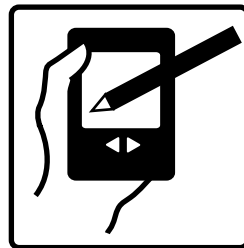
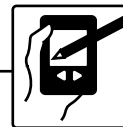


## *Chapter 9*

---

# *Personal Information Appliances*





## Contents

<b>Introduction</b>	<b>9-2</b>
<b>Standards</b>	<b>9-4</b>
<b>User Requirements</b>	<b>9-5</b>
<b>Conclusions</b>	<b>9-15</b>

## Introduction

### What are Information Appliances

The term "Personal Information Appliances" was coined to describe a family of devices which result from the convergence of communication technology with information processing technology. As the name suggests these devices are personal, often mobile and always with their users, and are dedicated appliances, not general purpose devices as the standard PC.

<p style="text-align: center;"><b>Home Environment</b></p> <ul style="list-style-type: none"><li>- Sub-Notebooks, PDAs, Smartphones, Remote Controls, Screenphones</li></ul>
<p style="text-align: center;"><b>Public Environment</b></p> <ul style="list-style-type: none"><li>- Information Kiosks, PC-based Payphones (covered in section 12)</li></ul>
<p style="text-align: center;"><b>Mobile Environment</b></p> <ul style="list-style-type: none"><li>- Communicators, Sub-Notebooks, PDAs, Smartphones</li></ul>

**Figure 9-1**

PIAs have been developed from two different starting points. The first starting point was the PC which became portable (Notebooks) and in consequence smaller and smaller (Sub-Notebooks). Since the power of the PC is not required by many people to be carried around, the first PDAs (Personal Digital Assistants) were developed, which had only limited functionality but a user interface which made them much easier to be used than the standard notebook. Adding communication features to these PDAs results in what we call PIAs.

The second starting point was the communication device, specifically the mobile phone. By simply adding information processing capabilities to a phone it is possible to create PIA which allow e.g. Internet access on the road or the use of an organizer system in the telephone.

The main problem in using PIAs currently is that of the user interface design. Coming from the PC the UI of many devices is far too complex for the average user, independently from any form of disability. For devices with a dedicated user interface the most important barrier for disabled people is the trend towards miniaturisation. Even a dedicated UI may become unusable with smaller and smaller keys or displays. Another potential problem area stems from the use of touchscreens in many PIAs. This is enforced by the requirement of portability of the devices in combination with the functionality required

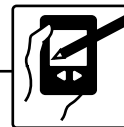


by their users. The use of touchscreens is more dominant in the area of PIAs than in the PC or Public Access area. Obviously, touchscreens impose a major obstacle on the use of these devices for people with visibility impairments or dexterity problems.

On the positive side, the communication and information capabilities of most PIAs allow the integration of assistive technology approaches with these devices. In addition, since many of the devices in question have general purpose processors, the possibilities of the PC environment to enhance the access for disabled users can be transferred to PIAs.

In the following tables we have focussed on PIAs in the mobile realm. Corded PIAs in the home have the same usage requirements as the well-known PC and we refer to the section on Personal Computer Access. Cordless PIAs on the other hand have requirements fairly similar to those of mobile communication devices. Their main advantage seems to be the fact that the user interface hardware is more developed than on most mobile telephones. Obviously many requirements for mobile phones will be found for PIAs at least to some extent.

Since PIAs are personal devices public, access PIAs are not considered of major importance. Public access PIAs (information kiosk etc.) are covered in section 11 of this report.



## Standards

In the area of PIAs only very little work on standards can be found at the moment. The main reason for this is the fact, that the entire family of products as described in the previous section is still being defined. The products themselves are therefore not ripe for standardisation issues.

There are a number of standards in other areas which are relevant for the family of PIAs as well. In particular, standards from the communication device area are at least helpful for the designers of PIAs.

We consider the following standards, summarized in chapter 6 of this report as relevant for the products in questions:

### Relevant ETSI recommendations

- ETR 068
- ETR 334
- ETR 029
- ETR 165
- ETR 345
- ETR 166
- DTR/HF-00005
- DTR/HF-02021
- DEG/HF-00006

### Relevant ITU-T Recommendations

ITU-T F.910 (02/95) – Procedures for designing, evaluating and selecting symbols, pictograms and icons.

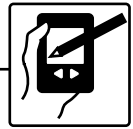
ITU.T E.136 (05/97) – Specification of a tactile identifier for use with telecommunications cards.

ITU.T E.161 (05/95) – Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network.

ITU-T F.901 (03/93) – Usability evaluation of telecommunications services.

### Standards and Recommendations from the PC-area

In addition to the standards for telecommunication devices a number of standards for computer systems may be applicable for the design of PIAs. A comprehensive list of relevant standards from the PC area can be found in chapter 10 of this report.



## User Requirements

### Locating and Physical Access



#### Home Environment

- Problem: locate after misplacing your device. For portable PIAs connected to e.g. a DECT base station the possibility of misplacing the device is rather high. To locate the device a "paging"-possibility should be foreseen on the base station. The device itself should react to a paging request with different audible and/or visible signals.



#### Mobile Environment

- No appropriate solution envisaged.

### Requirements

### Standardisation



#### Physical

- Stable positioning on table-top.
- No need for standardisation.



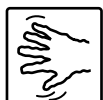
#### Auditory



#### Visual



#### Cognitive

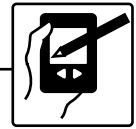


#### Dexterity



#### Combination

- None identified.



## Physical Handling



### Home Environment

- Light protection, card slot accessible without moving device. Not a requirement fit for standardisation.



### Mobile Environment

- Usable in a mobile environment, light protection.

## Requirements

## Standardisation



### Physical

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>- Weight, Size, One hand operation.</li> <li>- One-handed operation of card readers, e.g. for pay cards or installation purposes,</li> </ul> | <ul style="list-style-type: none"> <li>- This is a design issue. Not a standardisation topic.</li> </ul> |
|---|--|



### Auditory

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>- Scalability of audio output (data and feedback).</li> </ul> | <ul style="list-style-type: none"> <li>- Standardise external connector and protocol for external audio amplifier.</li> </ul> |
|--|---|



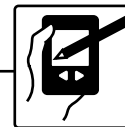
### Visual

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>- Standardized access to functionality Easy detection recognition of interaction elements (Button size, colour).</li> <li>- Display resolution and illumination.</li> </ul> | <ul style="list-style-type: none"> <li>- Standardized interface for external display system (TV-Monitor, larger display).</li> </ul> |
|--|--|



### Cognitive

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>- All the interaction points (slots, buttons, screen buttons...) must be easily detected and recognised.</li> <li>- Unique shape of connectors if several exist.</li> </ul> | <ul style="list-style-type: none"> <li>- Standardized symbols to main operations (e.g. Power on/off).</li> <li>- Not a standardisation issue, but recommend to suppliers.</li> </ul> |
|--|--|



## Requirements

## Standardisation



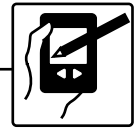
### Dexterity

- One-hand operation of card readers, power supply for battery charging.
  - Usage of keyboard; replacement of touchscreen by keyboard input or voice input.
- Not a standardisation issue.
  - Standardised interface (protocols) for external input system (e.g. keyboard).



### Combination

- Input and output devices should offer information redundantly (tactile feedback, keyclick, etc.).
- Not a standardisation issue, recommendation to suppliers.



## User Interface (UI)



### Home Environment

- The user interface must be consistent when using different applications on one device.



### Mobile Environment

- The user interface must be consistent independently from environmental influences (e.g. type of mobile communication network).

## Requirements

## Standardisation



### Physical

- Parallax problem and touchscreens.
- Display angles on non-mobile devices must be adjustable.



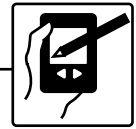
### Auditory

- Optional provision of redundant (acoustic and visual) feedback.
- Create recommendation on feedback typology: how to activate the different outputs (speech, visual...), message typologies, tactile feedback.
- Possibility to increase the acoustic signal.
- Create standards on support for hearing impaired: possibility to plug in ear phones or hearing aids...). Create standard for connecting external amplifier system.



### Visual

- The entire user interface must be "readable" by a visual impaired person.
- Create standardisation on "blind" navigation and its activation.
- Display text (contrast, colour, size) must be readable by visually impaired person.
- Create recommendations on the user interface attending to typefaces, legibility, sizes, colours and graphical representations.



## Requirements

- Utilisation of standard layouts for keypads.
- Legible key labels (size, contrast).

## Standardisation

- Use the standardised telephone layout on the PIAs, require QWERTY (AZERTY, QWERTZ) layout for PIAs. Require external connection to separate keyboard (via IRDA, cable, BlueTooth, etc.).
- Recommend good design for keyboard layout and inscription.



## Cognitive

- Use established graphical symbols for common functions.
- Use consistent and distinguishable user interface layouts for different applications.
- Provide continuous feedback during operation.
- Internal consistency of the entire UI.
- Create standards on UI symbols.
- Create standards on consistent graphical representations. Use industrial style guides (e.g. Windows CE).
- Create standards on feedback typology (auditory, tactile, visual).
- Use industrial style guides.



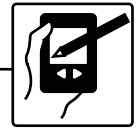
## Dexterity

- For manual dexterity the dimensions of the operation buttons are priority. For mobile devices this requirement can only be fulfilled by assistive technology.
- Same as physical.
- Standardise assistive technology interface.



## Combination

- Internal consistency of the entire UI.
- Create guidelines, use industrial style guides.



## Operation (User Dialogue)



Home



Mobile Environment

- Common Concept of Dialogue.

### Requirements

### Standardisation



Physical

- None identified.



Auditory

- Redundant dialogue prompting.



Visual

- Not a technical standardisation issue; recommend good practice by consensus.



Cognitive

- Time-outs.
- Correlation between logic of the user task and screen design/button or menu ordering.
- Consistent standard functionality.
- Simple access to context-sensitive multi-modal help.
- Keep dialogues simple.
- Prompts must be recognisable, understandable and unambiguous.

- These requirements are not specific to disabled users. They are considered "Good User Interface Design" rules. Ignoring these good practice hints may be disastrous for impaired people. This is not a standardisation issue.



Dexterity

- Time-dependant input events must be scalable, adjustable.
- Sequencing of shift-key input.

- Recommendations, not a technical standardisation issue.
- Standardise the requirement for sequencing as on a Macintosh and/or PC.



Combination

- None identified.



## Adaptation to User Profile



### Home Environment

- Full individualization of the device should be possible for different users of the home-based device (profile selection).



### Mobile Environment

- Full adaptation of the device for the personal requirements of an individual and/or the environment.

## Requirements

## Standardisation



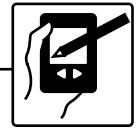
### Physical

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>- Adaptation of the user interface or operation process to specific physical requirements of the user.</li><li>- Use of replacement technology: voice input instead of keypad input.</li></ul> | <ul style="list-style-type: none"><li>- Standardise technology interfaces and protocols: Infrared, Bluetooth etc., Standardise protocol for information exchange between peripherals and PIA. (same as for PC?).</li><li>- Standardise protocol for information exchange between peripherals and PIA.</li></ul> |
|--|---|



### Auditory

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>- Adaptation of the user interface or operation process to specific auditory requirements of the user: replace auditory output with visual output.</li><li>- Enhance volume of auditory output.</li></ul> | <ul style="list-style-type: none"><li>- Same as physical.</li><li>- Recommendations for replacement rules auditory signals vs. Visual signals.</li><li>- Standardise acoustic interface for external speakers/earphones.</li><li>- Hearing aid coupling.</li></ul> |
|---|--|



## Requirements

## Standardisation



### Visual

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>- Adaptation of the user interface or operation process to specific visual requirements of the user:</li><li>- Enhance visual output with auditory output.</li><li>- Enlarge visual output.</li><br/><li>- Profiling of character size on the display.</li></ul> | <ul style="list-style-type: none"><li>- Same as physical.</li><br/><li>- Recommendations as above.</li><br/><li>- Technical interface for enlarged output.</li><li>- Not a technical standardisation issue; recommend good practice by consensus.</li></ul> |
|--|---|



### Cognitive

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>- Adaptation of the user interface or operation process to specific cognitive requirements of the user.</li><li>- Novice/expert profiling.</li><br/><li>- Extended help mode.</li><li>- Supply simplified user interface for the most important functions.</li></ul> | <ul style="list-style-type: none"><li>- Same as physical.</li><br/><li>- Not a technical standardisation issue; recommend good practice by consensus</li><li>- Recommend good practice.</li></ul> |
|--|---|



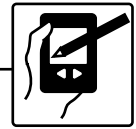
### Dexterity

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>- Adaptation of the user interface or operation process to specific dexterity requirements of the user.</li><li>- Require confirmation dialogues for potentially problematic actions.</li></ul> | <ul style="list-style-type: none"><li>- Same as physical.</li><li>- Supply standardised interface to external input devices; assistive technology interface standard.</li></ul> |
|---|---|



### Combination

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>- Replacement of several input channels.</li></ul> | <ul style="list-style-type: none"><li>- Standardise assistive technology interfaces.</li></ul> |
|--|--|



## Security of Operation



### Home Environment

- No need of special characteristics to assure the security of operation.



### Mobile Environment

- Unauthorised use, unauthorised data access.
- Unintended use.
- Infringement.

## Requirements

## Standardisation



### Physical

- None identified.



### Auditory

- Some hear impaired people should need a higher volume of the acoustic feedback, which can be heard by people nearby.
- Standardise earphone connector.



### Visual

- Some visually impaired people should need larger type, which can be read by people nearby.
- Multimodal prompts to prevent inadvertent actions.
- Replace PINs by biometric identification (e.g. fingerprints, iris recognition, voice authentication).
- No possibility foreseen.
- Recommend good UI practice.
- Standardise interface for identification modules.



## Requirements

## Standardisation



### Cognitive

- Replace PINs by biometric identification (e.g. fingerprints, iris recognition, voice authentication).
- Standardise interface for identification modules.



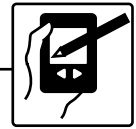
### Dexterity

- Replace PINs by biometric identification (e.g. fingerprints, iris recognition, voice authentication).
- Standardise interface for identification modules (ref. to biometric work within EESSI).



### Combination

- None identified.



## Conclusion

### Summary of Standardisation Issues

Standardise external connector and protocol for external audio amplifier.

Standardised interface for external display system (TV-Monitor, larger display).

Standardised symbols for main operations (e.g. Power on/off).

Standardised interface (protocols) for external input system (e.g. keyboard).

Display angles on non-mobile devices must be adjustable.

Create standards on support for hearing impaired: possibility to plug in ear phones or hearing aids.

Create standardisation on “blind” navigation and its activation.

Create recommendations on the user interface attending to typefaces, legibility, sizes, colours and graphical representations.

Use the standardised telephone layout on the PIAs, require QWERTY (AZERTY, QWERTZ) layout for PIAs.

Require external connection to separate keyboard (via IRDA, cable, BlueTooth, etc.)

Create standards on UI symbols.

Create standards on feedback typology (auditory, tactile, visual).

Standardise assistive technology interface.

Standardise the requirement for sequencing chord input as on a Macintosh and/or PC.

Standardise technology interfaces and protocols: Infrared, Bluetooth etc.

Standardise protocol for information exchange between peripherals and PIA. (same as for PC?).

Standardise earphone connector.

Standardise interface for identification modules.