

Overview of the *userfit* methodology

1. What is the *USERfit* methodology?

The *USERfit* methodology comprises a set of nine summary tools designed to assist AT developers in addressing the issue of usability in design. The tools combine to assist in the process of collating design information obtained using a variety of data gathering techniques. The essence of the methodology is that it provides a structure to assist the developer in assuring that relevant design issues have been considered. It should be noted that in no way does the use of *USERfit* imply that a linear or sequential approach to design is being endorsed as it is anticipated that developers would be using the methodology to summarise information rather than as a guide to design. Individual tools may be visited and revisited a number of times in an iterative design process. The *USERfit* methodology directs AT developers to the questions that must be answered if products are to be successfully applied in their intended market, and focuses on the importance of taking user requirements into account in the product development cycle.

Consequently *USERfit* should be seen as a methodology for collating design material rather than a design model per se. From this perspective *USERfit* acts as a meta-toolkit rather than being a detailed design tool in its own right.

2. USERfit and the Design Process

Figure 1 illustrates common design activities and shows how the USERfit methodology supports them. Design usually involves a number of common elements. Typically these include:

- ◆ a problem definition phase
- ◆ the development of a functional specification
- ◆ a building phase
- ◆ a testing or evaluation phase

Many designers will intuitively recognise this sequence even though they may not actually use this terminology. This matters not, it is the understanding of the process that is important. Let us now look at this process in more detail and consider how USERfit can be embedded within it.

2.1 Problem definition

Problem definition is where a designer will identify a problem and begin to conceptualise a potential solution – namely a product or service aimed at solving that problem. This process can be broken down into a series of inter-related activities which differ in purpose and level of detail required. These might include background research to establish the nature of the intended market; the extent of competition posed by similar products already in existence; the need to adhere to standards; estimates of the cost of development of the new product, and so on.

It is at this early stage of the process that designers may find greatest use of the methodology's summary tools. In all, five of the tools may be utilised at this stage. Briefly, the Environmental Context and Product Environment tools allow designers to refine a general understanding of the problem that is to be explored and to examine how a product may fit into the wider environment in which end users live. The main purpose of these tools is to force developers to consider the wider implications of how the product will be supported, and also document some of the likely implications of these factors.

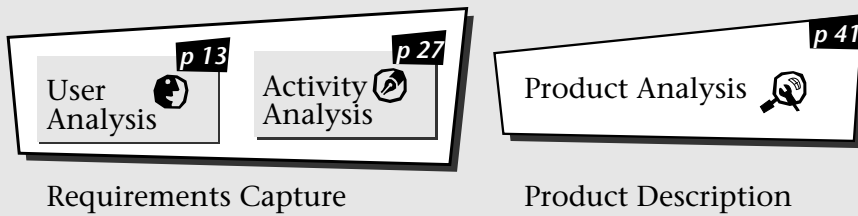
More detailed analysis activities are supported by summaries which cover what is known about the characteristics of users (User Analysis) and the activities (Activity Analysis) that they need to perform. The User Analysis (UA) acts as a repository of design information about user characteristics, and summarises the implications that these may have for design. The Activity Analysis (AA) performs a similar function in describing the activities or tasks that each user will need to perform.

Problem Definition

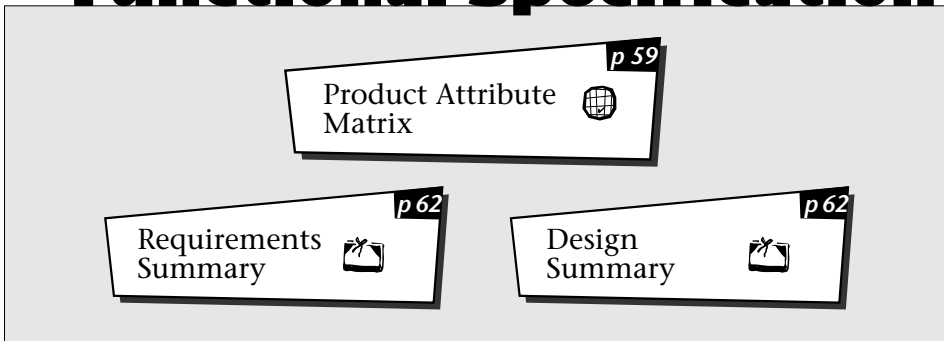
Context of Use



Analysis



Functional Specification



Build

Test

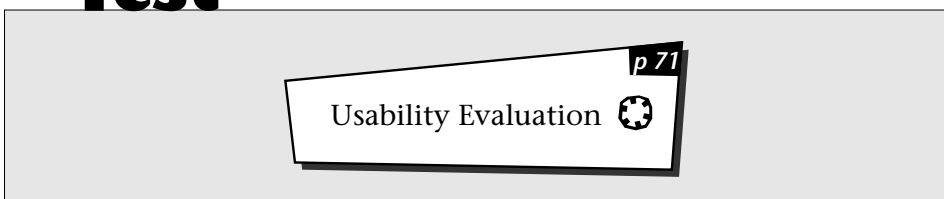


Figure 1

Showing how userfit supports common design activities

Describing the initial functional specification of a product is supported by Product Analysis (PA) which summarises the design decisions made regarding a product's features. This can be used in a variety of ways, as different types of design activity dictate. For example a product may already exist which needs refinement and in this case a Product Analysis can be conducted early in design. Conversely only a basic idea for a product may exist at the start of a project, and so a description of the product will emerge over time and after much deliberation.

2.2 Functional Specification

Once some understanding of the users and their activities has been obtained, it is necessary for developers to move to the more creative process of developing a detailed specification for a product to satisfy users needs. USERfit assists in the process of refining a functional specification for products i.e. what should be implemented, but does not explicitly address technical details of the specification e.g. how a database might be organised or software modules constructed.

The USERfit framework assists in this definition process with a Product Attribute Matrix (PAM) which assists developers in cross-referencing the desired features of a product (as revealed through User and Activity Analyses) with its actual features (as suggested through Product Analysis and Environmental Context considerations). This allows an initial analysis of the likely success of a product in meeting the requirements of end users. The results of this comparison are then used to create a Requirements Summary (RS) and Design Summary (DS) which may be taken through into the build process.

2.3 Build

Building the product follows the specification process. USERfit does not provide assistance in the management of this process as this is largely a technical activity and outside the scope of the methodology. Many structured methods already exist to support such activities.

2.4 Test

Once a physical product exists, USERfit directly supports the planning of testing and evaluation activities through the Usability Evaluation (UA) tools. These assist in the planning of testing activities, in summarising the results of such testing, and in recording any actions needed in the form of design modifications. The emphasis within USERfit is on evaluation of the functionality of products and the degree of match between the capabilities of the product and the needs of users. Technical evaluations are not specifically included within USERfit.

3. Source material for USERfit

The reader is reminded that USERfit is essentially a summarising methodology and therefore the product designer is likely to employ a variety of data capture tools to feed into the summary forms. To help in this process, USERfit contains advice on data capture tools and techniques which can be used to assist in the completion of the USERfit methodology. Many of these can be used for different purposes, and their use in this process is described along with examples of their application.

The data capture tools and techniques described in the USERfit manual are listed below according the phases of design to which they may be commonly applied (figure 2). Further detail on when and where to use specific tools and techniques are provided in the detailed instructions for each section of the methodology.

<i>Problem Definition</i>	<i>Analysis/Specification</i>	<i>Testing</i>
■ User mapping	▲ Task analysis	◆ User trials
■ Brainstorming	▲ Direct observation	◆ Direct observation
	▲ Diary methods	◆ Questionnaires
	▲ Questionnaires	◆ Interviews
	▲ Interviews	◆ Group discussions
	▲ Group discussions	◆ Field trials
	▲ Empathic modelling	◆ Expert opinion

Figure 2

USERfit tools and techniques for data capture for each phase of design

USERfit includes specific instructions on how to use these tools and techniques together with worked examples of their use. There is also guidance on the appropriateness of different data gathering tools with different types of disability. Additional sources of information and advice on further reading is also provided in these sections.

For the reader wanting even more background information, the USERfit manual also contains an introduction to the design implications of ageing and disability along with a collection of design prescriptions. This information can be of particular value in the specification phase of design where operational features of a product are being considered, but is also of value in giving a wider understanding of the issues involved in designing for disability.

For completeness the USERfit manual also contains a section on further information, which gives some guidance on conducting basic research, and identifies some of the common sources of information in this area. These include on line information sources, relevant organisations concerned with usability issues in assistive technology, and a list of other design techniques. The USERfit manual also contains a comprehensive bibliography and reference section, with material grouped into broad topic areas as well as alphabetically.

4. Route guidance

The USERfit methodology is essentially modular and should be thought of a framework for ensuring that all the right kinds of questions are considered during the design cycle, and that design decisions are well recorded. USERfit is also based on a design philosophy which stresses the importance of user involvement and the analysis of user requirements, but that this does not mean that it is believed that all requirements can be captured in advance of working products or prototypes to evaluate. Conversely USERfit has been developed with the understanding that iterative design is often an essential aspect of product development and that developers may often need to engage in a definition/evaluation cycle going through a number of steps.

This makes it difficult to provide definitive guidance on how to use the USERfit methodology, but some indications can be provided based on practical experience gained in its use. Common scenarios for use include:

- ❖ Where there is no idea for a product
- ❖ Where there is no existing product but some broad awareness of the problem to be solved.
- ❖ Where there is an existing product to be refined

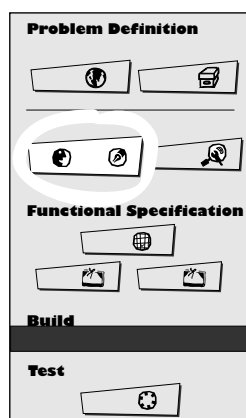


Figure 3
User and Activity Analyses

It should also be noted that in practice the routes decided upon in a given development project are likely to vary considerably. In addition as you gain experience in using USERfit you will find your own preferred ways of using the approach, and will discover that you place greater or lesser emphasis on different design phases depending on the nature of the problem and your own particular interests.

A developer starting a design activity without a clear view of a possible product should consider starting with the Analysis aspects of USERfit and begin with **User and Activity Analysis** activities (*figure 3*). The objective of this will be to try and understand the needs of a target group of potential users and what they might want from a product. A variety of techniques may be applied to try and understand the problems faced by users, and these might include the **direct observation** of a particular

group of interest to the developer, or the use of **interviews** or **group discussions** with them. **Task analysis** may also be used to organise this information and to gain a better understanding of the interactions between the different activities that potential users may engage in. The **User Analysis** part of the methodology also focuses the developers attention on the necessity of considering the needs of all possible users in a development and the use of **User Mapping** can assist in this process

Developers will need to decide broadly what product they will develop, and begin creating an initial definition or **Product Analysis**. Problem solving techniques such as **Brainstorming** may be particularly useful, and in addition there is likely to be value in exploring the likely context of use of the product, and attempting to complete the **Environmental Context** and **Product Environment** tools (figure 4).

Where there is already some broad idea of the problem to be solved the developer may decide to begin with a detailed **Activity Analysis**, rather than a more general problem identification activity. However even in these cases it is recommended that the context of use be explained, as it can be useful to document these assumptions. This is particularly important where design teams are brought together to solve problems, as it is important to ensure that there is a common vision of the product to be developed and how it will be used.

In the cases where developers are starting from a clear definition of what they will build or have an existing product they wish to refine, a useful starting point can be to document this using **Product Analysis** (figure 5). Appendix 1 provides details of the use of the methodology in such a case, and goes into specific details of how the different forms were filled in. This will be particularly useful when the reader tries using the USERfit methodology for themselves. This example shows the USERfit methodology being used for the development of a general consumer product for use by elderly people, and illustrates the scope of the methodology for improving general consumer products. Appendix 2 shows its application in a more obvious AT setting, where an existing specialist communication aid is to be improved.

In many design contexts **Product Analysis** will become more detailed as design discussions continue, and the developer may want to draw on the section on the Design Implications of Ageing and Disability, and Design Principles, to provide them with further information. Once some initial specification has been constructed developers move into a functional specification stage, where the desired attributes of products (as identified from **User and Activity Analyses**) are matched against product attributes that have been defined through **Product Analysis**. This activity is intended to force developers to explicitly consider how

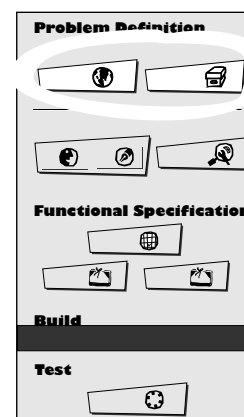


Figure 4
Environmental Context and
Product Environment

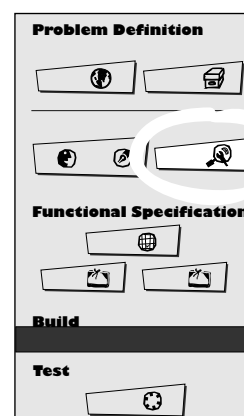


Figure 5
Product Analysis

Overview of USERfit methodology

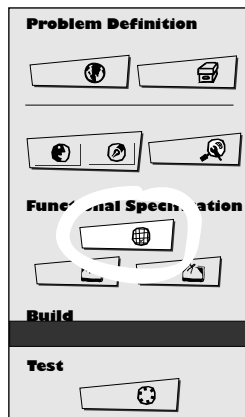


Figure 6
Product Attribute Matrix

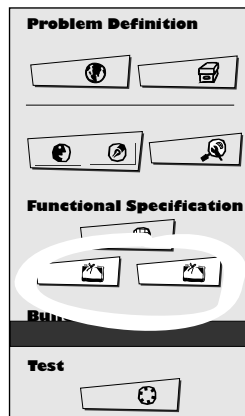


Figure 7
Requirements Summary and
Design Summary

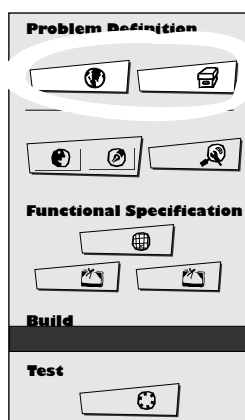


Figure 8
Environmental Context and
Product Environment

well a product specification is likely to satisfy user requirements, in this case before a product has been constructed. The **Product Attribute Matrix** (figure 6) is specifically designed to assist in this cross referencing activity but it can also be used as part of the creative design process where developers are trying to identify features that are so far missing from a design specification. In other words, not only will the matrix assist in matching how well design features are meeting users needs, it will also reveal gaps in knowledge about users and the activities they wish to perform using a product.

The outcome of this process is a **Requirements Summary** and **Design Summary** (figure 7) which then forms the basis for subsequent design and building of the product. The **Requirement Summary** acts to document all of the desired attributes of the product based on user needs, whilst the **Design Summary** documents what will be implemented. The **Design Summary** can be seen as the agreed functional specification of what will be subsequently built. In many cases what may be built first may be a working prototype rather than a final product, and may range in sophistication from having the full functionality of the final product through to it being a simple mock-up of a product's interface.

The USERfit methodology also encourages developers to consider the practical aspects of implementation early in the design cycle, by directing developers to consider The **Environmental Context** and **Product Environment** (figure 8). Such issues are important to consider, and may reveal other parties who should get involved in the development cycle. For example the early consideration of potential training needs and need for support materials such as manuals, can identify other parties who may contribute to the products specification. The production of training and support materials can in itself provide insights as to the quality of a design, and should therefore be encouraged early in the development cycle as an additional way of refining the specification.

The opportunities for evaluating product specifications with end users are somewhat limited however, as most users find abstract concepts harder to discuss than tangible working products. **Group discussions** with potential users can be a useful way of refining a specification in the absence of a working product, but there is no substitute for providing some degree of hands on experience of a product in order to obtain feedback. Thus the value of building prototypes and evaluating them with end users should not be ignored. USERfit encourages the early planning of evaluation activities through the **Usability Evaluation** tool (figure 9), and explicitly forces developers to consider their evaluation plans.

Almost without exception, after a product has been developed it will also go through some form of formal evaluation procedure. The USERfit methodology provides assistance in the planning of this activity and also acts to record the outcomes of such evaluations and any changes to the specification needed. Developers are directed to a variety of techniques which will assist in evaluation ranging from the use of **Expert Opinion** through to more formal **User Trials** and **Field Trials**. Evaluation may lead to a refined specification, but may also highlight the need for further research into user issues and the requirements that users may have for products. Depending on the complexity of the problem, developers may find themselves in a development evaluation cycle that takes a number of iterations before a satisfactory product is eventually produced.

Where an existing product is to be refined it may be appropriate to begin using USERfit at the **Usability Evaluation** phase and use the results of any evaluations carried out to refine the specification. Thus it is important to remember that developers need to consider the logical starting point for their design activities. It may be at the **Product Attribute Matrix** stage if knowledge already exists about users, the activities they wish to perform and intended product functionality; or it may even be at the **Usability Evaluation** stage if a product already exists and the designer wishes to assess its effectiveness with specific user groups.

In practice it does not matter too much where the designer starts because the use of the USERfit methodology will expose gaps in one's knowledge or deficiencies in the product specification. It is then a matter of visiting the appropriate stages of the methodology to gather the missing information, and to go through the appropriate stages of design again. In addition developers may decide to only use part of the USERfit methodology, as for small design projects the effort involved in going through each stage may be perceived to be prohibitive. An example of the use of the USERfit methodology for a small design problem is given in Appendix 2, which concentrates on the analysis and specification of an enhanced communication aid.

One word of caution should be given when using USER fit however, and that is the danger of being misled as to the quality of information that is obtained and used in the decision making process. The quality of any output will be limited by the quality of its inputs, and many of the procedures lend themselves to being used as part of group discussions amongst design teams. In these situations it is possible for participants to mislead themselves into believing that opinion is based on factual information, and it is therefore important to question the basis of any assumptions made, and to be aware that merely reaching consensus and filling in USERfit forms does not make the information contained on the forms true. The old adage 'Trash In Trash Out' is appropriate here, and every effort should be made to ensure that the information recorded is

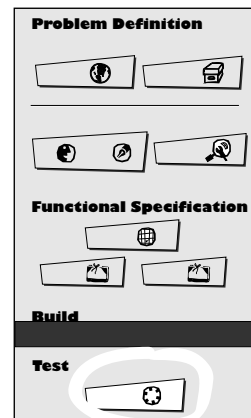


Figure 9
Usability Evaluation

factual rather than based on opinion. This is particularly important where user needs and requirements are being represented by developers.

In many cases it will be found effective to complete the USERfit methodology as group based activities, and design workshops can be an effective way of completing the USERfit forms.

In such cases there is also a danger of “groupthink” occurring, where opinions are judged to be correct because there is a high degree of consensus. Developers should be aware that this can happen and be prepared to challenge the assumptions they are making under such circumstances. However, much of the value of USERfit is obtained by its use in facilitating communication between the relevant parties involved in design within an organisation, and ensuring that consensus of opinion is reached. We have collated a number of practical tips for using the USERfit methodology in group settings. These include:

- ◆ Ensuring participants prepare themselves before attending any workshops
- ◆ Ensuring that workshop participants reflect different parts of the organisation such as:
 - ❖ marketing/customer contacts
 - ❖ system developers
 - ❖ leaders of relevant divisions
- ◆ Using a person from outside the development team to act as a workshop facilitator
- ◆ Ensuring that the objectives of any workshops are clear and priorities are agreed.
- ◆ Ensuring that the rules by which any workshops will operate are made clear in advance. These should:
 - ❖ allow equal participation by all group members
 - ❖ provide a non confrontational or threatening environment
- ◆ Use a secretary to record the results of the discussions
- ◆ Questioning any assumptions that appear to be being made by the group.

The workshop needs to agree on its method of operation, e.g. how it will deal with different opinions. It is suggested that areas where agreement cannot quickly be reached are noted and recorded, as the difficulty in reaching agreement may highlight issues which will need particular attention later in the design process.

For more information on how to conduct **group discussions** in general the reader should consult the description of this technique in the tools and techniques section.

More specific details about how to use USERfit are given in the sections which follow.

5. The Format of the Tools

Each of the tools in the methodology follows a similar format. There is first an Overview which describes: the purpose of the Tool, inputs or information sources for the Tool, a brief description of how the Tool is used, and finally the output from the Tool. Next there is a more detailed description of the Procedure to be followed to complete the Tool, and finally there is the Pro Forma for the Tool itself.

For each of the Tools, the reader will also be advised on appropriate data gathering techniques that can be used to generate the required source material for USERfit.

6. Using the Tools

The detailed Procedure for each of the Tools gives the steps to be carried out for the completion of that particular Tool. It is an outline only. If the tool is being completed in a workshop setting it is essential that the workshop is led by somebody with experience in using the concepts. Initially this person may come from outside the design team but as experience builds up it may be led by a member of the team who has participated in previous workshops and developed a thorough understanding of the concepts. The workshop will also need to appoint a person to record the data.

For the purposes of illustration we have created an example of designing an intelligent washing machine for use by elderly people (See Appendix 1). This is broadly based on an actual product development that the authors were responsible for, but has involved some modification for the purposes of illustration. This example is used to illustrate more clearly how each of the tools may be used in practice and is included as an appendix to this document. A further example of the use of the

approach in the development of a communication aid is given in Appendix 2.

It should be noted that the methodology also acts as a reference source listing the design history of a development. For this reason it is recommended that each document created is dated, and in larger developments it may also be useful to record the authorship of the documents produced, and who were present at any project meetings. A useful tip for the practical use of the methodology is to put the forms into a word processor, and to type notes into this rather than on paper. The advantage of doing this is that it allows cutting and pasting of text between the different forms, thus avoiding the repetition of having to copy by hand material from one form to another.

A commonly asked question is how much detail needs to be put on the forms and how much analysis is needed in order to use the methodology. This is seen as being a particularly relevant issue for the User and Activity analysis phases of the methodology, but the same issue applies to other sections as well. Unfortunately there are no simple answers to this question, and each design problem is likely to be different. However USERfit is flexible enough to be used in a variety of different design scenarios, and in some cases the complexity of the problem may warrant the developer looking at some issues in detail, whilst in others a superficial use of the tools may be acceptable. USERfit encourages developers to ask the right questions but it is then up to them to decide how much detail is needed.

For example it may be decided that **Activity Analysis** should only be performed in detail with end users when it is discovered that other parties do not play a central role in using the product, and in addition it may be decided to concentrate on key activities or tasks rather than trying to be all inclusive. The criteria used has to be realistic, based on the limited design resources available and the confidence of the developers that they understand the activities of end users and their attributes in sufficient detail. These are difficult decisions to quantify, and there is no substitute for experience in using a methodology for resolving these sorts of issues. It is therefore recommended that developers practice using the USERfit methodology and tools before trying to use it in solving real design problems, and should not be afraid to experiment with its use, and modify it to their own needs.