Read' emotions from the face of users

Home lab

Usability testing of:

- TV and audio equipment
- Entertainment
- Games
- Appliances
- "Aware" applications



Philips Research



Eindhoven University of Technology



TNO Human Factors

Lab on wheels

Usability testing of:

- Dashboard design
- Navigation systems
- Audio equipment

Integrate video recording with:

- Speed, acceleration, turning
- Position (GPS)

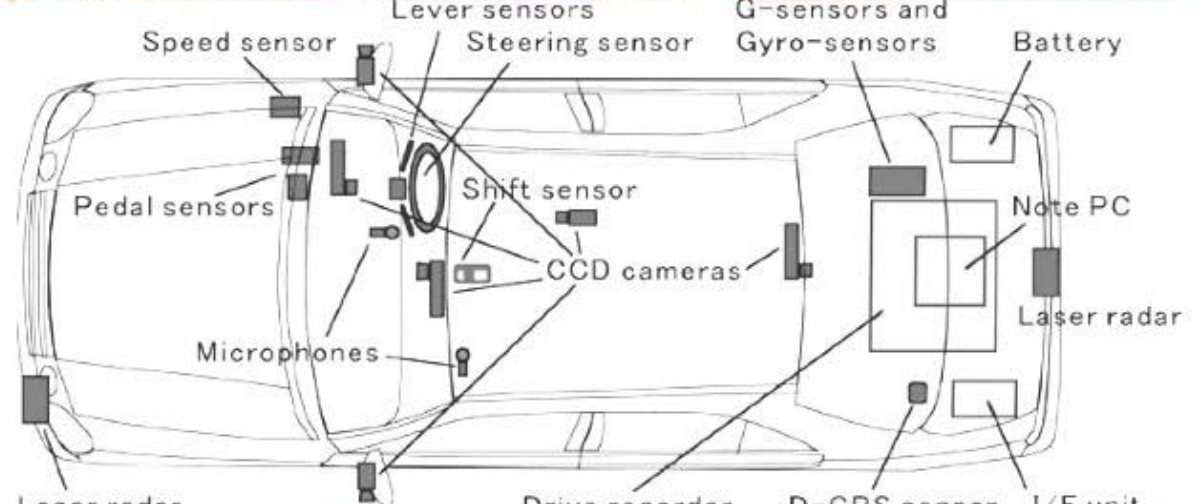


*SensoMotoric
Instruments*



*AIST,
Tsukuba,
Japan*

Instrumented car



headway distance front view camera D-GPS sensor speed sensor rear view camera

Examples

Our own products

Observer

- **'our' sequence:**



Examples

ATM Machine

steps:

1. Insert card
2. Enter PIN
3. Enter amount
4. Take out money
5. Take out card



Examples

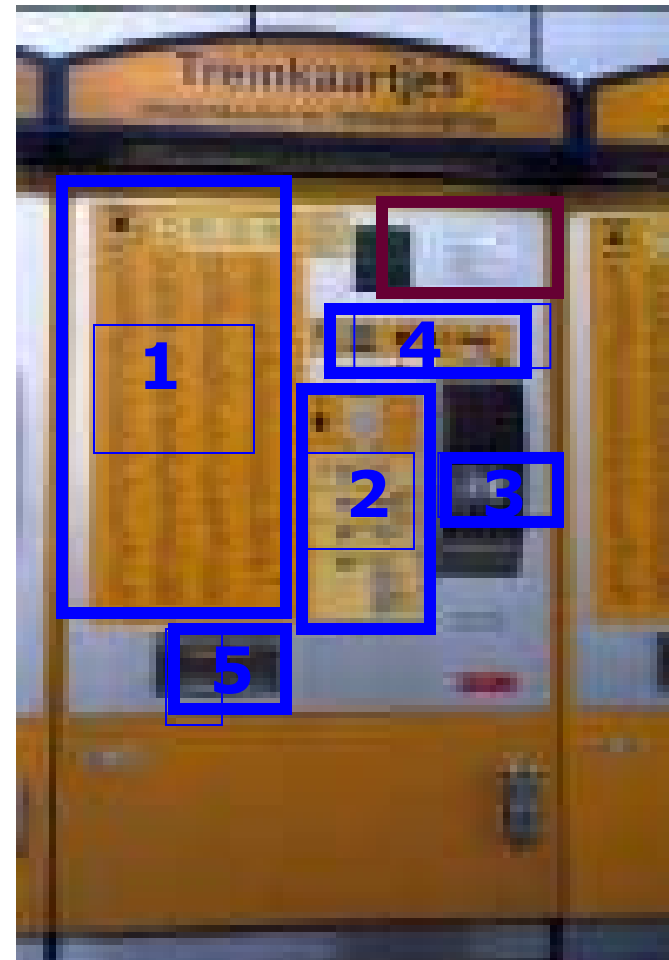
Flight stick control problem in aircraft



Examples

NS ticket vending

1. Find destination
2. Select card type
3. Enter destination
4. Enter money
5. Get ticket



Examples

Requirements:

- **Users from 8 to 80**
- **All should be able to get a ticket**

NOTE:

Computer people had more difficulty using it

