



2.2 Belgium -Flanders

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2.2.1 *Methods of approach in drawing up the inventory*

In order to draw up an inventory of user participation in R&D, a questionnaire was designed based on “User fit: a practical handbook on user-centred design for Assistive Technology, Tide”. The questionnaire was discussed with research specialists, Pronto Ontwerpersmarkt, Sint-Niklaas; Hogeschool Antwerpen, Department of product development, and partners of the ACTS project, Umpti Dumpti, KULeuven.

The questionnaire was subdivided into several parts:

2.2.1.1 **Part 1: General**

The first section recorded general information about the organisation in open questions, including the name and address of the organisation, type of organisation, aims and activities. We expected to find that R&D methodologies varied according to whether a new product or a custom-made product was being developed, whether a prototype was being built or existing products were being compared. We therefore queried what kind of activities the organisation performed through a multiple choice question:

Custom-made product development

New product development

Project work

Comparative tests of products

We asked what sort of products were being researched, and for which type of handicap, in order to determine whether user participation varied according to category of handicap: motor handicap, visual handicap, speech handicap, hearing disability, or general product development, which might cover one or more of these categories.



2.2.1.2 Part 2

In the second section, the questions were specific to the R&D area mentioned above, (custom-made product development, new product development, project work or evaluation and comparison of existing products). Again a subdivision was made.

A General

Questions addressed how the organisation approach their R&D and whether they involve consumers in the process. A table containing the stages in R&D taken from “User fit: a practical handbook on user-centred design for Assistive Technology, Tide” is presented in the questionnaire for completion. Alternatively, the participants could complete their own table. A list of the team personnel involved in the R&D was requested, and whether the personnel form a multi-disciplinary team.

We did not expect all the organisations to have defined stages in R&D, or necessarily to have the time to answer a detailed questionnaire, so some general questions on user participation were included:

How often do you involve users?

How do user opinions affect the design of the product?

How do you select your participants?

through personal contacts

through user organisations

through organised user panels

other, please specify?

Do you approach user organisations? If so, which and at what stage?

Do you train users before they participate in the research? If so, what type of training is given? How is the training organised?

B Details

This part of the questionnaire examined the different stages of R&D in detail. The following stages were defined, according to “User fit: a practical handbook on user-centred design for Assistive Technology, TIDE”:



2.2.1.2.1 Problem Definition

- 1.1 User analysis
- 1.1 Defining possible stakeholder groups
 - 1.1.2 Defining the characteristics of the various stakeholder groups
 - Deriving desired product attributes from the user analysis
- 1.2 Task analysis
 - 1.2.1 Defining the activities a possible user needs to be able to do with the product
 - Defining the functional implication and the desired product attributes, required for the activities a possible user needs to be able to do with the product
- 1.3 Environmental analysis (where, when, how frequently, ... will the product be used?)
- 1.4 Product context (maintenance, installation, documentation, ...)

2.2.1.2.2 Functional Specification (comparison of the desired characteristics according to the problem definition and establishing priorities)

2.2.1.2.3 Technical Specification (comparison of the desired characteristics with the technical possibilities and establishing priorities)

- 4 Construction
- 5 Evaluation
 - 5.1 Technical evaluation
 - 5.2 Usability evaluation
 - 5.2.1 Defining the evaluation plan
 - 5.2.2 Executing the evaluation plan
 - Implication of the evaluation results
- 6 Standardisation



For each stage the following questions were included:

- 1 What procedures do you use in this stage?
 A multiple choice list of methods was made up relevant to each stage
 (see question list in appendix 1)
- 2 Who do you contact to carry out this stage?
- 3 How do you select your informants?
- 4 How do user opinions affect the results at this stage? (this question was only
 asked at the end of each principal stage)

Some extra pages were provided at the end of the questionnaire for organisations to complete details of any stages they use which were not listed in the questionnaire.

2.2.2 *Institutions, organisations, actors*

2.2.2.1 List of organisations

The questionnaire was only sent to the Flemish part of Belgium (including Brussels) to avoid any language problems (see organisation list in appendix 2).

The address file of Vlicht was used to build up a mailing list through which contact was made with various organisations in Belgium.

The manufacturers of technical aids for the disabled were selected from Vlibank, the computer database from Vlicht. This database contains information on more than 10 000 technical aids for people with a motor impairment, visual impairment, hearing or speech impairment. For each product the name, number, technical characteristics, price, description, image and name of the manufacturer and distributor are listed.

Both the manufacturers of new products and of custom-made products were asked to complete the questionnaire. Large telecommunication companies, such as Belgacom and Telenet, were also included in the mailing list, together with university projects developing product prototypes for the disabled.



2.2.2.2 Response

In total 95 companies or organisations received the questionnaire. 15 organisations responded before the deadline. A reminder letter was sent the day of the deadline, which resulted in a further 8 responses, giving approximately a 25% response rate. Only 9 questionnaires were fully completed. 13 organisations completed the general section of the questionnaire (section 2, part A). The other questionnaires only contained information on the organisation (address, type of products, activities). Meaningful responses were only received therefore from 13.6% of the organisations approached.

2.2.3 *Methods and experiences*

2.2.3.1 Introduction

General stages in R&D

In Belgium (Flemish part and Brussels) there are very few new products being developed for the disabled, and most products are custom-made. The results are discussed respective to the type of development to reveal whether R&D procedures vary according to whether a product is developed for a whole range of people, or just for one individual, or whether a prototype is being developed. (The results of the organisations performing comparative tests, are discussed in section 3.3.2.)

a) Development of new products

Only 5 of the responding organisations develop new products to be brought into the market for a whole group of people with a handicap. These new-product developers reported the following stages occurring in the R&D process:

1. A demand coming from an individual, or an organisation is analysed and discussed;
2. Market research: Are there already alternatives on the market, meeting the same need? Is there a group of users with the same general needs from such a product;



3. Feasibility study: study of the economical and technical feasibility;
4. Development of a prototype;
5. Evaluation of the prototype by end-users;
6. Modification of the prototype according to the remarks of the users in stage 5;
7. Testing the modified prototype: by a supplementary group of users, in real life;
8. Production.

According to the marks in the table, listing the stages from “User fit, a practical handbook on user centred design for Assistive Technology, Tide” all stages are used: Problem definition - Functional specification - Technical specification - Construction - Evaluation - Standardisation. Only one organisation developing hard- and software for visual and/or speech impaired users does not perform the standardisation stage.

b) Custom made product development

The R&D process of the organisations who develop custom-made products, is described as follows:(based on the 4 organisations who answered the questionnaire):

1. Request from an individual customer;
2. Study of the problem in consultation with the customer;
3. Development of product;
4. Customers test the product;
5. Modification of the product if necessary;
6. Finishing.

According to the table which lists the stages from “User fit, a practical handbook on user centred design for Assistive Technology, Tide” all stages are used except for the standardisation stage.



c) Project work

Only two universities carrying out project work (European) answered the questionnaire. One project, Umti Dumti, is developing prototypes of telecommunication services for people with a motor impairment. The other project, Transwheel, is developing a crash resistant wheelchair to be used in a car for motor impaired users.

The Umti Dumti project develops the prototype as follows:

1. List user needs and possible problems;
2. Experiment with users to verify 1;
3. Functional analysis of the model;
4. Technical analysis of the model;
5. Technical development of the prototype;
6. Technical lab tests;
7. Experiments with users;
8. Modification: if necessary back to 6, 7 and 8;
9. Final experimental evaluation with a large group of users.

The development of a wheelchair prototype in the Transwheel project includes:

1. Definition of user needs;
2. Design of the prototype;
3. Building the prototype;
4. Testing the prototype with users.

According to the table which lists the stages from “User fit, a practical handbook on user centred design for Assistive Technology, Tide” all stages are used, from problem definition to standardisation.



d) Summary

All the organisations who responded to the questionnaire use the stages Problem definition - Functional specification - Technical specification and Evaluation. Companies developing new products and universities designing prototypes use the standardisation stage, whereas custom-made product developers appear not to. An overview of possible stakeholder groups only applies to companies developing new products. Since custom-made products are made for a single individual and projects designing prototypes have defined target groups, market research to identify potential users is unnecessary.

User participation in R&D: general results

The second section - part A of the questionnaire queried general information on user participation in R&D. The responses to these questions are listed below. Detailed information on user participation in the various stages of R&D is reported in 3.2.

a) Development of new products

The 4 companies who completed the questionnaire and who develop new products reported user participation in the following (main) stages:

stage	number of companies (total 4)
1.1 user analysis	4
1.2 task analysis	4
1.3 environmental analysis	4
1.4 product context	3
2 functional specification	3
3 technical specification	3
4 construction	1
5.1 technical evaluation	2
5.2 usability evaluation	4
6 standardisation	---

b) Custom-made product development

The 4 companies who completed the questionnaire and who develop custom-made products marked user participation in the following (main) stages:



stage	number of companies (total 4)
1.1 user analysis	4
1.2 task analysis	4
1.3 environmental analysis	4
1.4 product context	4
2 functional specification	4
3 technical specification	4
4 construction	---
5.1 technical evaluation	---
5.2 usability evaluation	4
6 standardisation	---

c) Project work

User participation in the two European projects who completed the questionnaire is as follows:

stage	number of projects (total 2)
1.1 user analysis	1
1.2 task analysis	2
1.3 environmental analysis	2
1.4 product context	---
2 functional specification	---
3 technical specification	1
4 construction	---
5.1 technical evaluation	2
5.2 usability evaluation	2
6 standardisation	---

d) Summary

A first screening of the tables above reveals variation between the type of development regarding user participation in the various stages of R&D. These variations are addressed in more detail in section 3.2.

2.2.3.2 User participation in R&D

User participation in the various stages of R&D: who participates, which methods are used?

To define which methods are used and who is contacted at the various stages in R&D, a detailed questionnaire was designed querying the stages listed in ‘User fit, a practical handbook on user-centred design for Assistive Technology, Tide’.

Four of the five companies who responded to the questionnaire who develop new products, and both the university projects completed the detailed section of the



questionnaire. Two of the four companies developing custom-made products also completed the detailed part.

Below are the results of the questionnaire, listed by stage.

Stage 1.1.1: Defining possible stakeholder groups and their respective interests in the product

In the first part of the problem definition: ‘defining possible stakeholder groups and their respective interests in the product’, the following methods are used with different informants:

Development of new products (4 companies answered the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
Brainstorming	2	direct end-users	3
Interviews	1	Indirect end-users	1
study of literature	2	Experts	2
Questionnaires	1	user organisations	---
enquiries with clients	1		

Study of literature was specified by one company as consulting databases and foreign research centres. The same company defined experts as universities, physiotherapists, and hospitals.



Custom-made product development (2 companies answered the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
Brainstorming	---	direct end-users	2
Interviews	---	Indirect end-users	1
study of literature	---	Experts	1
Questionnaires	---	user organisations	---
visiting exhibitions	1		
knowledge of existing products	1		

Project work (2 project groups answered the detailed questionnaire)			
Methods	Number of projects	Informants	Number of projects
Brainstorming	1 (with partners)	direct end-users	---
Interviews	---	Indirect end-users	---
study of literature	---	Experts	1
Questionnaires	---	user organisations	---
using experience of partners in the project	1		

The target group is already pre-defined for the project. To define the target group's interest in the prototype, the experiences of the members of the project group are used.

Sum of the answers (of 8 organisations)			
Methods	Number of organisations	Informants	Number of organisations
Brainstorming	3	direct end-users	5
Interviews	1	Indirect end-users	2
study of literature	1	Experts	4
Questionnaires	---	user organisations	---
enquiries with clients	1		
visiting exhibitions	1		
knowledge of existing products	1		
using experience of partners in the project	1		



Stage 1.1.2: Defining the characteristics (age, experience with technology,...) of the stakeholder group

Methods and contacts used to define the characteristics of the stakeholder groups are listed in the tables below:

Development of new products (4 companies completed the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
statistical analysis	1	direct end-users	4
Anthropometric analysis	---	Indirect end-users	1
Demographic analysis	---	Experts	2
Interviews	3	user organisations	---
direct observation	1		
group discussions	2		
Questionnaires	1		

One company specified carers as an indirect end-user contact group.

Custom-made product development (2 companies answered the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
statistical analysis	---	direct end-users	2
Anthropometric analysis	---	Indirect end-users	1
Demographic analysis	---	Experts	1 (colleagues)
Interviews	---	user organisations	---
direct observation	2		
group discussions	1		
Questionnaires	---		

Project work (2 project groups answered the detailed questionnaire)			
Methods	Number of projects	Informants	Number of projects
statistical analysis	---	direct end-users	2
anthropometric analysis	---	Indirect end-users	---
demographic analysis	---	Experts	---
interviews	1	user organisations	---
direct observation	2		
group discussions	---		
questionnaires	1		
video observation	1		

Summary of responses (from 8 organisations)



Methods	Number of organisations	Informants	Number of organisations
statistical analysis	1	direct end-users	8
anthropometric analysis	---	Indirect end-users	2
demographic analysis	---	Experts	3
interviews	4	user organisations	---
direct observation	5		
group discussions	3		
questionnaires	2		
video observation	1		

Stage 1.1.3: Deriving desired product characteristics from the outcome of the user analysis

In this stage the following informants are contacted:

Development of new products (4 companies completed the detailed questionnaire)	
Informants	Number of companies
direct end-users	3
indirect end-users	1
experts	3
user organisations	---

Custom-made product development (2 companies completed the detailed questionnaire)	
Informants	Number of companies
direct end-users	2
indirect end-users	1
Experts	1
user organisations	---

Project work (2 project groups answered the detailed questionnaire)	
Informants	Number of projects
direct end-users	1
indirect end-users	---
Experts	1
user organisations	---



<i>Sum of the answers (of 8 organisations)</i>	
Informants	Number of organisations
direct end-users	6
Stage 1.2.1: Defining the activities a possible user must be able to perform with the product indirect end-users	2
Experts	5
user organisations	---

Methods used and informants contacted to define the activities a possible user needs to be able to do with the product are listed in the tables below:

Development of new products (4 companies completed the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
task analysis techniques	1	direct end-users	4
direct observation	2	indirect end-users	2
interviews	2	experts	3
group discussions	2	user organisations	
literature	1		

Custom-made product development (2 companies answered the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
task analysis techniques	1	direct end-users	2
direct observation	2	indirect end-users	1
interviews	---	experts	---
group discussions	---	user organisations	---
literature	---		

Project work (2 project groups answered the detailed questionnaire)			
Methods	Number of projects	Informants	Number of projects
task analysis techniques	1 (matrix)	direct end-users	1
direct observation	2	indirect end-users	---
interviews	---	experts	1
group discussions	---	user organisations	---
literature	---		



<i>Summary of the responses (from 8 organisations)</i>			
Methods	Number of organisations	Informants	Number of organisations
task analysis techniques	3	direct end-users	7
direct observation	6	indirect end-users	3
interviews	2	experts	4
group discussions	2	user organisations	---
literature	1		

Stage 1.2.2: Deriving the functional implications and the desired product characteristics from the results of the task analysis

In this stage the following informants are contacted:

Development of new products (4 companies completed the detailed questionnaire)	
Informants	Number of companies
direct end-users	4
indirect end-users	2
experts	2
user organisations	---

Custom-made product development (2 companies completed the detailed questionnaire)	
Informants	Number of companies
direct end-users	2
indirect end-users	1
experts	1
user organisations	---

Project work (2 project groups answered the detailed questionnaire)	
Informants	Number of projects
direct end-users	1
indirect end-users	---
experts	2
user organisations	---

<i>Summary of the responses (from 8 organisations)</i>	
Informants	Number of organisations
direct end-users	7
indirect end-users	3
experts	5
user organisations	---

Stage 1.3: Environmental analysis: when, where, how, ... will the product be used?



In this stage the methods and informants listed below are used:

Development of new products (4 companies completed the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
brainstorming	2	direct end-users	4
empathic modelling	2	indirect end-users	3
group discussions	3	experts	2
		user organisations	---

Custom-made products (2 companies completed the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
	---	direct end-users	2
brainstorming	1	indirect end-users	1
empathic modelling	---	experts	1
group discussions		user organisations	---

Project work (2 project groups completed the detailed questionnaire)			
Methods	Number of companies	Informants	Number of projects
brainstorming	---	direct end-users	1
empathic modelling	1	indirect end-users	---
group discussions	1	experts	2
based on technical needs	1	user organisations	---

Sum of the answers (of 8 organisations)			
Methods	Number of organisations	Informants	Number of organisations
brainstorming	2	direct end-users	7
empathic modelling	4	indirect end-users	4
group discussions	4	experts	5
based on technical needs	1	user organisations	---



Stage 1.4: Product context (maintenance, installation, documentation, ...)

To define the product context and the impact of the product context on the design of the product, organisations reported the methods and informants listed in the tables below.

Development of new products (4 companies completed the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
empathic modelling	3	direct end-users	4
brainstorming	2	indirect end-users	3
group discussions	3	experts	2
		user organisations	---

Custom-made product development (2 companies completed the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
empathic modelling	1	direct end-users	2
brainstorming	---	indirect end-users	---
group discussions	1	experts	---
		user organisations	---

This stage is not relevant to the project groups who are developing prototypes.

Summary of the responses (from 8 organisations)			
Methods	Number of organisations	Informants	Number of organisations
empathic modelling	4	direct end-users	6
brainstorming	2	indirect end-users	3
group discussions	4	experts	2
		user organisations	

Stage 1: Problem definition: summary

The first stage in R&D, problem definition, is subdivided into four main stages, according to “User fit: a practical handbook on user-centred design for Assistive Technology, Tide”

- 1.1 User analysis
- 1.2 Task analysis
- 1.3 Environmental analysis
- 1.4 Product context.



To define possible stakeholders, and to analyse their interests in the product, and product characteristics, direct end-users are mostly contacted using interviews, questionnaires, general enquiries, direct observation and video registration when a new or a custom-made product is being developed. Projects developing a prototype mostly have a defined target group and do not need to define possible stakeholders in the product. They do contact end-users when defining product characteristics and the derived functional product attributes. A few organisations also contact indirect users (family, carers, technical engineers) and experts (within or outside the company) to identify possible users and product characteristics. Through brainstorming and/or consultation with these indirect end-users and experts, stage 1.1, user analysis, is accomplished. Other methods used for user analysis are study of literature, study of foreign databases and knowledge gained through experience.

Secondly, in the problem definition stage, activities a possible user must be able to perform with the product need to be defined (stage 1.2, task analysis). All of the respondents except one involve direct-end users in this stage, using direct observation and interviews. Indirect end-users and experts are also consulted by means of group discussions. One company studies literature to define the activities, 3 organisations use task analysis techniques (one specified this as being a matrix). There appears to be no variation according to the type of product development.

To determine when, where, and how, the product will be used direct end-users are generally contacted as well as indirect end-users and experts. Brainstorming, empathic modelling and group discussions are used to carry out this stage: stage 1.3, environmental analysis. There appears to be no variation between new product development and development of custom-made products. Project workers seem to rely more on the opinion of experts than on asking the direct end-users.

The last step in the problem definition stage is defining the product context. This step is not taken by the project groups. All other respondents reported involvement of direct end-users in this stage. In a lesser way they also involve indirect end-users and experts. Methods to define the product context and the impact of the product context on the design of the product are: empathic modelling, brainstorming and group discussions.



Stage 2: Functional specification: comparison of the desired product characteristics evolving from problem definition and the establishment of priorities

Some organisations responded to the question on how this stage was accomplished. One company uses a matrix consisting of functional analysis lists (“the user wants” statements). Another company puts in two rules to establish priorities in desired product characteristics: ‘form follows function’ and ‘scientific research comes first’. A third company establishes priorities based on 1) safety 2) multifunctional ease of operation 3) appearances.

One project group compares the functional criteria evolving from the problem definition with the previously defined criteria, technical feasibility, and cost price. The other project puts the needs of the users performing their tasks in a matrix, identifies the problems and looks for solutions.

In general, this stage is carried out within the company, using the experience of the product developers. Five companies marked the direct end-users in the table and two companies marked the indirect end-users as participants.

Stage 3: Technical specification: comparison of the desired functional product characteristics with the technical possibilities

This stage is carried out internally by all correspondents, in consultancy with the technical specialists. Functional characteristics are translated into technical product attributes. As much as possible, all desired functional characteristics are met. One organisation (new product development) consulted consumers if the technical possibilities did not match the functional requirements. The European project developing a wheelchair to be used in a car carries out comparison tests with end-users to specify technical aspects of the product.

Stage 4: Construction

None of the respondents involves the users in the manufacturing stage.

Stage 5.1: Technical evaluation

Five companies involve users in the technical evaluation of the product. The consumer tests the product for a while and reports his opinions. The two university projects involve users to evaluate the technical status of the product. These



evaluations takes place in controlled situations. In the project with telecommunication services, the product is first tested by able bodied people to ensure everything works.

The other respondents do not involve users in this stage.

Stage 5.2: Usability evaluation

Three steps are taken to evaluate a product's usability: defining the usability evaluation plan, executing the plan and implementation of the results.

The following methods are reported for definition of the evaluation criteria and how to carry out the evaluation: group discussion, drawing up a questionnaire or making up a list of criteria. These lists, questionnaires and group discussions are carried out with experts in or outside the company. One company involves users to define the usability evaluation plan by using their criticisms as test criteria.

Various methods are used to carry out the usability evaluation plan:

Development of new products (4 companies completed the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
laboratory tests	---	direct end-users	4
direct observation	2	indirect end-users	3
questionnaires	2	experts	2
interviews	2	user organisations	---
field experiments	3		

Custom-made product development (2 companies completed the detailed questionnaire)			
Methods	Number of companies	Informants	Number of companies
laboratory tests	---	direct end-users	2
direct observation	2	indirect end-users	---
questionnaires	---	experts	---
interviews	---	user organisations	---
field experiments	1		



Project work (2 project groups completed the detailed questionnaire)			
Methods	Number of projects	Informants	Number of projects
laboratory tests	2	direct end-users	2
direct observation	2	indirect end-users	---
questionnaires	1	experts	---
interviews	1	user organisations	---
field experiments	2		
video registration	1		

Summary of the responses (from 8 organisations)			
Methods	Number of organisations	Informants	Number of organisations
laboratory tests	2	direct end-users	8
direct observation	6	indirect end-users	3
questionnaires	3	experts	2
interviews	3	user organisations	---
field experiments	5		
video registration	1		

In the third step, the results of the usability evaluation must be interpreted and implemented in the product design. Most organisations modify the product design according to the criticisms of the users, if it is technically and financially possible.

Stage 5: Evaluation: summary

The evaluation stage can be subdivided into two main steps: technical evaluation and usability evaluation. To carry out the technical evaluation only some companies appeal to direct end-users (the consumers test the product). The usability evaluation on the other hand is always carried out with end-users. Methods used to evaluate the usability of the product are (in order of importance): direct observation, field experiments, questionnaires and interviews. Only the two European projects carry out laboratory tests to evaluate usability. One project also performs laboratory tests in the technical evaluation stage.

Stage 6: Standardisation

Only the four companies developing new products and the two European project groups carry out the standardisation stage. No organisations involve users in the standardisation stage.



Remark

Comparing the results of the general answers with the detailed answers reveals some differences. For example, in the general part, 80% of the organisations reported user participation in stage 3, technical specification, whereas only 25% report involving direct end-users in this stage in the detailed section. Perhaps a misunderstanding of the general stages or of the term “users” in the general section of the questionnaire is causing this difference.

Comparison between the answers on user participation in the general section (results in 3.1.2) and in the detailed section of the questionnaire:

Stage	% of organisations who marked user participation in the general section of the questionnaire	% of organisations who marked involvement of direct end-users in the detailed section of the questionnaire
1.1	90	78
1.2	100	87
1.3	100	87
1.4	70	75
2	70	62
3	80	25
4	10	0
5.1	40	87
5.2	100	100
6	0	0

Involving user organisations

accounted for by the fact that a user organisation on aids for disabled people doesn't yet exist in Flanders. User advice is mostly gathered from years of experience and contact with consumers. Only a few work groups of carers exist acting as a forum for discussion on products. The only channel of communication for user feedback to product developers is through the casual and None of the respondents involve user organisations or user panels in their R&D process, which is informal communications of these work groups with manufacturers.



User selection strategies

How informants are selected was reported in every stage of the questionnaire. None of the companies who responded used specific strategies to select users. Most organisations reported selection of informants from personal contacts, existing customer address lists and potential customers. One company mentioned the importance of the objectivity of the informants who were contacted.

Companies who develop custom-made products are mostly contacted by the individual user with the demand.

The project developing telecommunication services selects test subjects from universities, specialist employment centres for people who are disabled, and from associations for people with a handicap.

2.2.3.3 User participation in standardisation work, and in comparative testing by testing agencies

User participation in standardisation work

Only the four companies developing new products and the two European project groups complete the standardisation stage. No organisations involved user participation at the standardisation stage.

User participation in comparative testing by testing agencies

Since there is only one organisation in Flanders carrying out comparison tests of products for handicapped people, a division of Vlicht, the Flemish centre for information and communication on handicap and technology, we can only present the response of this organisation. The main task of Vlicht is gathering and distributing information on technical aids for people with a motor impairment, visual impairment, hearing or speech impairment. Vlicht is divided into five units. Four of these address the specific types of physical handicap, motor, visual, hearing and speech, while the fifth unit provides a central information service.



The visual handicap unit of Vlicht, Cel Infovisie, also compares high technology aids for people with a visual impairment. The products that are tested are chosen on the basis of current real issues. When gathering the products to be tested, the organisation tries to cover the whole Flemish and Dutch market (comparative tests are carried out in cooperation with the Netherlands). A comparative test (of aids for the visually impaired) is performed through the following stages:

1. A list of criteria is drawn up and sent to manufacturers or distributors for suggestions.
2. If possible, some visually impaired users are selected to give user opinions.
3. The products are tested. All results are written down on report forms. The criterium list is used herewith as a guideline.
4. All report forms are collected and processed into a test report (published in a magazine), technical filing cards and specific articles. These articles may be technical (to explain the technical background to the tests) or may report user experiences.

The tests are performed by technical engineers, mostly involving visually handicapped people. In some cases (when TV loops are tested) low vision centres are contacted.

User participants are selected through personal contacts.

Sometimes users are trained before the product is tested. Depending on the type of products, training is limited to a short introduction on the working of the product or a real training in using the product if necessary. These training sessions are not organised formally.

The user opinions are only used when the test leaders are sure that they are objective. Distributors' opinions are also checked for objectivity.

According to the stages listed in the "User fit, a practical handbook on user-centred design for Assistive Technology, Tide" the following stages are recognised:

1. Functional specification:
desired product characteristics are compared using the criterium list. Direct end-users as well as experts and distributors are contacted in this stage.



2. Technical specification:

functional characteristics are compared with the technical possibilities using the criterium list. Experts and distributors are contacted at this stage.

2.1 Technical evaluation: no end-users are involved in this step.

2.2 Usability evaluation:

2.2.1 Defining the usability evaluation plan

By using the criterium list, the test procedure and report forms are drawn up. When carrying out the test battery a report form per test item is completed for each individual and for each different product. To define the plan experts are contacted and in some cases also direct end-users.

2.2.2 Executing the usability evaluation plan

Laboratory tests, direct observation, questionnaires and interviews are used to test the usability of a product. Direct end-users as well as experts are involved.

2.2.3 Interpreting and implementing the results of the usability test

The results of the evaluation tests (technical and usability) are discussed in articles and are used to give advice to persons with a visual impairment, their family and carers.

2.2.3.4 Overview about user training

Only the university project group, investigating accessibility of telecommunication services for handicapped people reported a short briefing of the test subjects before starting the tests.

The organisation testing highly technical aids for the visually impaired, trains the test participants before they perform the test. This training varies from a short explanation on the product functioning, to a thorough training on how to use the product.

None of the other organisations provide training for the participants.

Customers are not always trained in the use of a product once it has been purchased. Disabled users and their carers are pleading for an obligatory training programme with the purchase of a product.



2.2.3.5 Overview of organisational frameworks for user participation

None of the organisations who answered positively to the questions on user participation in R&D-stages, used specific user selection strategies. As far as we know, no organisational framework for user participation exists in Belgium.

2.2.4 *Summary*

Questionnaire

In order to draw up an inventory of user participation in R&D, a questionnaire was designed based on the recommendations of the handbook, “User fit: a practical handbook on user-centred design for Assistive Technology, Tide”. The questionnaire was subdivided into a general and a specific part. The general section recorded information about the organisation, including the name and address of the organisation, type of organisation, aims and activities. In the second section, the questions were specific to R&D-stages. Because we did not expect all the organisations to have defined stages in R&D or necessarily to have the time to answer a detailed questionnaire, a further subdivision was made. A first section asked some general questions on user participation, and a second section examined the different stages of R&D in detail.

We expected to find that R&D methodologies varied according to whether a new product or a custom-made product was being developed, or whether a prototype was being designed or existing products were being compared. We therefore queried what kind of activities the organisation performed.

Organisations

The questionnaire was only sent to the Flemish part of Belgium (including Brussels) to avoid any language problems. Manufacturers of technical aids for the disabled were included in the mailing list as well as large telecommunication companies, university projects developing prototypes of products for the disabled, and one organisation comparing existing products. In total 95 companies or organisations were mailed.



Response

25% of the organisations responded, but only 13.6% completed the more detailed section of the questionnaire. In the Flemish speaking part of Belgium, and Brussels few new products are being developed, and most products are custom-made. Of the respondents five companies develop new products and 4 companies develop custom-made products. Two university projects and one organisation who evaluate and compare existing products also answered the questionnaire.

General stages in R&D

All the organisations who responded to the questionnaire, use the stages Problem definition - Functional specification - Technical specification and Evaluation. Companies developing new products and universities building a prototype carry out the stage of standardisation, whereas custom-made product developers do not. An overview of possible stakeholder groups only applies to companies developing new products. Since custom-made products are made for one individual and projects building a prototype have defined target groups, market research to identify potential users is unnecessary.

User participation in R&D

Direct end-users participate mainly in the problem definition stage and the evaluation stage (specifically the usability evaluation). To carry out functional specification only a few companies involve direct end-users. The technical specification of the product is performed internally. One organisation consults the consumer for cases where the technical possibilities don't match the functional requirements, and one university project evaluates products with the end-user at this stage. To evaluate the technical characteristics of the product or prototype, a few companies ask users to test the product for a while. One university project tests the functionality of the product with able bodied users first. Most other companies test the technical product attributes themselves. None of the respondents involve direct end-users in the construction or standardisation stages.



Experts are consulted at almost every stage. These experts are usually the product developers of the company.

Often, indirect end-users (such as family and carers, etc.,) are consulted at various stages of R&D. Only one company specified the type of indirect end-users as being carers.

Methods to carry out R&D

Various methods are used in the different stages. In the problem definition stage mostly interviews, questionnaires, direct observation, group discussion and brain storming are used. Also task analysis techniques, empathic modelling and study of literature are mentioned. The second stage, functional analysis, is carried out differently by all respondents, using matrices, logical rules, etc. To evaluate the product's usability direct observation is most frequently used. Also field experiments, questionnaires and interviews are used. Laboratory tests are only carried out by the university projects.

User organisations

None of the respondents involve user organisations or user panels in their R&D process, which is accounted for by the fact that a user organisation on aids for disabled people doesn't yet exist in Flanders. User advice is mostly gathered from years of experience and contact with consumers. Only a few work groups of carers exist acting as a forum for discussions on products. The only channel of communication for user feedback to product developers is through the casual and informal communications of these work groups with manufacturers.

Selection of participants

None of the companies who responded to the questionnaire used specific strategies to select users to participate in the various stages of R&D. Most organisations reported selection of informants through personal contacts, from existing customer address lists, or potential customers. One company commented on the importance of the



objectivity of the informants. Companies who develop custom-made products are mostly contacted by the individual users themselves. The project developing telecommunication services selects their test subjects from universities, specialist employment centres for people who are disabled, and from associations for people with a handicap.

User participation in standardisation work

Only the four companies developing new products and the two European project groups complete the standardisation stage. No organisations involved user participation at the standardisation stage.

User participation in comparative testing

Since there is only one organisation in Flanders carrying out evaluations and comparisons of products for handicapped people, the visual handicap division of Vlicht, the Flemish centre for information and communication on handicap and technology, we can only present the response of this organisation.

Manufacturers and distributors are contacted to determine the criteria for which the product must be tested. If possible, some visually impaired users are selected through personal contacts to give user opinions on the products. The test results are documented in reports and articles. These articles may be technical (to explain the technical background to the tests) or may report the user experiences.

User opinions are only used when the test leaders are sure they are objective. Distributors' opinions are also monitored for objectivity.

In the handbook, "User fit, a practical handbook on user-centred design for Assistive Technology, Tide" the following stages are recognised: functional specification, technical specification, technical evaluation and usability evaluation.

Laboratory tests, direct observation, questionnaires and interviews are used to carry out the usability tests.



User training

Only the university project group, investigating accessibility of telecommunication services for handicapped people reported a short briefing of the test subjects before starting the tests. The organisation testing highly technical aids for the visually impaired, trains the test participants before they perform the test. This training varies from a short explanation on the product functioning, to a thorough training on how to use the product. None of the other organisations provide training for the participants.

Organisational framework for user participation

None of the organisations who involve users in the R&D-stages, used specific user selection strategies. As far as we know, no organisational framework for user participation exists in Belgium.