



Human Computer Interaction (HCI)



Human Computer Interaction

- ◆ A discipline combining psychology, ergonomics and computer science
- ◆ UI Metaphors
- ◆ Approaches to UI Design
- ◆ Standards and Legal Requirements

The User Interface (1)

- ◆ Primary and secondary objectives
- ◆ Metaphors: terms used figuratively to describe something but applied literally
- ◆ Dialogue metaphor

Output	prompt	request for user input
	data	data from application following user request
	status	acknowledgement that something has happened
	error	processing cannot continue
	help	additional information to user
Input	control	user directs which way dialogue will proceed
	data	data supplied by user

The User Interface (3)

```

CUSTORD1          Customer Order Entry          25/08/2001
-----
Order Date 25/08/2001          Order No.  37291
Customer Code CE102_ Central Stores, Lytham St Annes
Customer Order Ref. R20716___

  Prod.    Product              Unit    Line
  Code    Description          Price   Price
01 12-75   Sandwi                     18.00   54.00
02 09-103  Brown                       24.60  246.00
03 12-99
04
05
06
07
08

                                Total    300.00
                                Tax        52.50
                                Order
                                Total    352.50

F1-Help  F2-Save  F3-Cancel  F4-New  F5-Cust.  F6-Prod.
F10-Exit          Cust.   Lookup  Lookup
  
```

The screenshot shows a terminal window for 'Customer Order Entry' on '25/08/2001'. The order details include Order No. 37291 and Customer Code CE102. A table lists product entries with columns for Prod. Code, Product Description, Unit Price, and Line Price. Line 03 has a product code of '12-99', which is circled in red and labeled 'Data'. A large red oval highlights the error message 'Invalid Product Code' with '12-99' below it, labeled 'Error'. The bottom of the screen shows function key shortcuts for navigation and editing.

The User Interface (4)

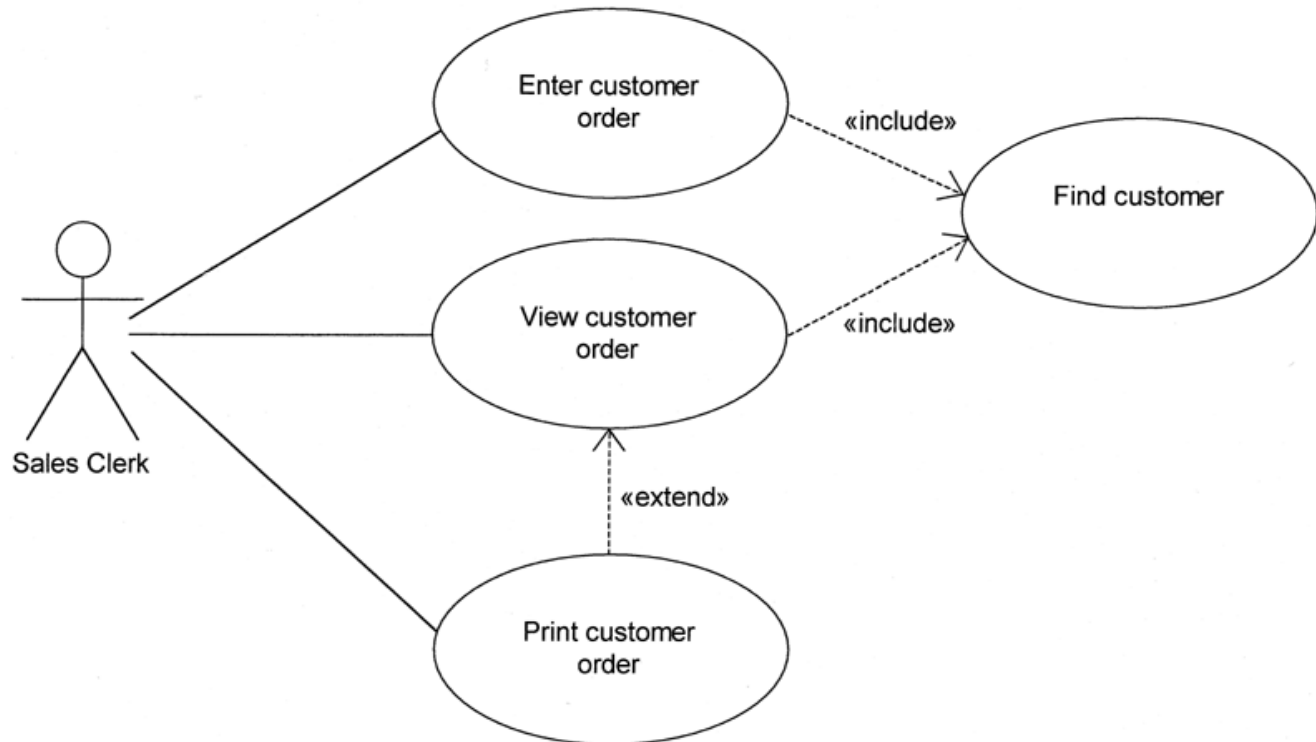
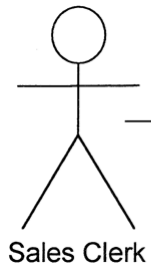
Prod. Code	Product Description	Qty	Unit Price	Line Price
01 12-75	Sandwi		18.00	54.00
02 09-103	Brown		24.60	246.00
03 12-99				
04				
05				
06				
07				
08				
			Total	300.00
			Tax	52.50
			Order	
			Total	352.50

HELP
All product codes consist of two digits, a hyphen and two or three digits. Press Function Key F6 to view a product list.

F1-Help F2-Save F3-Cancel F4-New F5-Cust. F6-Prod.
F10-Exit Cust. Lookup Lookup

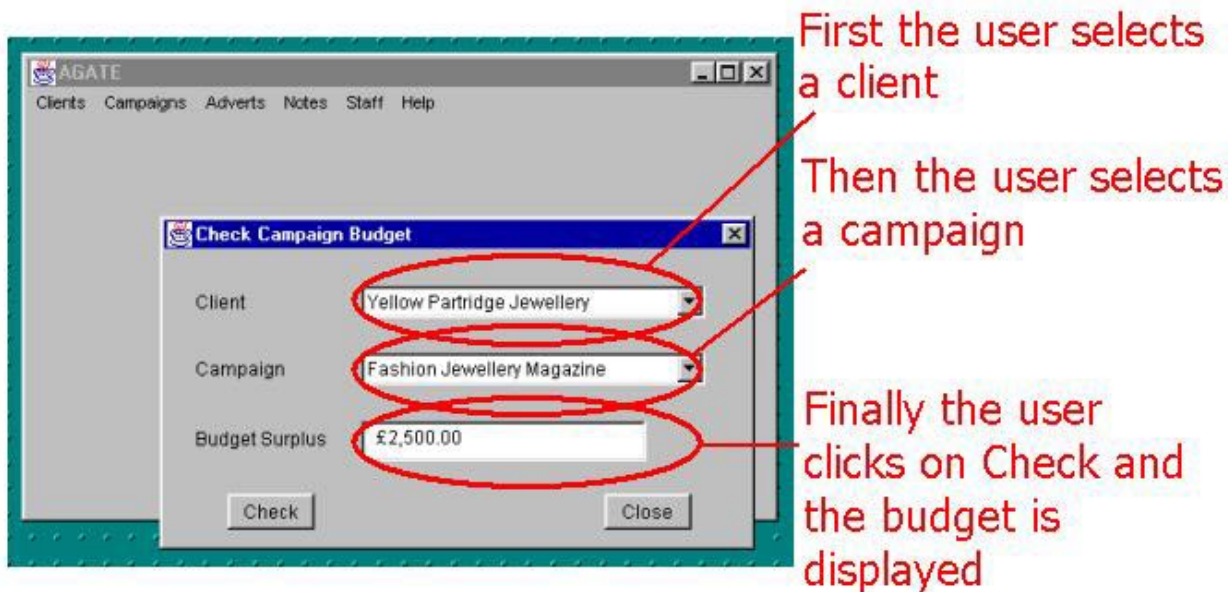
Control

The User Interface (5)



The User Interface (6)

- ◆ Direct manipulation metaphor
 - Event-driven interfaces
 - Dialogue boxes



AGATE
Clients Campaigns Adverts Notes Staff Help

Check Campaign Budget

Client Yellow Partridge Jewellery

Campaign Fashion Jewellery Magazine

Budget Surplus £2,500.00

Check Close

First the user selects a client

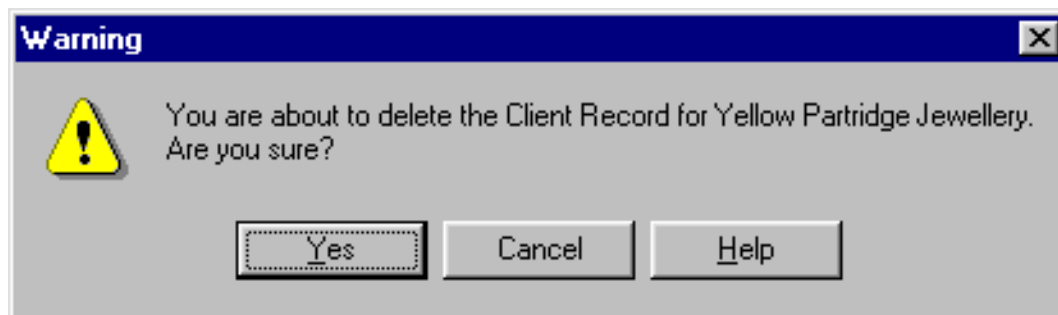
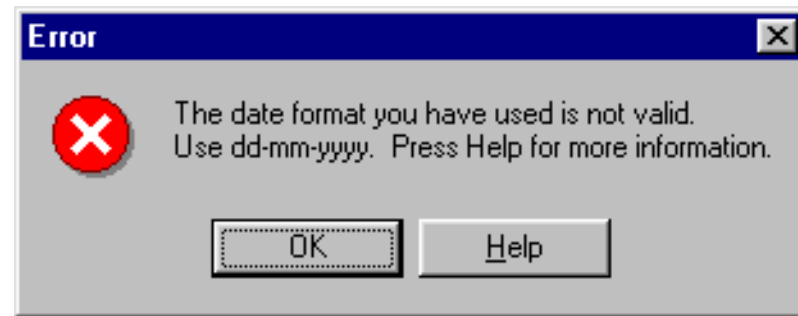
Then the user selects a campaign

Finally the user clicks on Check and the budget is displayed

The User Interface (7)

- ◆ Good dialogue design
 - Consistency
 - Helps users to learn the applications
 - Appropriate user support
 - Help messages: context-sensitive (GUI focus), hypertext, tooltips
 - Error messages: what went wrong and how to recover
 - Adequate feedback from the system
 - Clear indications of action taken
 - Response time appropriate to user action
 - Minimal user input
 - Reduction of errors, increased data entry speed
 - Use of codes and abbreviations, Selection from a list, Editing of incorrect values, Provision of derived information, Use of defaults, Use of accelerator keys for menus

The User Interface (8)



The User Interface (9)

- ◆ Style guides
 - Standard guidelines for the design of user interfaces
 - The Windows Interface Guidelines for Software Design by Microsoft – Windows certification
 - Macintosh Human Interface Guidelines by Apple

Approaches to UI design (1)

	Tele-Sales System	WAP Tourist Information System
The nature of the task that the user is carrying out	Routine task; closed solution; limited options.	Open-ended task; may be looking for information that is not available.
The type of user	Clerical user of the system; no discretion about use (must use it to do their job).	Could be anyone; discretion about use of system; novice in relation to this system.
The amount of training that the user will have undertaken	Training provided as part of job.	No training provided.
The frequency of use	Very frequent; taking an order every few minutes.	Very occasional; may never use it again.
The hardware and software architecture of the system	Mini-computer, dumb terminals with text screens, keyboard data entry. All software runs on the mini-computer. Structured programs with subroutines for data access and screen-painting.	Mobile telephone screen with keypad and scroll buttons to move through menus. WAP browser runs on mobile telephone, WAP gateway connects to server, which generates WML for WAP browsers and HTML for other browsers using XML and stylesheets.

Approaches to UI design (2)

Step	Objectives
Requirements gathering	Determine characteristics of the user population: types of user, frequency of use, discretion about use, experience of the task, level of training, experience of computer systems.
	Determine characteristics of the task: complexity of task, breakdown of task, context/environment of task.
	Determine constraints and objectives: choice of hardware and software, desired throughput, acceptable error rate.
Design of the interface	Allocate elements of task to user or system; determine communication requirements between users and system.
	Design elements of the interface to support the communication between users and system in the light of characteristics of the users, characteristics of the task and constraints on design.
Interface evaluation	Develop prototypes of interface designs.
	Test prototypes with users to determine if objectives are met.

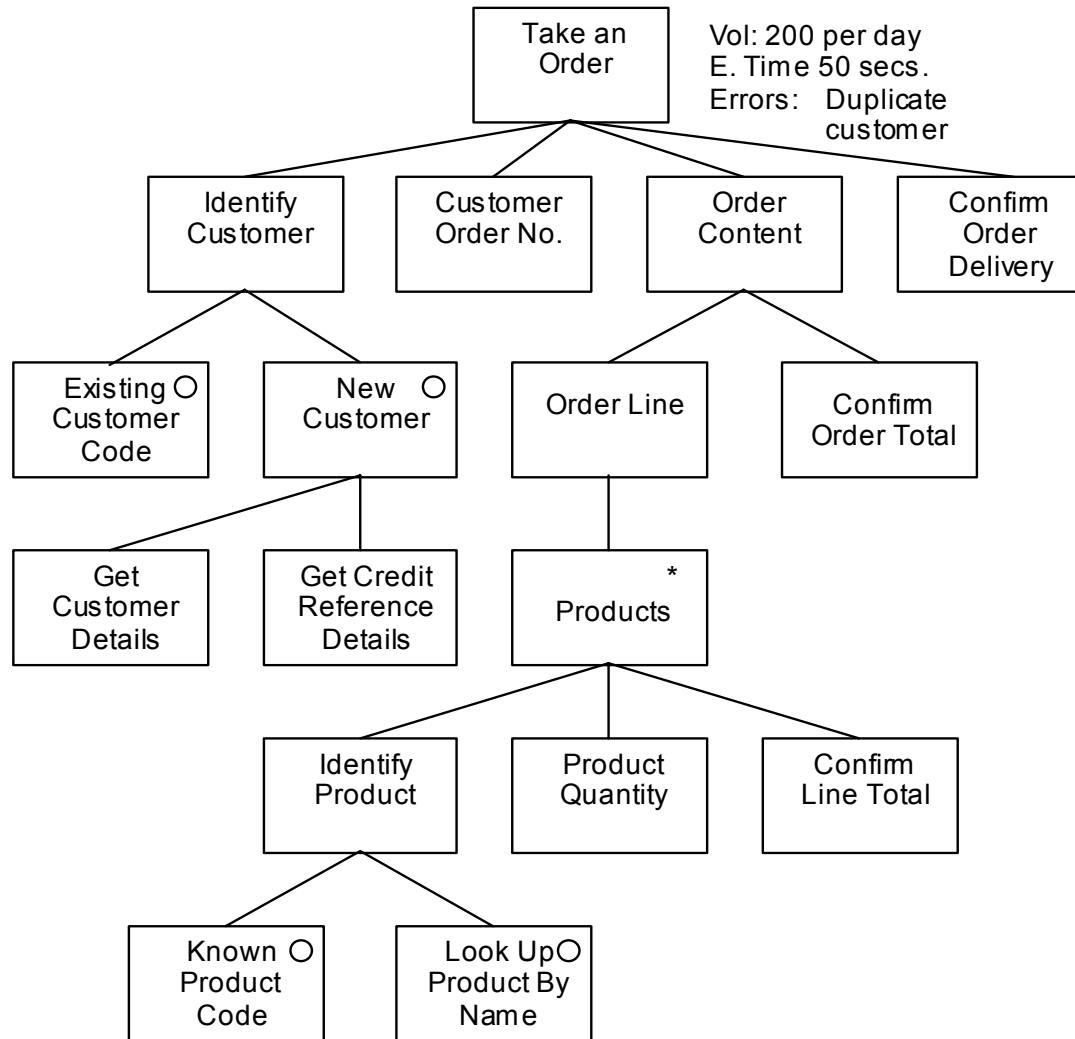
Approaches to UI design (3)

- ◆ The formal-informal range: structured, scenario-based and ethnographic
- ◆ Structured approaches
 - Lifecycle as stages, steps, tasks
 - Inputs, techniques applied, deliverables
 - Top down decomposition – dataflow (processes) and structure diagrams (programs)
 - Advantages: easier project management, improved communication between project staff (standardised diagrams and documentation), improved system quality

Approaches to UI design (4)

- UI design
 - Diagrams for task structure and allocation between users and system
 - Checklists for user, tasks and task environment categorisation
 - Evaluation: user performance against measurable usability criteria
- STUDIO
 - Five stages: Project Proposal and Planning, User Requirements Analysis, Task Synthesis, Usability Engineering, User Interface Development
 - Techniques: **task hierarchy diagrams**, knowledge representation grammars, task allocation charts, statecharts
- Criticisms
 - Very bureaucratic and evaluated under laboratory conditions that lack ‘ecological validity’

Approaches to UI design (5)



Approaches to UI design (6)

◆ Ethnographic

- Ethnography is a philosophy about scientific enquiry in social sciences
 - It involves the ethnographer participating overtly or covertly in people's daily lives for an extended period of time, watching what happens, listening what is said, asking questions
 - Qualitative versus quantitative approaches
 - Emphasis on subjective interpretation of user experience and on capture the context
 - Examples: Contextual enquiry, Participative or co-operative design and evaluation
 - Techniques: interviews, discussions, prototyping sessions, videos (time consuming)

Approaches to UI design (7)

◆ Scenario-based

- Fit well with use cases
- Forms: textual narratives, storyboards, video mock-ups, prototypes
- Design envisioning and Evaluation
- Claims – design justifications
- Roles for scenarios: requirements analysis, user-designer communication, design rationale, envisionment, software design, implementation, documentation and training, evaluation, abstraction and team building
- Main concern: large volumes of textual information that needs to be organised and cross-referenced

Approaches to UI design (8)

Pete starts up the word-processor.

He types in a title for the note and changes its style to *Title*.

He types in two paragraphs describing his idea for an advertisement for the Yellow Partridge campaign to be used in fashion magazines in Europe during the summer of 2002.

He types his initials and the date and time.

He uses the short-cut keys to save the file.

The save-as dialogue box appears and, using the mouse, he changes to the *Summer 2002 Campaign* folder in the *Yellow Partridge* folder on the server.

He scrolls to the bottom of the list of files already in the folder and reads the title of the last note to be added, *Note 17*, he calls the new note *Note 18* and clicks on Save.

He exits from the word-processor.

Approaches to UI design (9)

The user selects Add a Note from the menu. A new window appears.

From the list box at the top of the window she selects the name of the client.

A list of campaigns appears in the list box below, and she selects a particular campaign.

A list of adverts appears in the next list box, and she selects a specific advert.

She types a few paragraphs into a text box to describe her idea for the advert. She fills the space on screen and a vertical scrollbar appears and the text in the text box scrolls up.

She enters her initials into a text box, and the system checks that she is allocated to work on that campaign.

The date and time are displayed by the system, and the Save button is enabled.

She clicks on the Save button and the word Saved appears in the status bar.

The text box, the text field for initials and the date and time are cleared.

Approaches to UI design (10)

The Save button is disabled until the user has selected a client and a campaign, entered some text and entered his or her initials. This prevents the user attempting to save the note before all data has been entered and getting an error message.

The initials of the user could be entered automatically from their network login, but observation shows that the creative staff often work together as a group and different people will come up with ideas that they record as notes. It would be inconvenient for them to be logging in and out of the system each time a different person wants to enter a new note. For this reason, they are required to enter their initials.

The initials, date, time and text fields are cleared after a note is saved, but the client, campaign and advert list boxes are left untouched so that the user can enter another note for the same advert or campaign without having to reselect these items.

Approaches to UI design (11)

◆ Usability

- The degree to which specific users can achieve specific goals within a particular environment; effectively, efficiently, comfortably and in an acceptable manner
- Usability criteria
 - Learnability
 - Throughput
 - Flexibility
 - Attitude

Standards and Legal Requirements (1)

- ◆ International standards
 - ISO 9241 ergonomic requirements for work with Visual Display Terminals
 - ISO 14915 Multimedia User Interface Design – Ergonomic Requirements for human-centred multimedia interfaces
- ◆ EU directives
 - Health and Safety (Display Screen Equipment) Regulations
 - Covering physical equipment, environmental factors (positioning, lighting, noise, heat, humidity), employer responsibilities (e.g. breaks, eye sight tests, training)

Standards and Legal Requirements (2)

- ◆ Principles for designing, choosing, commissioning and modifying software
 - Software must be suitable for task
 - Software must be easy to use and adaptable to the user's knowledge and experience
 - Employer may not use software to check up on employees without their knowledge
 - Systems must give feedback to users about performance
 - Systems must display information suited to users
 - Principles of software ergonomics must be applied to the way people process data