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Human-Computer Interaction
Exercise sheet 1

36P

Exercise 1 - Usability 6

Solution part (1):
Following are the six goals in which usability is usually broken down:

Goal # 1: Effective to use

0.5

The term "Effective to use" refers to how much a system is capable of allowing its users to perform tasks accurately and completely i.e. how good a system is able to serve its purpose. **For Example**: Old touch screen systems like ATM machines which have very poor touch quality due to which user has to tap the screen twice-thrice to let the function works. This also happens many times in cheap smart phones.

Goal # 2: Efficient to use

0.5

It refers to the way any system provides support to its users to complete any task. It basically refers to the ease with which a user can repeat a task to completion with minimum amount of effort involved.
For Example: A phone answering machine is more efficient to let the user carry out common tasks (e.g., listening to messages) through a minimal number of steps. In contrast, the voice-mail system is comparatively inefficient because it required the user to carry out many steps to perform the same task every time.

Goal # 3: Safe to use

0.5

This involves saving the user from undesirable conditions and dangerous situations. It refers to to the possibility of reducing the errors in the system and the measures to recover in case an error happens.
For Example: In Microsoft Office, in the 'File' menu, option 'Save' and 'Save As' are next to each other. A user who wanted to save the new version has to click 'Save As' but might end up clicking 'Save' button accidently leading to the loss of the old version of the file. A measure might be to use 'Undo' function, however, the 'undo' history is sometime limited.

Goal # 4: Have good utility

0.5

It refers to the appropriateness of the functionality provided to the users in order to help them to do the required task. It is the extent to which the system allows the users to meet their needs.
For Example: A example of a system with low utility is a software drawing tool that does not allow users to draw free-hand but forces them to use a mouse to create their drawings, using only polygon shapes.

Goal # 5: Easy to learn

0.5

It refers to how easy it is for the user to learn using a system without much effort. It should be easy to learn the system by exploring the system on their own.

For Example: An example where this goal fails are learning computers especially, by elderly set of people. They need special practice and guidance to understand it's working.

Goal # 6: Easy to remember

0.5

It refers to how easy it is to remember the functioning of a system, once it is known to user. It also refers to the amount of time that the user took to remember its functionality.

For Example: An example where this fails are the syntax design of any programming language. I have not practiced Java since two years and now it is difficult for me to remember the exact style of its programs. I again need to brush up the language and has to keep it in practice to make use of java to write programs. Similar is the case with software like Adobe Photoshop, Adobe After Effect etc.

Solution part (2)

Effective to use: 1

The iPod classic design allows user to perform tasks accurately and completely. It serves its purpose of music options in different genre well.

Efficient to use: 1

The menu design allows user to perform the task (listen to music/watch video/...) very easily. To listen to music after turning the iPod on, user needs to press one button and choose a track to complete the task based on the user music type choice.

Easy to learn: 1

To operate the iPod itself is easy to learn, however the way to put information into it using iTunes can confuse people who never used it before. Without previous knowledge about iTunes or without using manual, it's impossible to find out how to put music/videos/... to the iPod.

Observation about other three goals: good work

Safety: It's safe to store music of different genre but for a non-touch iPod, a song deleted is deleted forever.

Utility: Yes, it has high utility when it comes to listening to music.

Easy to remember: The buttons are easy to remember as the design of the buttons follow external consistency as that of a traditional music player.

Try to stay in the sentence limit

Exercise 2 – Interaction Modes 2P

1. In order to drive the car, the driver must have good vision and be able to move, and therefore a large display (to be easy to see from a distance if one does not stop ideally by the ticket automat) and pushbuttons and payment ability should be provided on an arm extended a bit closer to the user than the rest of the automat in order to let the user use the device without stepping out of the car. The text on the screen should be large and preferable with icons next to the text telling the user what is desired from them, to be able to be used without knowing the language of the automat, and the buttons and payments options should be located so that they are easy to be reached without stretching too much which can be hard for a partially disabled person, and e.g. coin slots should have protection so that dropped coins by the slot are gathered instead of being dropped on the ground. good descriptioon, but state the interaction mode 0.5

2. A pedestrian navigation system should give information visually but since the user can stop in at a safe spot it does not need to be able to use without looking at it and the user interface can therefore be more complex. One good interaction method for this might be ~~using a touch screen~~ of a size one can grip with one hand, for combining maximum visual area for maps and information with still have many options for different menu functions that are accessible via touch input. good descriptioon, but state the interaction mode 0.5

3. A digital picture presenter should have some kind of screen or projector that both can browse folders to find the desired picture(s) to show and for showing those pictures, and as input method a device with buttons to change picture and browse the folders. Since the pictures are to be presented, the input device should be remote and the buttons should be easy to find and identify with the fingers without looking at the device so that the user can focus on their audience, so placement, size and structure of the buttons is of importance. good descriptioon, but state the interaction mode 0.5

4. When playing a race game on a mobile device it is likely that the screen acts as the main output to the user, therefore it is good to choose the axis of rotation for control such that the display is always visible. Rotating the device like a steering wheel should therefore be the best way to control the game, and also provides the metaphor of a physical steering wheel of a vehicle.

good descriptioon, but state the interaction mode 0.5

Exercise 3 - Analyze Interfaces

Solution:

The four Interfaces we are analyzing are;

1- Saarfahrplan – Virtual Interface
2- Pocket Calculator - Physical Interface
3- Dishwasher - Physical Interface
4- Apple watch - Physical Interface

Saarfahrplan – Virtual Interface

All the pictures from this section are screenshots of the Saarfahrplan app Version 2.2.5 for iPhone6. 4

Figure 1.1: Landing Page

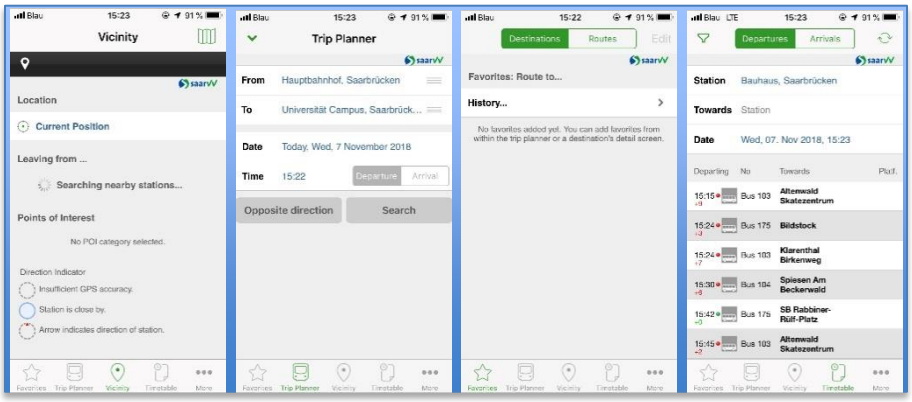


Figure 1.2: Starting Options

- *Affordances* 0 not an affordance
  Saarfahrplan app allows user to find an optimal way from one location to another (within Saarland) with buses, trains, trams, by foot. It allows user to access information about transport delays (Fig. 1.3: 1st Image). It allows user to see list of stops the chosen transport will make before it gets to destination. It allows user to see their location on the map (Fig. 1.3: 2nd Image). It allows user to estimate time it will take to get from one location to another (Fig. 1.3: 2nd Image). It allows user to choose the time and date when they want to depart from start location or arrive to the goal location (Fig. 1.3: 3rd Image).. It

allows user to look for the location names in the list provided by the app or choose from locations user looked for recently (Fig. 1.3: 4th Image).

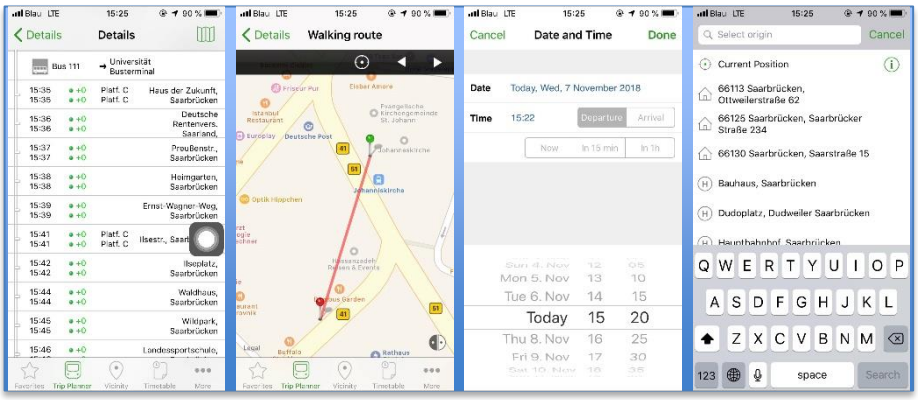


Figure 1.3: Affordable options

- *Visibility* 1

  It's easy to find how to use the most important functions: choose start position (marked as "From"), goal position (marked as "To") and goal position. However, it's not that easy to find how to use some other functions, for example, it might take a lot of time to figure out that in order to see the root on the map user needs to press sign from Fig. 1.4.

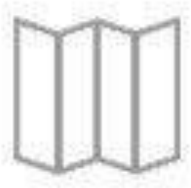


Figure 1.4: Map Option

- *Feedback* 1

  After user provides information about Start/Goal location and Time/Date app gives user the list of possible routes and basic information about each root: departure time, arrival time, duration, number of changes, in how much time must the user start the journey, how much should the user walk and how much time will it take + it indicates if the transport is delayed. After user chooses a root from the list provided by the app, it gives user further information about it: separate information about each transport (time, platform). User have an opportunity to see the root on the map, see list of stops of each transport.

- *Mapping* mapping does not means map, here it refers to the ordering/grouping of elements/buttons 0P

  In order to see the root on the map, user needs to press a small picture of a map (although, initially it's not obvious that the picture depicts a map).

- *Constraints* 1

  User have to choose from the list of locations when they indicate start and goal location. It helps to avoid typos in the names of locations.

- *Consistency*
  - internal consistency
  - External consistency: how? 0P

- *What metaphors are used (if applicable)?*
  There is a vertical line at the left side of the screen, which shows at which point in time of the root the user should be to take the root (Fig. 1.4). The conceptual model behind the interface. User enters start location, goal location and time app gives information about different routes. The app is designed in a way so as to enable the user to perform the above actions efficiently. whats the metaphor? 0P

- *How can the interface be improved based on the principles discussed above?*
  The app can offer an option to save favorite routes, such that user can just change time. These will make use of the app more efficient 1

Pocket Calculator – physical Interface 8 (really nice work, hovever try tro stay in the sentence limit +1/2 is ok)

Analysis of the calculator TI-nspire cas (2007 edition). The picture from this section are self-taken.

- *Affordances* 1

  The device has many input buttons and a large display, which makes one think that it could do some job for the user and present it on the screen. It is slightly slimmer and has all buttons at one end of the device, and is slightly wider and has the display at the other. This hints to the user that it is supposed to be held by the slimmer part where the buttons are, and having the display facing upwards. good

- *Visibility*

  Buttons with similar functionality are grouped, have the same colour and are placed together, e.g. numbers, letters, commonly used functions such as operators and trigonometric functions, and so on. The on/off button has no own color and could be made more visible. The important "ctrl" button however has an own color, and the function that button has on every other button is written on or by the side of it with the same color. 1

- *Feedback* 1

  The only physical feedback is when the buttons are pressed, but this tactical feedback is quite strong. Most feedback is given on the screen.

- *Mapping* 1

  Many of the buttons have two functions each, most buttons are colored and grouped dependent on their functionality (see visibility above) and cultural mapping are used for example to let contrast adjutancy with a left arrow mean less contrast and right arrow mean more contrast. At the top of the keyboard area there are some buttons not following the placement pattern of the rest of the buttons, including a round button for navigating/moving the cursor, which indicates that any direction can be given (which also is the case!). However, some functions have similar descriptions and it is not entirely clear what the differences are, for example the "esc" button versus its control function symbol, the arrow pointing backwards versus it's control function "clear", or the thick upwards pointing arrow versus it's control function "CAPS".

- *Constraints* 1

  The calculator has a mini USB port on top of it, and the USB cable can only be inserted in one direction. The buttons are placed so that one can't reach them if one does not hold the calculator with the thumbs from the long sides (compare to hold it at the top and bottom as a cell phone in "landscape mode").

- *Consistency* 1

  External consistency: numbers and enter buttons are placed in the same way as other calculators and computer numpads. Internal consistency is given through button groups such as numbers, letters and so on, which are overlapping but separated to the user with the help of button colors, sizes, shapes and heights. The letters are consistent placed in alphabetical order, which seems logical since there is not enough buttons to cover an entire qwerty layout which most people are used to, without mixing buttons from different groups and of different sizes.

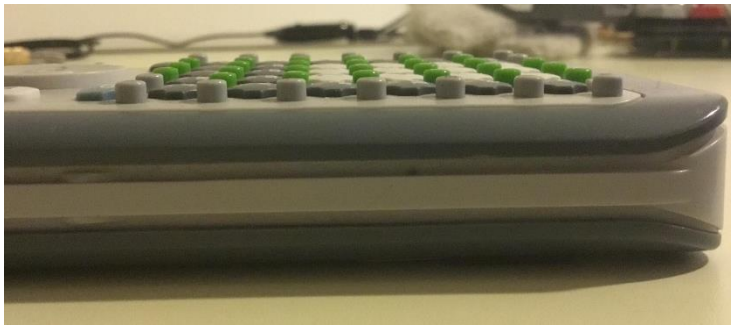
- *What metaphors are used (if applicable)?* 1

  Some metaphors are used, mostly as icons instead of text. Some examples are: a book for representing browsing all available formulas, operators and functions, a house for representing "home screen" and a wrench for certain document settings. Some of these could be cultural, such that the house representing "home" or a bolded up arrow for writing uppercase letters.

- *How can the interface be improved based on the principles discussed above?*

  Since almost every device with a complete alphabetical keyboard have its keys arranged according to the qwerty layout (even though there is more effective layouts) rather than in alphabetical order, most people are used to this arrangement of the letters. It may therefore be a good design choice to make some keys a bit smaller or placed closer to each other to make room for a keyboard with the qwerty layout without overlapping another button group, and it would also remove the current problem that it's hard to hit the number (white) or operator/function (dark grey) buttons due to the letters being taller than those. It would also minimize the confusion of overlapping button groups.

1



Dishwasher – physical Interface 8

We tried to analyze the dishwasher machine interface from various examples of possible dishwasher machines to broaden our understanding of the principles of the interface designing. All the pictures from this section are taken from Internet, sources are provided along.

- *Affordances* 1
  - The dishwasher allows to wash dirty dishes pressing buttons.
  - ~~Choose a program of dishwashing.~~
  - ~~To use a delay, start option.~~
  - ~~Cancel washing~~.

- *Visibility*

  In a lot of dishwashers in order to find buttons user need to open the dishwasher (fig 3.2: Image 1 & 2). In other dishwashers the interface is outside and clearly visible (fig 3.2: Image 3) 1

Figure 3.1: Affordable options
Source: Bosh Gallery

- *Feedback* 1

Dishwasher shows time which is required for chosen programmed or if the dishwasher is in process of washing, it shows time left till the end of the programmed (Fig. 3.1: Image 1 & 3). It shows chosen programmed (blue indicator in Fig. 3.1 image 2 and red one in Fig. 3.1 Image 3). It makes noise when it's finished. It shows error messages (Fig. 3.2). Can indicate when it needs rinse aid to be refilled (Fig. 3.2).

Figure 3.2: Feedback Options
Source: Bosh Gallery

- *Mapping* 1
  Some interfaces provide pictures which help to visualize programmed (Fig. 3.1: Image 1 &2). The buttons are placed in the order in which user needs to use them (Fig. 3.3): Turn on - Choose programmed - Start (From left to right).

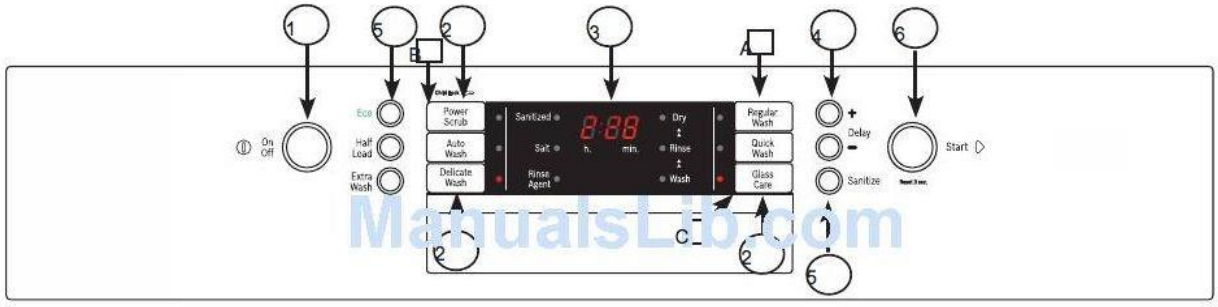


Figure 3.3: Mapping Options
Source: Bosh Gallery

- *Constraints* 1
  - User cannot choose several programmed at one time
  - Washing cannot start without choosing programmed
  - Washing cannot start if Rinse Aid should be refilled (gives an error: Fig. 3.2)

- *Consistency* 1
  External consistency: In some dishwashers, user needs to just choose a programme (Fig. 3.2), in some others user needs to combine several options (Fig. 3.5) (Eco/Half Load/Extra Wash + Programme).

- *What metaphors are used (if applicable)?* 1
  a. Pictures to indicate different programme (Fig. 3.1: Image 2)
  b. Arrows to choose a programmed (Fig. 3.2)
  c. The conceptual model behind the interface.
     - User loads a dishwasher
     - Chooses a programme
     - Washing starts
     - Dishwasher makes a sound
     - User unloads the dishwasher.

- *How can the interface be improved based on the principles discussed above?* 1
  Whenever there is an error, the user has to refer a dictionary of errors corresponding to the error number in the current scenario. Instead, we suggest to use digital messages like “Refill rinse aid”. We can have separate sections for separate dishes made of different materials like plastic, glass etc so that we can wash them simultaneously with different temperatures.

Apple Watch – physical Interface 8

All the pictures from this are taken from internet and sources are given along.

- *Affordances*
  1. It affords to press buttons on its interface for different applications like alarms, play music etc apart from keeping up the user up with time and date. 1
  2. ~~It affords to allow users to read mails and text messages and respond to them. However, the response is not very easy as the buttons are very small.~~
  3. It affords to aware the user by buzzing on the wrist of user with every new notification as shown in fig 4.1. this is feedback

Figure 4.1: Affordability

(*side note: this problem is called the fat finger problem which may be an exercise in the exam)

- *Visibility*
  1. This watch does not play a good role in giving clear and easy access to the user about the various applications as there are too many application icons on that small screen of the watch as shown in fig 4.2. 1
  2. The visibility of icon says, a user could easily end up pressing the wrong icon as they are very close to each other as shown in figure 4.2. (*)
  3. It is difficult to respond to a message or type on it as the buttons are very small and the scroll bar in the corner is not even properly visible.

Figure 4.2: Visibility
Source: https://goo.gl/wN6TFX

- *Feedback*
  1. The watch gives feedback for different notifications by buzzing or vibrating on wrist.
  2. The feedback is same for all new notifications i.e. vibration at the wrist.
  3. The watch also gives feedback in form of adjusting the output to the various output appliances as shown in figure 4.3 in which the watch changes the quality of sound based on the user choices.

Figure 4.3: Responsiveness

- *Mapping*
  1. There is physical analogy in some of its applications like the running application in which the number of calories lost increases as the user keeps on running.
  2. There is spatial analogy of the icons alongside the 2 or 3 buttons on its edge and sometimes these buttons are used to switch between applications.
  3. There is physical analogy for adjusting volume in the watch.

- *Constraints*
  1. There are physical constraints of the screen size to be limited to that of a wrist watch as shown in fig 4.3.
  2. There are physical constraints of the button sizes as they are very small and make it hard for the user to identify and explore the different functionalities of the watch.
  3. There are logical constraints when it comes to using the interface of the clock as we do not have the option to reduce the icons on the watch interface as that of the mobile phones even if a particular application is not interesting to the user.

- *Consistency*
  1. The icons of different applications used here follow external consistency as at all other places where this application is available, these icons follow external consistency.
  2. There is internal consistency in its interface for the colors as always a notification in green color refers to a notification on WhatsApp but a blue color refers to notification from skype.
  3. The layout of the keyboard for typing follows external consistency as that of the Qwerty style keyboard found all over the world as shown in figure 4.3.

- *What metaphors are used (if applicable)?*

  The icon of an envelope is used to refer to mail, icon of picked receiver is used to pick the call, music icon of a node is used to start music application etc. as shown in fig 4.4. And fig 4.5. These icons are consistent with the icons on mobile phone applications and the desktop applications.

1

Figure 4.3: Responsiveness
Source: https://goo.gl/gQnVVm

Figure 4.5: Responsiveness
Source: goo.gl/47CcHX

- *How can the interface be improved based on the principles discussed above?*

  The development of the interface can be seen in fig 4.6. Apple tried to incorporate all the basic applications which a smartphone user uses daily in that wrist watch so as to make its applications more easily accessible to the user and to get the user constantly in touch with the updates from its user. The conceptual design was to incorporate these applications along with a mainstream watch function which shows time and date to the user to come up with a smart watch. Fig 4.7 shows the different watch series available according to different budget of the user differing the amount of functionality.

1

Figure 4.6: Responsiveness
Source: https://goo.gl/QSzrZk

Figure 4.7: Improvisation
Source: https://goo.gl/gXuUiS