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**Human Factors (HF);
Results of an evaluation study of
pictograms for point-to-point videotelephony**

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Foreword

This ETSI Technical Report (ETR) has been produced by the Human Factors (HF) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or the application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETS.

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1 Scope

This ETSI Technical Report (ETR) gives the results of an evaluation study of pictograms for basic videotelephony functions. The seven functions covered by the study are:

- a) VIDEOPHONE / TELEPHONE (upgrading / downgrading the call);
- b) CAMERA ON / OFF (turning on and off picture transmission);
- c) MICROPHONE ON / OFF (turning on and off sound transmission);
- d) SELFVIEW (turning on and off the selfview function);
- e) STILL PICTURE (turning on and off screen freeze);
- f) DOCUMENT CAMERA (switching between document and person cameras); and
- g) HANDSFREE (switching between handset and handsfree modes).

Seven pictogram sets, each containing candidate pictograms for the seven basic videophone functions, were empirically evaluated with the aim of identifying the most suitable pictogram set. Data for this study were collected in eight European countries from more than 650 respondents. The results of the study lead to the recommendation of a combined set of pictograms.

The Multiple Index Approach to the evaluation of pictograms is described in detail in ETR 070 [1]. The seven recommended pictograms are the content of ETS 300 375 [2].

2 References

For the purpose of this ETR the following references apply.

- [1] ETR 070 (1993): "Human Factors (HF); The Multiple Index Approach (MIA) for the evaluation of pictograms".
- [2] ETS 300 375: "Human Factors (HF); Pictograms for point-to-point videophony".
- [3] 417-IEC-5467: "Graphical symbols for use on equipment. Index, survey and compilation of single sheets".

3 Abbreviations

For the purposes of this ETR, the following abbreviations apply:

DIN	Deutsches Institut für Normung
EC	European Commission
ETR	ETSI Technical Report
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
HF	Human Factors
I-ETS	Interim European Telecommunication Standard
IEC	International Electrotechnical Commission
PSN	People with Special Needs

4 General

Pictograms and icons¹⁾ have the potential of easing the use of telecommunications devices. Well designed pictograms allow the user to intuitively understand which function the pictogram represents. In addition, they are said to require less learning time and effort than text based alternatives. They are "international" in the sense that they are not bound to a particular language and can be understood by illiterate people as well. Standardized pictograms for basic videophone functions allow the user to recognise the basic functions of any videophone without the need for extra instruction. However, international empirical tests are necessary to verify that pictograms carry the same intuitive meaning in different cultures and language communities.

4.1 Methodological considerations

Before comparing different methodological options available for testing pictograms, we have to establish *by which criteria* the pictograms will be judged, or in other words, what establishes a good set of pictograms²⁾. From what has been said before, a set of pictograms is considered a good set if:

- each of its elements is associated with the corresponding referent (i.e. the function to be represented);
- none of its elements is associated with any referent other than the corresponding one;
- users feel subjectively certain in their selection of a pictogram (i.e. in the selection of a control to use to bring about a desired effect).

Therefore, the testing method has to focus on correct associations as well as on errors and it has to take into account the respondent's subjective certainty. In addition, the most realistic evaluation approach is one *that tries to represent an actual usage situation*, i.e. a recognition situation in which a user with a certain intention (e.g. switching on the self-view function of a videophone) is confronted with the controls of a device and needs to make a choice as to which control will bring about the desired effect. There are basically four ways of assessing the associativeness of pictograms:

<u>Display</u>	<u>Task</u>
1) One pictogram at a time.	Name referent.
2) Set of pictograms and one referent.	Pick pictogram that represents the referent.
3) One pictogram and the list of referents.	Pick the referent that is represented by the pictogram.
4) Set of pictograms and list of referents.	To map the elements of each list.

The four options meet the criteria specified above to different degrees. The first test is one of recall rather than recognition processes. The third one, in which all referents and only one pictogram are presented at a time, is equally badly suited for the present aim since in a real-life situation, the user of a videophone may have all pictograms visually present but s/he will not necessarily have a complete cognitive representation of all functions of the terminal as defined by the referents. The same applies to Option 4) which has the additional disadvantage that it is a one-to-one mapping and that certain errors (like one pictogram being associated with two referents) do not occur. Some recommendations suggest combinations of the three options mentioned so far.

Option 2), i.e. the test in which the complete set of pictograms is presented to the subject (as would be in the case of a real videophone call situation in which the pictograms are placed on the terminal) and only one referent is presented at a time, was the testing method used for this ETR. In addition to its greater validity, it possessed the advantage of allowing all four kinds of outcomes of a signal detection situation (Hit, Miss, False Alarm and Correct Rejection) thus making a more detailed analysis possible.

1) In this document, the term "pictogram" is used for the graphical representation of a function or an element of a user interface. In this sense it is equivalent to the term "icon".
2) In the following, it is assumed that a *set* of pictograms is to be tested that represents a number of functions of a device as opposed to single, stand alone pictograms.

The Multiple Index Approach, as described in ETR 070 [1], was developed on the basis of these considerations. The approach used in this ETR takes the form of a questionnaire with three parts (it is, of course, possible to implement the test on computers with sufficiently high resolution screens):

- in Part 1 of the questionnaire, one referent (name and description of a function) at a time is presented with all pictograms of one set (Test of pictogram associativeness). The respondent's task is to choose the appropriate pictogram for the function in question. In addition, subjective certainty and suitability ratings are required for each pictogram;
- in Part 2, the respondent is asked to give preference ratings on the level of functions (Test of pictogram preference), i.e. all candidates for one function are shown and the most suitable one is supposed to be indicated;
- in Part 3, preference ratings are requested on the level of sets (Test of family preference), i.e. all sets are displayed and the preferred one is supposed to be indicated.

The results of the Test of pictogram associativeness are the main indicator for the usability of the sets to be tested. The Tests of pictogram and family preference are to be used mainly to verify that a pictogram set fulfils not only the associativeness criterion but also aesthetic criteria. Furthermore, they can be used in cases in which there are competing sets with similar results for associativeness.

Finally, order and learning effects should be controlled for by employing versions of the questionnaire with a different presentation order of the pictograms.

5 The ETSI evaluation study of pictograms for point-to-point videophone functions

5.1 The pre-test

To test the suitability of the approach outlined in Clause 4, a detailed evaluation method, the Multiple Index Approach, was designed and tested on a small sample of subjects using eight pictogram sets. The results of this test of the eight pictogram sets and of the evaluation methodology itself confirmed the suitability of the Multiple Index Approach.

5.2 The main evaluation study

Based on the results of the pre-test, seven of the eight pictogram sets used in the pre-test (one set was withdrawn by the designers) were tested in the main evaluation study with the aim of identifying the most suitable pictogram set according to the specified criteria. The seven basic videophone functions for which pictograms were designed and tested are as follows:

- a) VIDEOPHONE / TELEPHONE (upgrading / downgrading the call);
- b) CAMERA ON / OFF (turning on and off picture transmission);
- c) MICROPHONE ON / OFF (turning on and off sound transmission);
- d) SELFVIEW ON / OFF (turning on and off the selfview function);
- e) STILL PICTURE ON / OFF (turning on and off screen freeze);
- f) DOCUMENT CAMERA ON / OFF (switching between document and person cameras);
- g) HANDSFREE ON / OFF (switching between handset and handsfree modes).

The testing method of the proposed pictogram sets is one of a paper and pencil test. The questionnaire is described in detail in Clause 6.

5.3 Partners taking part in the study

The intention was to collect data in as many ETSI member countries as possible in order to enhance the representativeness of the study and to spread the burden of data collection to several partners. Running the questionnaire in as many languages as possible has the additional beneficial effect of lowering the risk of including language-bound or culture-bound pictograms.

The following institutions took part in the study:

1)	Norwegian Telecom	Norway
2)	Ericsson	Sweden
3)	Frystyk Consult ApS	Denmark
4)	Danish Centre of Technology for Disabled Persons	Denmark
5)	HUSAT Research Institute	Great Britain
6)	Heinrich-Hertz-Institut Berlin	Germany
7)	SEL-AG Stuttgart	Germany
8)	Aéro-Club of the EC	European Community
9)	Telefónica Investigación y Desarrollo	Spain
10)	Fundazione Ugo Bordini	Italy
11)	CSELT	Italy
12)	Foundation of Research and Technology Heraklion	Greece

These 12 institutions from eight countries cover a large area of the European continent excluding only the group of Eastern European countries.

5.4 The post-test

As the results of the main study led to a recommendation of a mixed set, a "post-test" was conducted with subjects from Berlin and Madrid. This post-test and the results obtained are described in Clause 10.

6 Method

6.1 Material 1: the pictogram families tested in the study

Seven pictogram sets (or "families"), each with pictograms for the seven videophone functions considered in the evaluation study, were tested. The designers of the seven families were:

- 1) Deutsches Institut für Normung e.V.(DIN), Berlin, Fed. Rep. Germany;
- 2) CSELT Torino, Italy;
- 3) Philips Corporate Industrial Design, Eindhoven, The Netherlands;
- 4) Teledirektoratets forskningsavdeling (Norwegian Telecom Research Dept)., Kjeller, Norway;
- 5) SEL - AG, Forschungszentrum Stuttgart, Stuttgart, Fed. Rep. Germany;
- 6) Ferris Associates - User Interface Designers, Bishop's Stortford, Great Britain;
- 7) Telefónica - Investigación y Desarrollo, Madrid, Spain.

The seven pictogram families are reproduced in Annex A.

6.2 Material 2: the questionnaire

The questionnaire used in the study differed from the one employed in the pre-test only with regards to minor aspects resulting from the pre-test results. These differences mainly concern the format of the response scales and the use of two versions with varying item orders instead of one in the case of the pre-test.

The questionnaire was handed out to the respondents in their native language with the exception of the Swedish sample which received the English-language version of the questionnaire.

The questionnaire was organised in five sections. Examples for all the sections can be found in Annex D.

Section 1

Section 1 introduces the background of the study and describes the basic components of a videophone and the relevant functions. It gives reasons for the necessity of designing and testing pictograms for videophones, and gives an overview of the remaining sections of the questionnaire.

Section 2

In Section 2 (Task 1, Test of Associativeness), one referent (i.e. videophone function, e.g. CAMERA ON / OFF) is presented together with all the pictograms (in random order) of the family to be tested. The task is to mark (circle, cross out) the pictogram that represents the referent and to answer the questions "How certain are you of your choice?" (Subjective Certainty, rating scales ranging from VERY UNCERTAIN to VERY CERTAIN) and "How well do you personally think the pictogram represents REFERENT?" (representativeness, rating scale ranging from VERY BADLY to VERY WELL). The task is repeated for each of the seven referents for the seven pictogram families to be tested (resulting in 49 pages for this section of the questionnaire).

Section 3

In section 3 (Task 2), each referent (function) is presented again, this time with a list of the corresponding pictograms of all families. The question to be answered is "Which of these pictograms do you think best represents the function REFERENT? I prefer pictogram number _____" (Test of Pictogram preference).

Section 4

In Section 4 (Task 3), all families are presented in a grouped form and the respondents are asked to select the one family that they prefer. The question to be answered is "Which set of pictograms do you like most? I prefer pictogram set number _____." (Test of Family preference).

Section 5

On the last page (Section 5), the respondent is asked about his/her gender, age, profession, his/her experience with videotelephony and videoconferencing, and on their general attitude towards technology.

Rating scales

All rating scales used in the questionnaire were 5-point scales of the following type:

"How certain are you of your choice?"

very uncertain [] [] [] [] [] very certain

Item order

In order to control the effects of the order of presentation on the evaluation of the seven pictogram families and to control the aspect for learning effects, two versions of the questionnaire have been used. In Version 1 of the questionnaire, the pictogram families were presented as listed in subclause 6.1 of this ETR. In Version 2, the first three pictogram sets (DIN, CSELT and Philips) were moved to the end thus moving the family by TF (Norwegian Telecom) to the first position (see below).

Position	Version 1	Version 2
1)	<i>DIN</i>	<i>TF (Norwegian Telecom)</i>
2)	<i>CSELT</i>	<i>SEL-AG</i>
3)	<i>Philips</i>	<i>Ferris</i>
4)	<i>TF (Norw. Telecom)</i>	<i>Telefónica</i>
5)	<i>SEL-AG</i>	<i>DIN</i>
6)	<i>Ferris</i>	<i>CSELT</i>
7)	<i>Telefónica</i>	<i>Philips</i>

We aimed at an equal number of Version 1 and Version 2 questionnaires. This could not always be realised, as the following table shows:

Table 1

Country	n Sample	Order (%)	
		Version 1	Version 2
Germany	88	64,8	35,2
Denmark	82	-	100,0
Spain	100	100,0	-
Sweden	102	51,0	49,0
Great Britain	42	52,4	47,6
Greece	69	47,8	52,2
Italy	99	50,5	49,5
Norway	103	50,5	49,5
Other ³⁾	2	50,0	50,0
Total	687	53,4	46,6

6.3 The respondents

687 respondents (55,2 % men and 41,8 % women) completed the questionnaire. Their average age was 33,5 years (range 11 to 74). 21,8 % were being trained (students, apprentices), 40,0 % of the respondents work in jobs that can be classified as "technical" and 32,2 % as "non-technical". 83,1 % of the respondents had absolutely no experience with videophones. Most respondents expressed a moderately positive attitude towards technology with slightly varying national means. People with disabilities have not been specifically considered. This information is shown in tables 2 and 3.

Table 2

Country	n Sample	Sex (%)			Age (mean)	Attitudes towards technology		
		male	female	miscellaneous		Rating 1	Rating 2	Rating 3
Germany	88	50,0	43,2	6,8	26,44	3,18	4,13	2,95
Denmark	82	52,4	47,6	-	38,49	3,63	4,19	3,49
Spain	100	68,0	31,0	1,0	29,66	3,94	4,25	3,95
Sweden	102	64,7	26,5	8,8	35,40	3,73	3,83	3,53
Great Britain	42	26,2	73,8	-	32,02	3,66	3,66	3,76
Greece	69	56,5	40,6	2,9	29,82	4,00	4,16	3,78
Italy	99	60,6	38,4	1,0	35,17	3,86	3,98	3,79
Norway	103	45,6	53,4	1,0	38,66	3,73	3,82	3,77
Other	50,0	-	50,0		59,0	4,00	4,00	4,00
Total	687	55,2	41,8	3,1	33,5	3,72	4,02	3,63

Table 3

Country	Profession %				Experience Videophone			
	student	non-tech. job	tech. job	miscellaneous	never	once	> once	missing
Germany	67,0	5,7	18,2	9,1	75,0	3,4	14,8	6,8
Denmark	11,0	48,8	35,4	4,9	84,1	12,2	-	3,7
Spain	12,0	33,0	54,0	1,0	84,0	10,0	6,0	-
Sweden	3,9	32,4	52,0	11,8	76,5	8,8	8,8	5,9
Great Britain	2,4	90,5	4,8	2,4	85,7	7,1	7,1	-
Greece	34,8	31,9	29,0	4,3	88,4	2,9	2,9	5,8
Italy	32,3	34,3	23,2	10,1	83,8	5,1	10,1	1,0
Norway	8,7	68,0	22,3	1,0	91,3	2,9	4,9	1,0
Other	-	-	50,0	50,0	-	50,0	-	50,0
Total	21,8	40,0	32,2	5,8	83,1	6,7	7,0	3,2

³⁾ Two respondents from the Aéroclub of the European Commission (EC) did not indicate their nationality.

6.4 Procedure

In most cases, one experimenter was present while the questionnaire was being completed, and all respondents were invited to ask the experimenter in case they had any problems with the format of the tasks. It took the respondents about 35 minutes to complete the questionnaire (range 20 minutes to 60 minutes).

7 Results

7.1 Effects of order and learning

Table 4 shows the mean percentages of correct pictogram selections (Task 1) for both versions of the questionnaire across the seven referents and across the seven families. In most cases, the differences are negligible. Tests for the statistical significance between Version 1 and Version 2 scores were performed only on the summated scores.

Table 4

Pictogram	Order	Set						
		Fam. 1	Fam. 2	Fam. 3	Fam. 4	Fam. 5	Fam. 6	Fam. 7
Videophone / Telephone	1	87,5	27,3	40,5	88,8	34,9	32,9	95,1
	2	87,8	38,0	59,0	83,4	35,1	35,8	94,3
Camera on / off	1	62,6	63,8	72,3	88,0	36,1	90,7	73,8
	2	81,0	71,0	88,9	87,5	27,9	91,5	74,4
Microphone on / off	1	42,7	64,4	64,4	97,8	65,7	73,8	95,6
	2	62,6	59,7	72,1	96,6	53,3	62,6	95,6
Selfview	1	68,4	37,7	50,3	73,2	55,8	56,0	89,3
	2	69,6	32,3	72,0	66,7	41,8	52,2	92,8
Still picture	1	36,4	28,6	63,6	87,4	77,1	40,6	74,4
	2	33,7	24,0	79,9	86,1	72,9	50,5	75,1
Document camera	1	87,5	71,5	88,2	96,5	96,7	96,7	97,3
	2	91,4	57,5	97,8	94,7	97,8	96,8	98,4
Handsfree mode	1	59,5	50,3	68,4	82,4	73,0	62,8	84,1
	2	76,6	53,9	84,2	79,1	76,4	51,9	83,4

Table 5 lists, for the seven families, the average score of correct selections across the seven referents. For example for Family 1, an average of 4,67 of the seven pictograms were selected correctly. The differences between the Version 1 (4,40) and the Version 2 (4,99) performance is significant. The same applies to Family 3 and to a lesser degree to Family 5 and the overall performance across families and pictograms.

Table 5

Family	Total	Version 1	Version 2	Significance
Family 1	4,67	4,40	4,99	***
Family 2	3,44	3,44	3,44	n.s.
Family 3	4,96	4,45	5,57	***
Family 4	6,07	6,14	5,98	n.s.
Family 5	4,25	4,39	4,07	*
Family 6	4,48	4,52	4,44	n.s.
Family 7	6,11	6,08	6,15	n.s.
Total	34,00	33,39	34,75	*

* p < 0,5, *** p < 0,01, n.s - not significant

The following graph represents the Version 1 / Version 2 differences for the seven families.

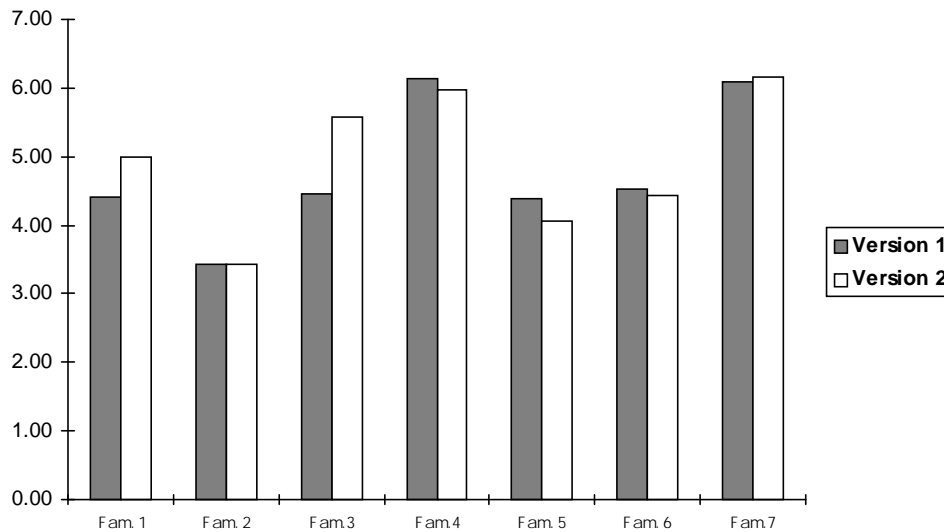


Figure 1: Average number of correct selections for Families 1 to 7 and questionnaire Versions 1 and 2

The results confirm that when ordered respectively, learning effects did indeed occur and that a control of these effects is important for the evaluation of pictograms. If only Version 1 of the questionnaire had been employed, the results for Families 1 and 3 would have been significantly more negative. Having balanced the order of families in the two versions provided more reliable means to work with than any single order procedure could have yielded.

7.2 The results for Task 1 (Test of Associativeness)

7.2.1 Task 1: Pictogram selection

In Task 1, one referent (i.e. videophone function, e.g. CAMERA ON / OFF) is presented together with all the pictograms of the family to be tested in random order. The task is to mark (circle, cross out) the pictogram that represents the referent.

Annex B (tables B.1 to B.14) summarizes the results for Task 1 for all seven families, the pictogram selection task. The column headings represent the referents (i.e. the function mentioned in the task), and the row headings represent the pictograms actually selected. The boxes printed with a bold frame contain correct selections. For example, when asked for the VIDEOPHONE / TELEPHONE pictogram of Family 1, 602 out of the 687 respondents (= 88,3 %) correctly selected the VIDEOPHONE / TELEPHONE pictogram. Nine respondents selected the Camera on / off pictogram, 11 the MICROPHONE ON / OFF pictogram, etc. (see tables B.1 and B.2 of Annex B). No significant differences could be found between the national samples as regards the mean number of correct selections.

Table 6 presents the percentage of hits (i.e. correct selections across referents and families).

Table 6

	Families							mean
	Family 1	Family 2	Family 3	Family 4	Family 5	Family 6	Family 7	
Vid / Telephone	88,3	32,2	49,0	86,3	35,0	34,2	94,7	60,0
Camera on / off	71,0	67,2	80,0	87,8	32,3	91,1	74,0	71,9
Microphone	51,6	62,2	67,9	97,2	60,0	68,7	95,6	71,9
Selfview	68,9	35,2	60,1	70,2	49,3	54,3	90,9	61,3
Still Picture	35,1	26,4	71,2	86,8	75,2	45,2	74,7	59,2
Document camera	89,3	64,9	92,6	95,6	97,2	96,8	97,8	90,6
Handsfree	67,3	52,0	75,6	80,9	74,6	57,8	83,8	70,3
Mean	67,4	48,6	70,9	86,4	60,5	64,0	87,4	69,3

The last column of table 6 shows that, in general, the proposed sets contained more successful candidates for the DOCUMENT CAMERA and CAMERA and MICROPHONE ON / OFF functions whereas a larger number of respondents seem to have encountered difficulties with the proposals for the VIDEOPHONE / TELEPHONE, SELFVIEW and STILL PICTURE pictograms. The bottom line of table 6 shows the mean hit rate across the seven pictogram families. These means are represented in figure 2.

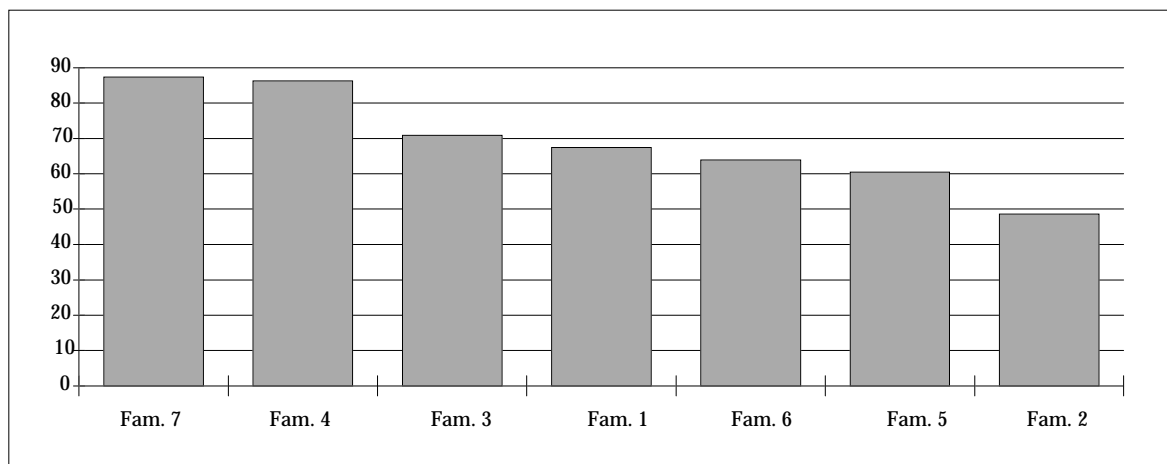


Figure 2

Two families, namely Family 4 and Family 7 received higher average scores than any of the other five families. These results correspond to the ones presented in table 10. There, we looked at the average number per family of pictograms correctly selected whereas the graph in figure 2 represents the average number of respondents who selected the correct pictogram. On the level of the seven referents, it is possible to check whether the most successful candidates are members of those two families. Table 7 shows the rank order of families across the seven referents.

Table 7

	Position			
	1	2	3	4
Videophone/Telephone	Fam. 7	Fam. 1	Fam. 4	Fam. 3
Camera on / off	Fam. 6	Fam. 4	Fam. 3	Fam. 7
Microphone	Fam. 4	Fam. 7	Fam. 6	Fam. 3
Selfview	Fam. 7	Fam. 4	Fam. 1	Fam. 3
Still Picture	Fam. 4	Fam. 5	Fam. 7	Fam. 3
Document camera	Fam. 7	Fam. 5	Fam. 6	Fam. 4
Handsfree	Fam. 7	Fam. 4	Fam. 3	Fam. 5

False Alarms

Table 8 presents, for each pictogram, the number of false alarms. A false alarm is an instance of the selection of a pictogram in the context of a different referent. For example, for Family 2 we find in Annex B, table B.4, that 215 respondents correctly selected the VIDEOPHONE / TELEPHONE pictogram in the context of the VIDEOPHONE / TELEPHONE referent. However, the same VIDEOPHONE / TELEPHONE pictogram was also selected by 41 respondents in the context of the CAMERA ON / OFF referent, by eight respondents in the context of the MICROPHONE ON / OFF referent, by 223 respondents in the context of the SELFVIEW referent (which suggests that the proposed pictogram is better suited as a candidate for SELFVIEW than for VIDEOPHONE / TELEPHONE), etc. In total, there were 338 instances of false alarms for the VIDEOPHONE / TELEPHONE pictogram of Family 2.

The false alarms parameter is particularly important because, next to the hit rate, it is a second, equally meaningful indicator of the suitability of a pictogram. The following example illustrates this point. The hit rate for the CAMERA ON / OFF pictogram in Families 4 and 6 was fairly similar (87,8 % and 91,1 %). The Family 4 CAMERA ON / OFF pictogram was also selected in 63 cases in the context of other referents. In the case of the one from Family 6, this happened 142 times which suggests that, in spite of similar hit rates, there is a difference in suitability between these two pictograms.

Table 8

	Families							mean
	Family 1	Family 2	Family 3	Family 4	Family 5	Family 6	Family 7	
Vid / Telephone	98	338	368	102	425	542	72	277,9
Camera on / off	140	255	125	63	256	142	105	155,1
Microphone	149	325	120	40	260	325	58	182,4
Selfview	464	489	167	148	367	330	154	302,7
Still Picture	286	380	200	209	279	119	128	228,7
Document camera	134	158	190	40	45	59	31	93,9
Handsfree	270	482	188	48	223	185	49	206,4
Mean	220,1	346,7	194,0	92,9	265,0	243,1	85,3	206,7

These and further statistics are summarized for each family in tables C.1 to C.7 of Annex C. The tables include columns for the above presented parameters (Hits and False Alarms) as well as others which are discussed in the next items.

Misses

A miss is an instance where, in the context of a particular referent, a different, non-corresponding pictogram was selected. For example in table B.2, we find that 481 respondents correctly selected the CAMERA ON / OFF in the context of the CAMERA ON / OFF referent. However, nine subjects selected the VIDEOPHONE / TELEPHONE pictogram instead, ten the MICROPHONE ON / OFF pictogram, 68 the SELFVIEW pictogram, etc. In total, there are 196 instances of a miss in the context of the CAMERA ON / OFF pictogram of Family 1. Table 9 lists the number of misses across pictograms and across families. Since hits plus misses plus missing values add up to 687 respondents, the misses are statistically redundant and are presented in the tables of Annex C as a percentage figure for the total number of respondents (n = 687).

Table 9

	Families							mean
	Family 1	Family 2	Family 3	Family 4	Family 5	Family 6	Family 7	
Videophone/Telephone	85	453	338	94	431	442	36	268,43
Camera on / off	196	223	136	84	453	61	177	190,00
Microphone	323	252	215	19	267	209	30	187,86
Selfview	209	442	264	204	345	312	62	262,57
Still Picture	440	501	193	90	169	368	169	275,71
Document camera	73	237	50	30	19	22	15	63,71
Handsfree	220	319	162	129	171	288	108	199,57
Mean	220,86	346,71	194,00	92,86	265,00	243,14	85,29	206,84

Selectivity

The selectivity parameter is the ratio of the hit rate percentage and the false alarm rate percentage. In the above example of the CAMERA ON / OFF pictogram of Families 4 and 6, the selectivity index for the Family 4 pictogram is 9,56 (hit rate 602 / false alarm rate 63), and for Family 6 it is 4,37 (hit rate = 621 / false alarm rate 142). The selectivity parameter is a very suitable parameter for the comparison at the pictogram level. Table 10 presents the selectivity values across pictograms and across Families.

Table 10

	Families							mean
	Family 1	Family 2	Family 3	Family 4	Family 5	Family 6	Family 7	
Videophone/Telephone	6,14	0,64	0,88	5,78	0,55	0,42	8,99	3,34
Camera on / off	3,44	1,79	4,36	9,56	0,84	4,37	4,81	4,17
Microphone	2,31	1,28	3,79	16,63	1,54	1,41	11,21	5,45
Selfview	1,00	0,49	2,38	3,24	0,91	1,12	4,02	1,88
Still Picture	0,83	0,47	2,38	2,83	1,84	2,55	3,90	2,11
Document camera	4,53	2,78	3,32	16,38	14,80	11,17	21,65	10,66
Handsfree	1,68	0,72	2,67	11,35	2,25	2,13	11,39	4,60
Mean	2,07	0,94	2,45	6,35	1,54	1,78	6,95	3,15

n Missing values

Table 11 presents for each pictogram the number of missing values, i.e. no response or instances where ambiguous ratings (e.g. two selections) were made. The number of missing values is another important indicator of the quality of a pictogram since it indicates the situations in which a respondent did not know the answer, or, in an actual usage situation, the respondent would not have known which control to use in order to bring about the desired effect. The parameters of the three remaining columns of tables C.1 to C.7 of Annex C are introduced in subclauses 7.2.2 and 7.3.

Table 11

	Families							mean
	Family 1	Family 2	Family 3	Family 4	Family 5	Family 6	Family 7	
Videophone/Telephone	5	19	24	3	24	15	4	13,43
Camera on / off	10	8	6	1	18	5	5	7,57
Microphone	20	20	17	3	19	20	7	15,14
Selfview	14	5	25	3	7	5	6	9,29
Still Picture	9	6	18	6	6	16	19	11,43
Document camera	7	11	7	2	2	6	1	5,14
Handsfree	14	23	23	13	15	5	21	16,29
Mean	11,29	13,14	17,14	4,43	13,00	10,29	9,00	11,18

7.2.2 Task 1: Subjective certainty and representativeness

In addition to marking the pictogram that corresponds to the referent in question, the respondent was asked to answer the questions "How certain are you of your choice?" (Subjective certainty, rating scales ranging from VERY UNCERTAIN (1) to VERY CERTAIN (5)) and "How well do you personally think does the pictogram represent REFERENT?" (representativeness, rating scale ranging from VERY BADLY (1) to VERY WELL (5)). Table 12 presents the mean certainty ratings across pictograms and families (complete sample, n = 687).

Table 12

Family	Pictogram							mean
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree	
Family 1	3,8	3,5	3,2	3,2	3,1	4,1	3,5	3,5
Family 2	2,8	3,2	3,2	3,3	3,7	3,8	3,0	3,3
Family 3	2,9	3,9	3,3	3,1	3,0	4,3	3,5	3,4
Family 4	4,2	4,2	4,5	4,0	3,9	4,5	3,8	4,2
Family 5	2,7	2,6	3,0	3,4	3,5	4,4	3,7	3,3
Family 6	2,8	4,1	3,4	3,2	2,9	4,4	4,0	3,5
Family 7	4,6	4,0	4,5	4,3	3,8	4,7	3,9	4,3
mean	3,4	3,6	3,6	3,5	3,4	4,3	3,6	3,6
n Missing	92	62	93	64	85	43	114	-

Table 13 presents the mean representativeness ratings across pictograms and families (complete sample, n = 687),

Table 13

Family	Pictogram							mean
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree	
Family 1	3,3	2,9	2,8	2,7	2,6	3,3	2,9	2,9
Family 2	2,3	2,7	2,6	2,8	3,2	3,1	2,4	2,7
Family 3	2,4	3,4	2,8	2,4	2,3	3,8	3,0	2,9
Family 4	3,9	3,9	4,2	3,5	3,4	4,2	3,3	3,8
Family 5	2,2	2,0	2,3	3,1	3,1	3,9	3,2	2,8
Family 6	2,3	3,7	2,8	2,5	2,0	3,7	3,6	2,9
Family 7	4,4	3,5	4,0	3,9	3,1	4,3	3,4	3,8
mean	3,0	3,2	3,1	3,0	2,8	3,8	3,1	3,1
n Missing	88	53	93	56	75	32	107	-

7.3 Part 2: Test of pictogram preference

This subclause reports the results for the second task, namely to indicate which of the seven candidate pictograms for each referent best represents the referent function (Pictogram Preference). Table 14 gives the percentages based on the *n* of respondents of 687. The means for the families are presented in table 16 of subclause 8.1.

Table 14

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Family 1	8,3	7,3	4,1	4,4	4,1	3,1	33,7
Family 2	0,3	5,7	5,4	5,4	7,9	0,3	13,0
Family 3		24,5	1,3	0,6	5,6	9,7	14,4
Family 4	14,9	24,8	49,3	18,5	32,0	33,9	7,7
Family 5	1,9	2,5	4,8	16,4	25,0	20,7	14,9
Family 6	0,1	16,4	8,2	2,6	2,8	8,5	4,9
Family 7	74,4	18,8	26,8	52,1	22,7	23,9	11,3
Missing	0,6	0,3	0,6	0,7	0,4	0,7	5,1

7.4 Task 3: Overall family preference

Table 15 gives the results for the third Task, i.e. to name the family which is personally preferred.

Table 15

Family	Frequency	%	Valid %
Family 1	27	3,9	4,0
Family 2	10	1,5	1,5
Family 3	16	2,3	2,4
Family 4	245	35,7	36,2
Family 5	36	5,2	5,3
Family 6	3	0,4	0,4
Family 7	339	49,3	50,1
Missing	11	1,6	Missing

In the graph shown in figure 3, the values the families received in Task 3 are presented in their rank order.

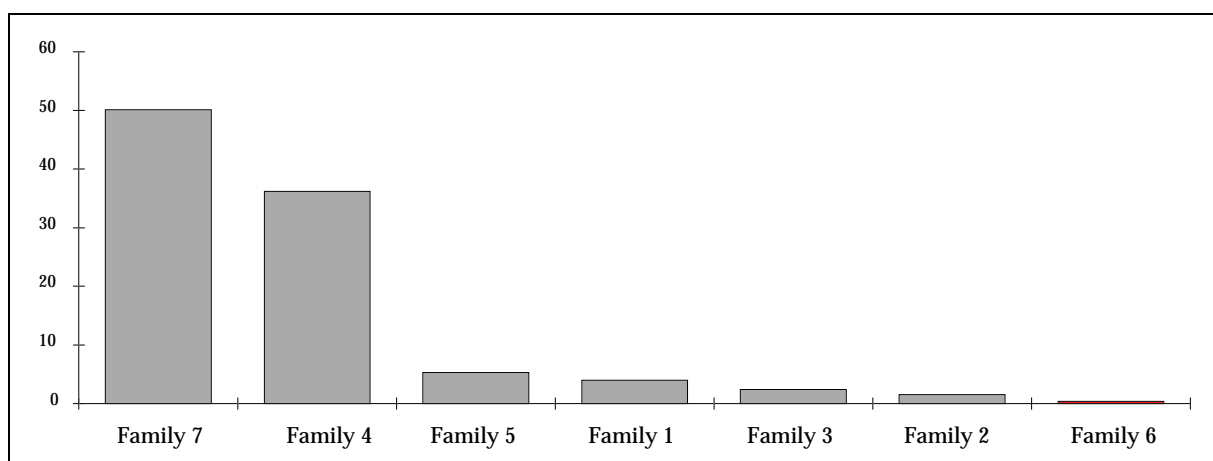


Figure 3

Again, as in the case of the results of Tasks 1 and 2, Families 4 and 7 received far better results than any of the remaining families.

8 Discussion of the results

8.1 Results on the level of the pictogram Family

Looking at the results on the pictogram family level, two Families have consistently received above average results according to all parameters. Table 16 summarizes for all families the results presented in Clause 7.

Table 16

Pictogram Family	Parameter							
	Mean % Hits	mean n False Alarms	mean selectivity	Mean n Miss. values	Mean Certainty	Mean Represent.	Mean pictogr. Preference %	Family Preference
Family 1	67,4	220,1	2,07	11,29	3,5	2,9	9,29	4,0
Family 2	48,6	346,7	0,94	13,14	3,3	2,7	5,43	1,5
Family 3	70,9	194,0	2,45	17,14	3,4	2,9	9,35	2,4
Family 4	86,4	92,9	6,35	4,43	4,2	3,8	25,87	36,2
Family 5	60,5	265,0	1,54	13,00	3,3	2,8	12,31	5,3
Family 6	64,0	243,1	1,78	10,29	3,5	2,9	6,21	0,4
Family 7	87,4	85,3	6,95	9,00	4,3	3,8	32,86	50,1
Mean	69,3	206,7	3,15	11,18	3,6	3,1	14,62	14,27

As regards the Test of Associativeness, both Families 4 and 7 received about similar results with the results of Family 7 being more favourable as concerns the Hit rate and the number of False Alarms and with Family 4 being more successful in terms of the mean number of Missing values. There is no significant difference between both families in terms of the Subjective certainty and Representativeness scores.

Tasks 2 (Test of Pictogram Preference) and Tasks 3 (Test of Family Preference) are subjective ratings of the pictograms' aesthetic qualities that, as was pointed out in subclause 4.2, are used to verify that the pictogram sets fulfil not only the associativeness criteria but also aesthetic criteria. Here is where we find the main differences between the two families: Family 7 received far better results than Family 4 both on the level of mean Pictogram Preference as well as on the level of Family Preference. This means that both Families are equally suited to be used as pictograms on videotelephony devices in terms of their associativeness, the ones of Family 7, however, are preferred by the respondents.

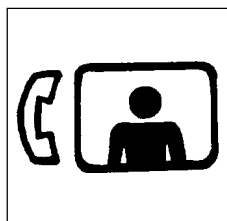
Before a conclusion is drawn, the parameters for the pictograms of these two Families is discussed.

8.2 Results on the level of individual pictograms

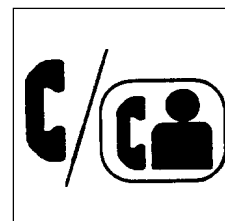
In the following, the more successful candidates are compared with regards of the results they achieved.

Pictogram 1: Videophone / Telephone

Family 4



Family 7

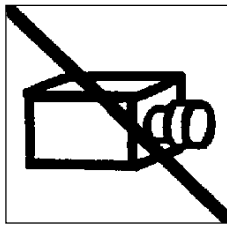


Family	Parameter						pictogram Preference %
	% Hits	n False Alarms	selectivity	n Miss. values	Certainty	Represent.	
Family 4	86,3	102	5,78	3	4,2	3,9	14,9
Family 7	94,7	72	8,99	4	4,6	4,4	74,4

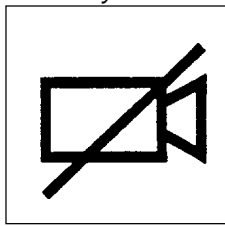
The Family 7 candidate achieved the better results in terms of all parameters except for the number of missing values. In addition to its better results in the Test of Pictogram Preference, its lower False Alarm rate suggests that it is the better suited pictogram.

Pictogram 2: Camera On / Off

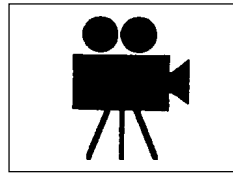
Family 4



Family 6



Family 7



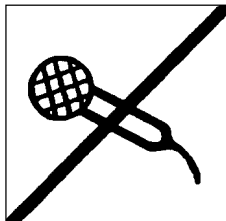
Family	Parameter						pictogram Preference %
	% Hits	n False Alarms	selectivity	n Miss. values	Certainty	Represent.	
Family 4	87,8	63	9,56	1	4,2	3,9	24,8
Family 6	91,1	142	4,37	5	4,1	3,7	16,4
Family 7	74,0	105	4,81	5	4,0	3,5	18,8

The Pictogram for Camera on / off needs to be seen in the context of the one for the Document Camera function, since in the three Families to be considered here, different representations of cameras were used. This means that in a mixed Family, the camera representations should not be mixed and the proposals for Camera on / off and Document Camera from one family only should be used. The Family 6 candidate for the Camera on / off function was more successful in the Test of Associativeness than the two candidates discussed so far. It did, however, receive slightly more unfavourable results in the Pictogram Preference task.

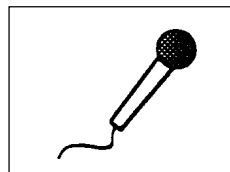
In both instances, the Family 4 proposals were preferred by the subjects (Pictogram Preference) whereas performance was comparable in the case of the Document Camera pictogram and better for Families 4 and 6 in the case of the Camera on / off pictogram.

Pictogram 3: Microphone On / Off

Family 4



Family 7

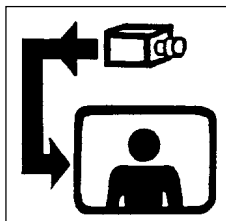


Family	Parameter						pictogram Preference %
	% Hits	n False Alarms	selectivity	n Miss. values	Certainty	Represent.	
Family 4	97,2	40	16,63	3	4,5	4,2	49,3
Family 7	95,6	58	11,21	7	4,5	4,0	26,8

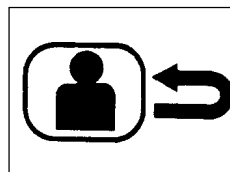
The two candidates depict the same motive. Performance parameters are comparable with a larger number of False Alarms in the case of the Family 7 candidate. As regards Pictogram Preference, the Family 4 candidate was clearly favoured.

Pictogram 4: Selfview

Family 4



Family 7

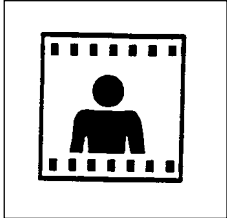


Family	Parameter						pictogram Preference %
	% Hits	n False Alarms	selectivity	n Miss. values	Certainty	Represent.	
Family 4	70,2	148	3,24	3	4,0	3,5	18,5
Family 7	90,9	154	4,02	6	4,3	3,9	52,1

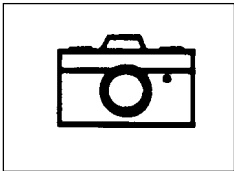
The Family 7 candidate received the better results in every respect except for slightly more False Alarms.

Pictogram 5: Still Picture

Family 4



Family 7

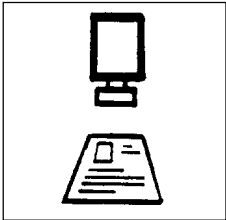


Family	Parameter						pictogram Preference %
	% Hits	n False Alarms	selectivity	n Miss. values	Certainty	Represent.	
Family 4	86,8	209	2,83	6	3,9	3,4	32,0
Family 7	74,7	128	3,90	19	3,8	3,1	22,7

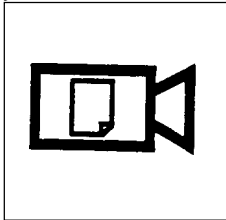
The Family 4 candidate received the better results in every respect except for a larger number of False Alarms.

Pictogram 6: Document Camera

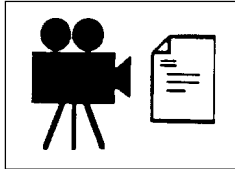
Family 4



Family 6



Family 7

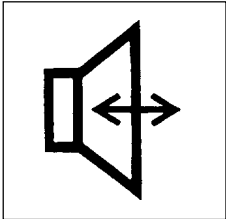


Family	Parameter						pictogram Preference %
	% Hits	n False Alarms	selectivity	n Miss. values	Certainty	Represent.	
Family 4	95,6	40	16,38	2	4,5	4,2	33,9
Family 6	96,8	59	11,17	6	4,4	3,7	8,5
Family 7	97,8	31	21,65	1	4,7	4,3	23,9

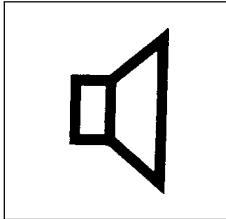
The Family 7 candidate received the better performance and Family 4 the better Preference results. As mentioned above, the candidates for the Document Camera function have to be seen in context of the ones for Camera on / off.

Pictogram 7: Handsfree

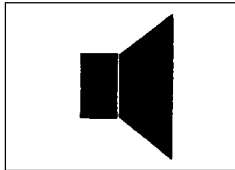
Family 1



Family 4



Family 7



Family	Parameter						pictogram Preference %
	% Hits	n False Alarms	selectivity	n Miss. values	Certainty	Represent.	
Family 1	67,3	270	1,68	220	3,5	2,9	33,7
Family 4	80,9	48	11,35	13	3,8	3,3	7,7
Family 7	83,8	49	11,39	21	3,9	3,4	11,3

As regards the Handsfree pictograms, there was little variation among the proposals. The differences in the results are due to the family context in which they appeared. The Family 1 Handsfree candidate pictogram differs from the other proposals by containing an additional double arrow indicating the two-way nature of the handsfree mode and differentiating it from existing pictograms for "loudspeaker". Secondly, it received the best Pictogram Preference results.

9 The recommendation of pictograms for point-to-point videotelephony

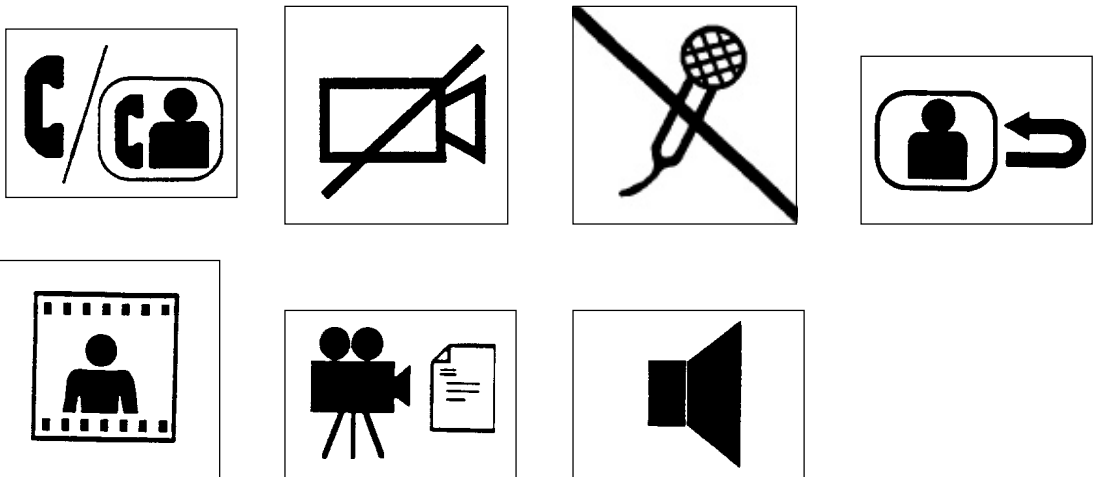
In the light of the above presented results and discussion, three recommendations were discussed. The first one is a recommendation of an entire Family as employed in the test, the two others are recommendations of mixed families.

Recommendation 1

To recommend Family 7 as employed in the study. This recommendation is based on the interpretation of the results in subclause 8.1. The disadvantage of this recommendation lies in the knowledge that this family has two less convincing members (i.e. the Camera on / off and the Document Camera pictograms).

Recommendation 2

To recommend a mixed set of pictograms selected from Families 4, 6 and 7. This recommendation is based on the interpretation of the results in subclause 8.2. In this recommendation, the best candidates for each function based on the Test of Associativeness are recommended. The advantage of this recommendation is that it combines the strongest candidates from the three Families (i.e. Videophone / Telephone, Selfview, Document Camera and Handsfree from Family 7, Camera on / off from Family 6, and Microphone on / off and Still picture from Family 4). Disadvantages of this solution are that the camera design for the Camera on / off and Document Camera functions needs to be harmonised and that a test of the resulting family is required.



Recommendation 3

To recommend a mixed set of pictograms resulting from different families. This recommendation is based on the interpretation of the results in subclause 8.2. For some functions, pictograms should be recommended, for others, design principles in terms of what to present and what to avoid should be given.

Function	Recommendation	What to avoid
1) Videophone / Telephone	To use the pictogram of Family 7	
2) Camera on / off	To use an icon of a camera (like in Families 4, 6 and 7)	
3) Microphone on / off	To use an icon of a hand-held microphone (like in Families 4 and 7)	To avoid the technical symbol for microphone (see results of Families 1,3 and 5).
4) Selfview	To use the pictogram of Family 7.	
5) Still picture	To use a representation of features of a photo camera (like in Families 4 and 7)	To avoid the technical symbol for pause (see the results of Families 1 and 3).
6) Document Camera	To use an icon of a camera and a document (camera icon consistent with Camera on / off icon) like in Families 4, 6 and 7.	
7) Handsfree mode	To use the pictogram of Family 1 to avoid confusion with representations of "Loudspeaker" as e.g. used in loudspeaking mode.	

ETSI TC-HF decided in favour of Recommendation 3 and conducted a small-scale post-test of the usability of the resulting pictogram family.

10 The post-test

10.1 Rationale

The mixed pictogram set had to be re-designed in a unitary fashion (size, form, line thickness, etc.). Secondly, the new pictogram had to be tested on a small sample to verify that it achieves sufficiently good results. In order to be able to employ all three tests of the Multiple Index Approach, the target family from Recommendation 3 was tested in the context of two distracter families.

10.2 Method

The structure of the questionnaire employed in the post-test was identical with the one used in the earlier studies with the main difference being that only three families were being tested which resulted in a much shorter time required for completion.

The three pictogram families consisted of one target family (Family 2) and two distracter families (Families 1 and 3). Target Family 2 was designed according to Recommendation 3 with a consistent design of the camera symbol and the standard loudspeaker symbol for the Handsfree-function. Distracter Family 1 was based on Family 7 of the main study and Distracter Family 3 was based on Family 4, both with minor alterations. Family 3 included an IEC symbol for Picture Freeze (417-IEC-5467 [3]). In order to ensure that the pictograms to be recommended can also be recognisable when printed on small keys, all post-test pictograms were printed at a size of 1,2 cm (as opposed to 3 cm as in the pre-test and the main study). All three Families are reproduced in Annex E.

62 respondents (48,4 % men and 51,6 % women) completed the questionnaire. 30 were from a Madrid sample and 32 from Berlin. Their average age was 28,4 years (range 17 to 67). 55,6 % were being trained (students, apprentices), 13,0 % of the respondents work in jobs that can be classified as "technical", and 31,5 % as "non-technical". 93,5 % of the respondents had absolutely no experience with videophones. Most respondents expressed a moderately positive attitude towards technology.

10.3 Results

10.3.1 The results for Task 1 (Test of Associativeness)

10.3.2 Pictogram selection

In Task 1, one referent (i.e. videophone function, e.g. CAMERA ON / OFF) is presented together with all the pictograms of the Family to be tested in random order. The task is to mark (circle, cross out) the pictogram that represents the referent.

Annex F (tables F.1 to F.6) summarizes the results for Task 1 for all three families. The column headings represent the referents (i.e. the functions mentioned in the task), and the row headings represent the pictograms actually selected. The boxes printed with a bold frame contain correct selections. For example, when asked for the MICROPHONE ON / OFF pictogram of Family 1, 39 out of the 62 respondents (= 63,9 %) correctly selected the MICROPHONE ON / OFF pictogram. 12 respondents selected the HANDSFREE pictogram and 10 selected the CAMERA ON / OFF pictogram (see Annex F tables F.1 and F.2).

Table 17 presents the percentage of hits (i.e. correct selections across referents and families).

Table 17

	Family 1	Family 2	Family 3	mean
Vid / Telephone	58,1	64,5	65,6	62,7
Camera on / off	48,4	63,9	65,6	59,3
Microphone	63,9	64,5	67,7	65,4
Selfview	50,0	55,7	66,1	57,3
Still Picture	67,2	60,7	56,7	61,5
Document camera	67,7	70,0	67,7	68,5
Handsfree	59,3	68,3	60,0	62,5
Mean	59,2	63,9	64,2	62,5

With an overall mean of 62,5, the post-test candidates did slightly worse compared with the results of the pre-test and the main evaluation study. No pictogram received a lower hit rate than 48,4 %, but it also needs to be noted that no pictogram received a higher hit rate than 68,3 which is much lower than the results of the more successful candidates from the main study. This result will be discussed in subclause 10.4.

The last column of table 17 shows that the proposed sets contained equally successful candidates for the seven referents (range of means 57,3 for Selfview to 68,5 for Document camera). The bottom line of table 17 shows the mean hit rate across the seven pictogram families. On average, Families 2 and 3 received higher average scores than Family 1.

False alarms

Table 18 presents the number of False alarms for each pictogram. A False alarm is an instance of the selection of a pictogram in the context of a different referent. For example, for Family 2 table F.4 of Annex F shows that 40 respondents correctly selected the VIDEOPHONE / TELEPHONE pictogram in the context of the VIDEOPHONE / TELEPHONE referent. However, the same VIDEOPHONE / TELEPHONE pictogram was also selected by 11 respondents in the context of the CAMERA ON / OFF referent, by 10 respondents in the context of the MICROPHONE ON / OFF referent and by 10 respondents in the context of the DOCUMENT CAMERA referent. In total, there were 34 instances of False alarms for the VIDEOPHONE / TELEPHONE pictogram of Family 2.

The False alarms parameter is particularly important because next to the hit rate, it is a second, equally meaningful indicator of the suitability of a pictogram. The following example illustrates this point. The hit rate for the VIDEOPHONE / TELEPHONE pictograms in Families 2 and 3 was fairly similar (64,5 % and 65,6 %). For Family 2, the VIDEOPHONE / TELEPHONE pictogram was also selected in 34 cases in the context of other referents, in the case of the one from Family 3, this happened 19 times which suggests that in spite of similar hit rates, there is a difference in suitability between these two pictograms.

Table 18

	Families							mean
	Vid / Tel.	Camera on / off	Microph. on / off	Selfview	Still pic.	Doc. camera	Handsfree	
Family 1	29	23	28	16	39	16	24	25,0
Family 2	34	1	12	25	18	25	39	22,0
Family 3	19	19	33	20	14	22	27	22,0
Mean	27,3	14,3	24,3	20,3	23,7	21,0	30,0	23,0

These and further statistics are summarized for each Family in Annex G, tables G.1 to G.3. The tables include columns for the above presented parameters (Hits and False alarms) as well as others which are discussed below.

n Missing values

Table 19 presents the number of Missing values for each pictogram, i.e. no response or instances where ambiguous ratings (e.g. two selections) were made. The number of Missing values is another important indicator of the quality of a pictogram since it indicates the situations in which a respondent did not know the answer or, in an actual usage situation, the respondent would not have known which control to use in order to bring about the desired effect.

Table 19

	Families							mean
	Vid / Tel.	Camera on / off	Microph. on / off	Selfview	Still pic.	Doc. camera	Handsfree	
Family 1	0	0	1	0	1	0	3	0,7
Family 2	0	1	0	1	1	2	2	1,0
Family 3	1	1	0	0	2	0	2	0,9
Mean	0,3	0,7	0,3	0,3	1,3	0,7	2,3	0,9

The parameters of the three remaining columns of tables G.1 to G.3 of Annex G are introduced in the following subclauses.

10.3.3 Subjective Certainty and Representativeness

In addition to marking the pictogram that corresponds to the referent in question, the respondents were asked to answer the questions "How certain are you of your choice?" (Subjective Certainty, rating scales ranging from VERY UNCERTAIN (1) to VERY CERTAIN (5)) and "How well do you personally think does the pictogram represents REFERENT?" (Representativeness, rating scale ranging from VERY BADLY (1) to VERY WELL (5)). Table 20 presents the mean certainty ratings across pictograms and families (n = 62).

Table 20

Family	Pictogram							mean
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree	
Family 1	4,2	3,9	4,3	3,8	3,6	4,6	3,4	4,0
Family 2	4,4	4,4	4,5	4,2	4,0	4,4	3,8	4,2
Family 3	4,2	4,3	4,5	3,9	3,2	4,4	3,8	4,0
mean	4,3	4,2	4,4	4,0	3,6	4,5	3,7	4,1
n Missing	1	2	0	0	4	2	7	2,3

Table 21 presents the mean representativeness ratings across pictograms and families (n = 62).

Table 21

Family	Pictogram							mean
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree	
Family 1	3,9	3,7	4,1	3,4	3,0	4,2	3,0	3,5
Family 2	4,2	3,9	4,0	3,7	3,5	3,8	3,1	3,7
Family 3	3,6	3,7	4,2	3,2	2,5	3,5	3,2	3,4
mean	3,9	3,8	4,1	3,4	3,0	3,8	3,1	3,5
n Missing	2	2	0	0	4	2	7	2,4

10.3.4 Part 2: Test of Pictogram preference

This subclause reports the results for the second task, namely to indicate which of the three candidate pictograms for each referent best represents the referent function (Pictogram preference). Table 22 gives the percentages based on the *n* of respondents of 62. The means for the Families are presented in table 24.

Table 22

Pictogram selected	Function						mean
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	
Family 1	21,0	35,5	49,2	48,3	47,5	40,3	40,3
Family 2	59,7	46,8	18,0	25,0	45,9	37,1	38,8
Family 3	19,4	17,7	32,8	26,7	6,6	22,6	21,0
Missing	0	0	1	2	1	0	0,7

10.3.5 Task 3: Overall Family preference

Table 23 gives the results for the third Task, i.e. to name the family which is personally preferred:

Table 23

Family	Frequency	%	Valid %
Family 1	31	50,0	50,0
Family 2	19	30,6	30,6
Family 3	12	19,4	19,4
Missing	0	0	Missing

In this task, Family 1 received 50 % better results than the competing families.

10.4 Discussion of the results

Looking at the results on the pictogram family level, two families have consistently received above average results according to all parameters. Table 24 summarizes the results presented in subclause 10.3 for the three Families.

Table 24

Pictogram Family	Parameter						Family Preference
	Mean % Hits	mean <i>n</i> False Alarms	Mean <i>n</i> Miss. values	Mean Certainty	Mean Represent.	Mean Pict. Preference %	
Family 1	59,2	25,0	1,1	4,0	3,5	40,3	50,0
Family 2	63,9	22,0	1,6	4,2	3,7	38,8	30,6
Family 3	64,2	22,0	1,4	4,0	3,4	21,0	19,4
Mean	62,4	23,0	1,4	4,1	3,5	33,4	33,3

As regards the Test of Associativeness, both Families 2 and 3 received nearly similar results with regards to most parameters. While Family 3 received a slightly better Hit rate, the Missing values, Certainty and Representativeness rates, favour Family 2. Compared to the results of the main evaluation study, the associativeness results for the three families are lower than the ones obtained for the more successful families in the main study. We assume that the difference in the size of the pictogram representation is responsible for this finding: in the main study, the size of the pictograms was 3 cm. In order to make sure that the target pictogram set would also be recognised if printed on small keys, in the post-test the pictograms were printed at a width of 1,2 cm only. Details were therefore harder to recognise which in turn explains the somewhat less favourable results of the post-test sets.

Tasks 2 (Test of Pictogram Preference) and Tasks 3 (Test of Family Preference) are subjective ratings of the pictograms' aesthetic qualities that are used to verify that the pictogram sets fulfil not only the associativeness criteria but also aesthetic criteria. Here is where we find the main differences between the two families: Family 2 received far better results than Family 3 both on the level of mean Pictogram Preference as well as on the level of Family Preference. This means that both Families are equally suited to be used as pictograms on videotelephony devices in terms of their associativeness, the ones of Family 2, however, are preferred by the respondents.

Based on the analysis of the above mentioned results, Family 2, the target family of the post-test, is recommended without further alterations.

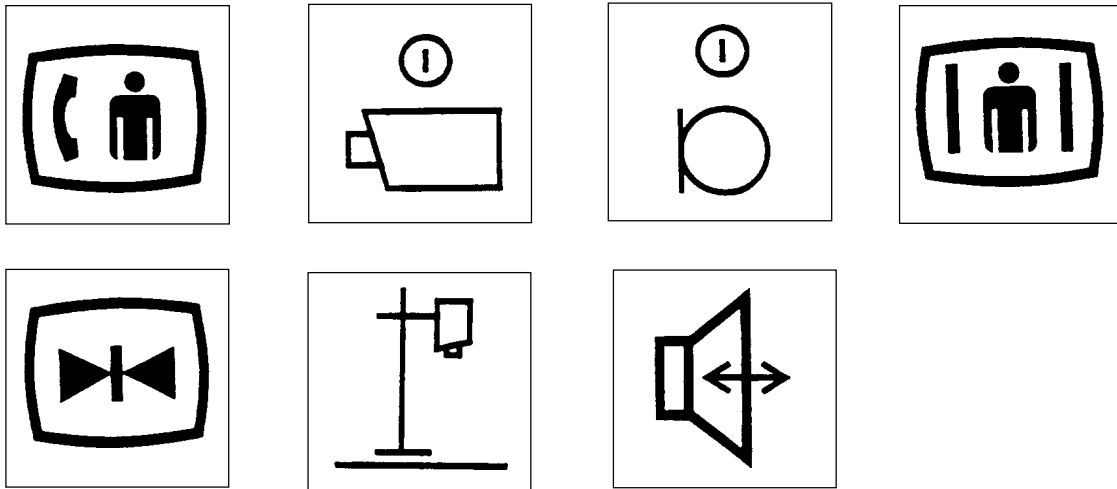
10.5 Confirmation of the Multiple Index Approach

This study confirmed the suitability of the Multiple Index Approach for the empirical evaluation of pictograms. Taking into account both performance (associativeness, and certainty) and aesthetic aspects (representativeness, pictogram and family preference), the method supplied the information that formed a sound basis for judging the suitability of the proposed pictogram sets.

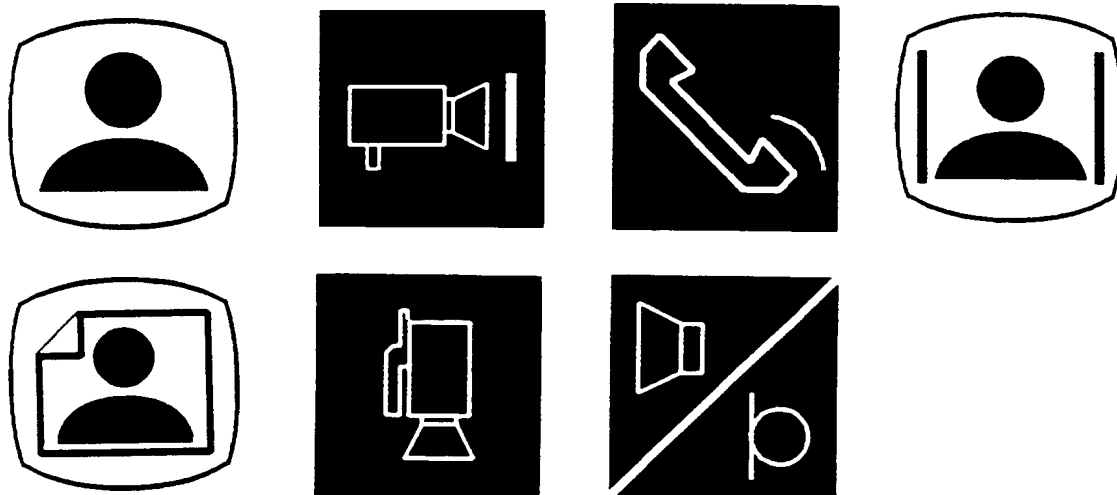
Future revisions of this ETR should include additional requirements of People with Special Needs (PSN) and, in particular, of prelingually deaf and mentally retarded people. In other contexts, other PSN groups may have to be considered.

Annex A (informative): The seven pictogram families tested in the main study

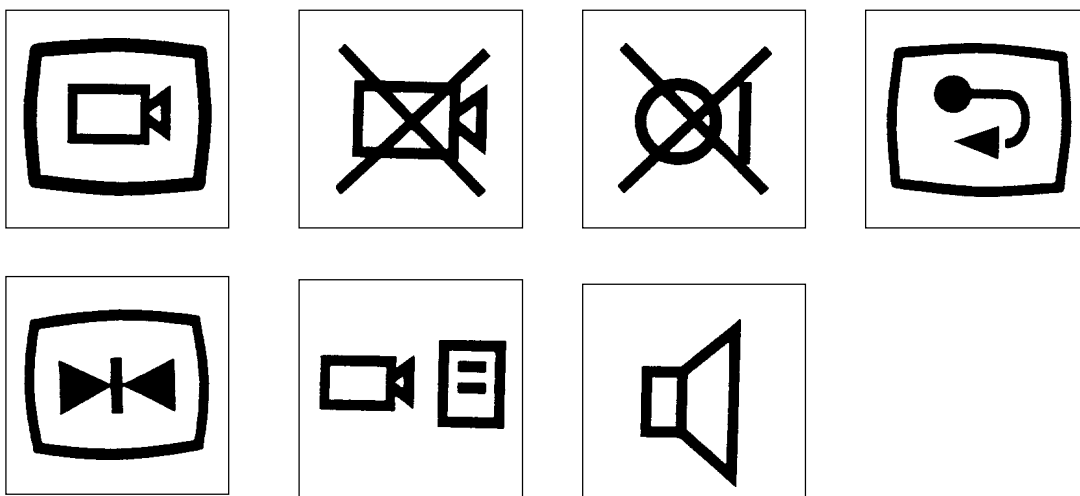
Family 1



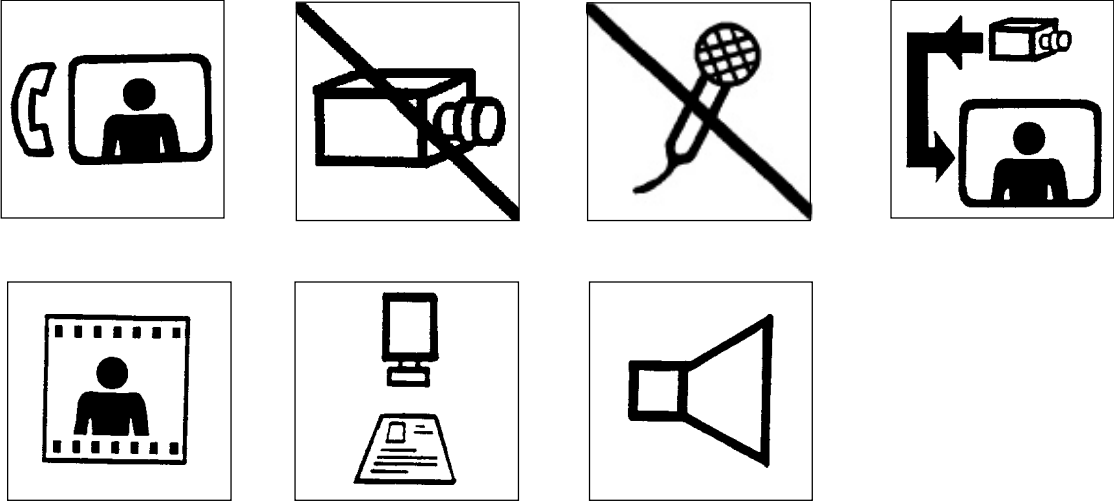
Family 2



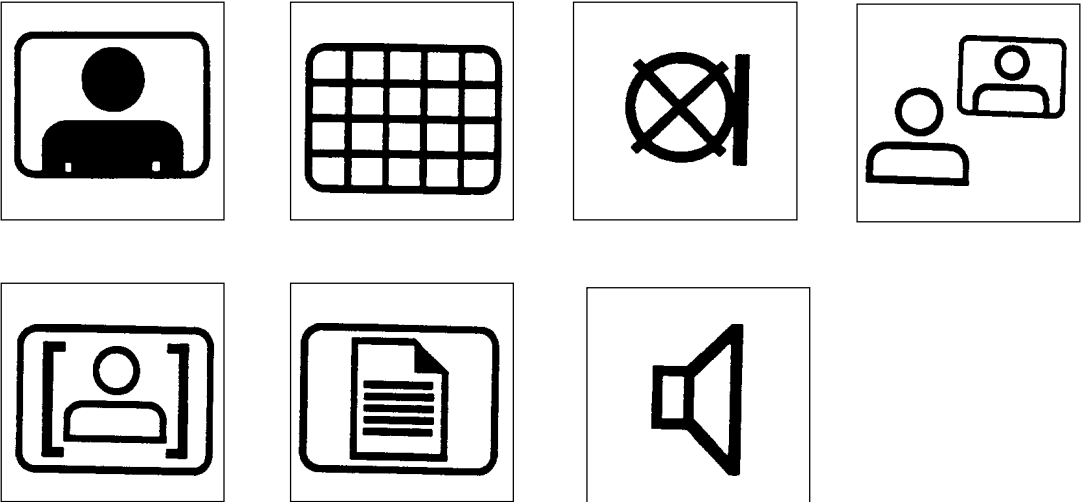
Family 3



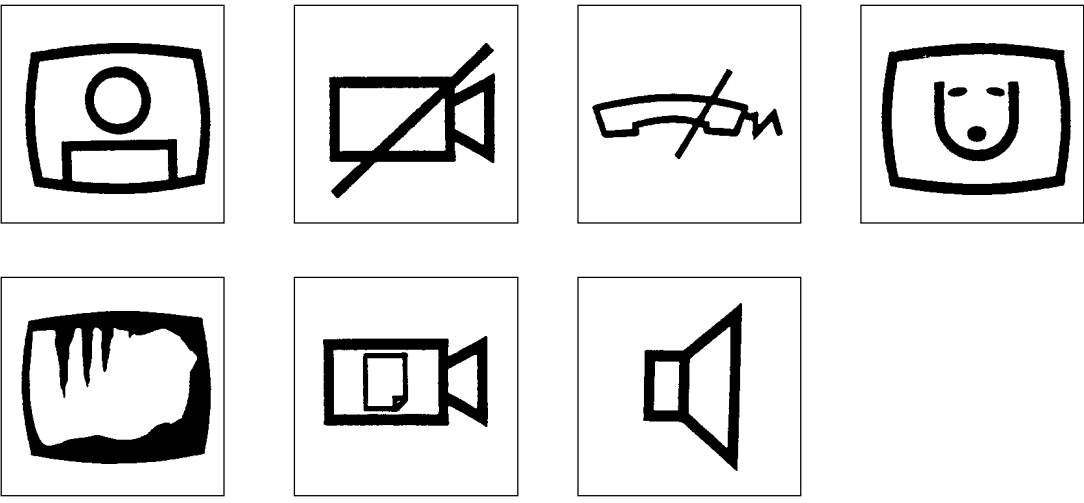
Family 4



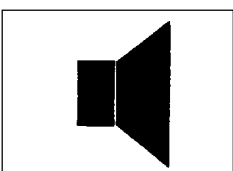
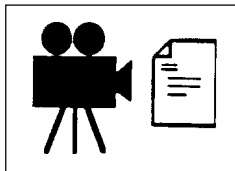
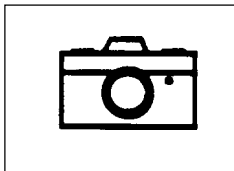
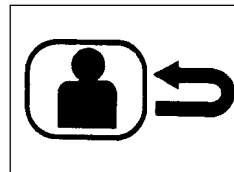
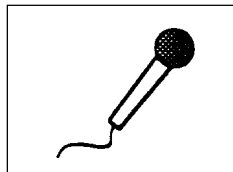
Family 5



Family 6



Family 7



Annex B (informative): Results of the total sample (n = 687)

Task 1: Selection Matrices

Table B.1: Selection Matrix Family 1 (Total Sample, n = 687) in %

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	88,3	1,3	1,6	2,1	0,4	0,6	8,5
Camera	5,4	71,0	0,4	4,8	3,4	5,6	1,0
Microph.	1,8	1,5	51,6	1,8	5,8	1,8	9,5
Selfview	2,2	10,0	3,0	68,9	49,9	0,4	3,0
Still Pic.	0,7	7,2	10,9	12,6	35,1	1,5	9,5
Doc. cam.	0,3	4,1	1,3	8,6	4,3	89,3	1,2
Handsfree	1,3	4,7	31,0	1,2	1,2	0,9	67,3
Missing	0,7	1,5	2,9	2,0	1,3	1,0	2,0

Table B.2: Selection Matrix Family 1 (Total Sample, n = 687) in n

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	602	9	11	14	3	4	57
Camera	37	481	3	32	23	38	7
Microph.	12	10	344	12	39	12	64
Selfview	15	68	20	464	338	3	20
Still Pic.	5	49	73	85	238	10	64
Doc. cam.	2	28	9	58	29	607	8
Handsfree	9	32	207	8	8	6	453
Missing	5	10	20	14	9	7	14

Table B.3: Selection Matrix Family 2 (Total Sample, n = 687) in %

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	32,2	6,0	1,2	32,7	5,4	0,4	3,9
Camera	10,0	67,2	1,0	3,1	2,9	18,0	2,7
Microph.	11,5	1,3	62,2	0,4	0,1	0,3	35,1
Selfview	3,4	2,8	0,9	35,2	62,8	0,1	1,8
Still Pic.	4,6	6,9	1,2	25,7	26,4	15,8	1,8
Doc. cam.	4,8	11,2	0,9	2,5	1,3	64,9	2,7
Handsfree	33,4	4,6	32,5	0,4	0,9	0,3	52,0
Missing	2,8	1,2	2,9	0,7	0,9	1,6	3,3

Table B.4: Selection Matrix Family 2 (Total Sample, n = 687) in n

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	215	41	8	223	37	3	26
Camera	67	456	7	21	20	122	18
Microph.	77	9	415	3	1	2	233
Selfview	23	19	6	240	428	1	12
Still Pic.	31	47	8	175	180	107	12
Doc. cam.	32	76	6	17	9	439	18
Handsfree	223	31	217	3	6	2	345
Missing	19	8	20	5	6	11	23

Table B.5: Selection Matrix Family 3 (Total Sample, n = 687) in %

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	49,0	11,3	0,7	22,7	15,1	3,8	1,4
Camera	15,4	80,0	0,7	0,8	1,2	0,4	0,3
Microph.	3,0	0,7	67,9	1,2	1,8	0,6	10,7
Selfview	9,4	1,8	3,6	60,1	4,3	0,7	5,3
Still Pic.	7,4	2,3	5,7	7,9	71,2	1,2	5,6
Doc. cam.	12,2	3,2	1,0	5,6	5,2	92,6	1,2
Handsfree	3,6	0,6	20,3	1,8	1,2	0,6	75,6
Missing	3,5	0,9	2,5	3,6	2,6	1,0	3,3

Table B.6: Selection Matrix Family 3 (Total Sample, n = 687) in n

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	325	77	5	150	101	26	9
Camera	102	545	5	5	8	3	2
Microph.	20	5	455	8	12	4	71
Selfview	62	12	24	398	29	5	35
Still Pic.	49	16	38	52	476	8	37
Doc. cam.	81	22	7	37	35	630	8
Handsfree	24	4	136	12	8	4	502
Missing	24	6	17	25	18	7	23

Table B.7: Selection Matrix Family 4 (Total Sample, n = 687) in %

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	86,3	0,7		1,9	1,2		11,3
Camera	6,1	87,8	0,1	0,4	1,3	1,0	0,1
Microph.		0,3	97,2			0,1	5,5
Selfview	4,4	8,6	0,1	70,2	5,7	1,5	1,3
Still Pic.	1,8	2,3	0,3	25,3	86,8	0,7	0,1
Doc. cam.	0,6	0,1	0,1	2,0	2,2	95,6	0,7
Handsfree	0,9	0,1	2,0	0,1	2,8	1,0	80,9
Missing	0,4	0,1	0,4	0,4	0,9	0,3	1,9

Table B.8: Selection Matrix Family 4 (Total Sample, n = 687) in n

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	590	5		13	8		76
Camera	42	602	1	3	9	7	1
Microph.		2	665			1	37
Selfview	30	59	1	480	39	10	9
Still Pic.	12	16	2	173	591	5	1
Doc. cam.	4	1	1	14	15	655	5
Handsfree	6	1	14	1	19	7	545
Missing	3	1	3	3	6	2	13

Table B.9: Selection Matrix Family 5 (Total Sample, n = 687) in %

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	35,0	16,3	0,7	29,7	12,9		3,1
Camera	11,5	32,3	10,2	1,0	7,0	0,7	7,7
Microph.	6,8	22,7	60,0	0,1	1,0	0,3	7,9
Selfview	37,3	10,6	0,7	49,3	2,3	0,6	3,6
Still Pic.	6,2	11,5	2,8	18,2	75,2	0,3	2,4
Doc. cam.	0,6	0,4	1,9	1,6	1,3	97,2	0,7
Handsfree	2,7	6,1	23,5		0,1	0,9	74,6
Missing	3,5	2,6	2,8	1,0	0,9	0,3	2,2

Table B.10: Selection Matrix Family 5 (Total Sample, n = 687) in n

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	232	109	5	202	88		21
Camera	76	216	68	7	48	5	52
Microph.	45	152	401	1	7	2	53
Selfview	247	71	5	335	16	4	24
Still Pic.	41	77	19	124	512	2	16
Doc. cam.	4	3	13	11	9	666	5
Handsfree	18	41	157		1	6	501
Missing	24	18	19	7	6	2	15

Table B.11: Selection Matrix Family 6 (Total Sample, n = 687) in %

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	34,2	2,3	1,0	40,6	33,8	0,6	1,6
Camera	19,2	91,1	0,9	0,1	0,3	0,3	0,3
Microph.	11,3		68,7	0,1		0,1	36,2
Selfview	23,7	2,5	2,4	54,3	18,3	0,6	1,6
Still Pic.	7,0	1,2	2,4	3,4	45,2	1,3	2,3
Doc. cam.	2,8	2,2	0,3	1,3	1,9	96,8	0,1
Handsfree	1,8	0,7	24,3	0,1	0,4	0,3	57,8
Missing	2,2	0,7	2,9	0,7	2,3	0,9	0,7

Table B.12: Selection Matrix Family 6 (Total Sample, n = 687) in n

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	230	16	7	277	227	4	11
Camera	129	621	6	1	2	2	2
Microph.	76		458	1		1	247
Selfview	159	17	16	370	123	4	11
Still Pic.	47	8	16	23	303	9	16
Doc. cam.	19	15	2	9	13	659	1
Handsfree	12	5	162	1	3	2	394
Missing	15	5	20	5	16	6	5

Table B.13: Selection Matrix Family 7 (Total Sample, n = 687) in %

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	94,7	3,1	0,4	1,3	1,0	0,3	4,5
Camera	3,4	74,0	0,1	1,6	8,5	0,3	1,7
Microph.	0,3	0,7	95,6	0,1		0,3	7,2
Selfview	1,0	6,7	0,3	90,9	12,4	0,7	1,7
Still Pic.		13,2	0,1	3,8	74,7	0,4	1,2
Doc. cam.		0,7	0,1	1,9	1,8	97,8	
Handsfree	0,6	1,5	3,2	0,3	1,5	0,1	83,8
Missing	0,6	0,7	1,0	0,9	2,8	0,1	3,1

Table B.14: Selection Matrix Family 7 (Total Sample, n = 687) in n

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	647	21	3	9	7	2	30
Camera	23	505	1	11	57	2	11
Microph.	2	5	650	1		2	48
Selfview	7	46	2	619	83	5	11
Still Pic.		90	1	26	499	3	8
Doc. cam.		5	1	13	12	671	
Handsfree	4	10	22	2	10	1	558
Missing	4	5	7	6	19	1	21

Annex C (informative): Tables with the results of the main study (summary)

Table C.1: Family 1

Pictogram	Parameter							Preference %
	% Hits	n False alarms	% Misses ⁴⁾	Selectivity	% Miss. values	Certainty	Represent	
Vid / Tel.	88,3	98	11,7	6,14	0,7	3,8	3,3	8,3
Camera	71,0	140	29,0	3,44	1,5	3,5	2,9	7,3
Microph.	51,6	149	48,4	2,31	2,9	3,2	2,8	4,1
Selfview	68,9	464	31,1	1,00	2,0	3,2	2,7	4,4
Still Pic.	35,1	286	64,9	0,83	1,3	3,1	2,6	4,1
Doc. cam.	89,3	134	10,7	4,53	1,0	4,1	3,3	3,1
Handsfree	67,3	270	32,7	1,68	2,0	3,5	2,9	33,7
Mean	67,4	220,1	32,6	2,07	1,6	3,5	2,9	9,3

Table C.2: Family 2

Pictogram	Parameter							Preference %
	% Hits	n False alarms	% Misses	Selectivity	% Miss. values	Certainty	Represent	
Vid / Tel.	32,2	338	67,8	0,64	2,8	2,8	2,3	0,3
Camera	67,2	255	32,8	1,79	1,2	3,2	2,7	5,7
Microph.	62,2	325	37,8	1,28	2,9	3,2	2,6	5,4
Selfview	35,2	489	64,8	0,49	0,7	3,3	2,8	5,4
Still Pic.	26,4	380	73,6	0,47	0,9	3,7	3,2	7,9
Doc. cam.	64,9	158	35,1	2,78	1,6	3,8	3,1	0,3
Handsfree	52,0	482	48,0	0,72	3,3	3,0	2,4	13,0
Mean	48,6	346,7	51,4	0,94	1,2	3,3	2,7	2,7

Table C.3: Family 3

Pictogram	Parameter							Preference %
	% Hits	n False alarms	% Misses	Selectivity	% Miss. values	Certainty	Represent	
Vid / Tel.	49,0	368	51,0	0,88	3,5	2,9	2,4	
Camera	80,0	125	20,0	4,36	0,9	3,9	3,4	24,5
Microph.	67,9	120	32,1	3,79	2,5	3,3	2,8	1,3
Selfview	60,1	167	39,9	2,38	3,6	3,1	2,4	0,6
Still Pic.	71,2	200	28,8	2,38	2,6	3,0	2,3	5,6
Doc. cam.	92,6	190	7,4	3,32	1,0	4,3	3,8	9,7
Handsfree	75,6	188	24,4	2,67	3,3	3,5	3,0	14,4
Mean	70,9	194,0	29,1	2,45	2,5	3,4	2,9	9,4

Table C.4: Family 4

Pictogram	Parameter							Preference %
	% hits	n False alarms	% Misses	Selectivity	% Miss. values	Certainty	Represent	
Vid / Tel.	86,3	102	13,7	5,78	0,4	4,2	3,9	14,9
Camera	87,8	63	12,2	9,56	0,1	4,2	3,9	24,8
Microph.	97,2	40	2,8	16,63	0,4	4,5	4,2	49,3
Selfview	70,2	148	29,8	3,24	0,4	4,0	3,5	18,5
Still Pic.	86,8	209	13,2	2,83	0,9	3,9	3,4	32,0
Doc. cam.	95,6	40	4,4	16,38	0,3	4,5	4,2	33,9
Handsfree	80,9	48	19,1	11,35	1,9	3,8	3,3	7,7
Mean	86,4	92,9	13,6	6,35	0,6	4,2	3,8	25,9

Table C.5: Family 5

Pictogram	Parameter							Preference %
	% Hits	n False alarms	% Misses	Selectivity	n Miss. values	Certainty	Represent	
Vid / Tel.	35,0	425	65,0	0,55	3,5	2,7	2,2	1,9
Camera	32,3	256	67,7	0,84	2,6	2,6	2,0	2,5
Microph.	60,0	260	40,0	1,54	2,8	3,0	2,3	4,8
Selfview	49,3	367	50,7	0,91	1,0	3,4	3,1	16,4
Still Pic.	75,2	279	24,8	1,84	0,9	3,5	3,1	25,0
Doc. cam.	97,2	45	2,8	14,80	0,3	4,4	3,9	20,7
Handsfree	74,6	223	25,4	2,25	2,2	3,7	3,2	14,9
Mean	60,5	265,0	39,5	1,54	1,9	3,3	2,8	12,3

Table C.6: Family 6

Pictogram	Parameter							Preference %
	% Hits	n False alarms	% Misses	Selectivity	% Miss. values	Certainty	Represent	
Vid / Tel.	34,2	542	65,8	0,42	2,2	2,8	2,3	0,1
Camera	91,1	142	8,9	4,37	0,7	4,1	3,7	16,4
Microph.	68,7	325	31,3	1,41	2,9	3,4	2,8	8,2
Selfview	54,3	330	45,7	1,12	0,7	3,2	2,5	2,6
Still Pic.	45,2	119	54,8	2,55	2,3	2,9	2,0	2,8
Doc. cam.	96,8	59	3,2	11,17	0,9	4,4	3,7	8,5
Handsfree	57,8	185	42,2	2,13	0,7	4,0	3,6	4,9
Mean	64,0	243,1	36,0	1,78	1,5	3,5	2,9	6,2

Table C.7: Family 7

Pictogram	Parameter							Preference %
	% Hits	n False alarms	% Misses	Selectivity	n Miss. values	Certainty	Represent	
Vid / Tel.	94,7	72	5,3	8,99	0,6	4,6	4,4	74,4
Camera	74,0	105	26,0	4,81	0,7	4,0	3,5	18,8
Microph.	95,6	58	4,4	11,21	1,0	4,5	4,0	26,8
Selfview	90,9	154	9,1	4,02	0,9	4,3	3,9	52,1
Still Pic.	74,7	128	25,3	3,90	2,8	3,8	3,1	22,7
Doc. cam.	97,8	31	2,2	21,65	0,1	4,7	4,3	23,9
Handsfree	83,8	49	16,2	11,39	3,1	3,9	3,4	11,3
Mean	87,4	85,3	12,6	6,95	1,3	4,3	3,8	32,9

Annex D (informative): Example sections of the questionnaire

The following text provides example sections from the initial questionnaire discussed in Clause 4 (more specifically in subclause 4.2).

What is a videophone?

A videophone is a new type of telephone. Whereas on a regular telephone you can only hear the person you are talking to, on a videophone you can see them and they can see you. For this reason, a videophone is equipped with the following parts: a screen on which you can see the other person, a camera so that the other person can see you too, a handset for hearing and speaking, and a built-in microphone and loudspeaker to enable you to speak without having to hold the handset. Figure A.1 shows what a videophone should look like:

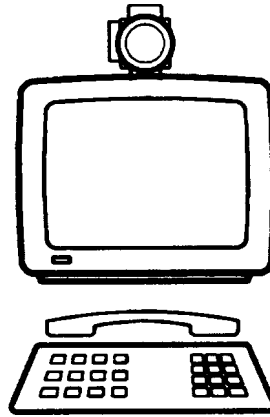


Figure A.1

Because of the additional functions, a videophone is more complex to use than a regular telephone. The following functions are possible on a videophone:

- to call someone or to receive a call;
- to switch between a telephone call (voice only) and a videophone call (voice and picture) (VIDEOPHONE/TELEPHONE Function);
- to turn the camera on and off (CAMERA ON/OFF Function);
- to make a call without using the handset = handsfree using the built-in microphone and loudspeaker (HANDSFREE Function);
- to turn the microphone in the handset or the built-in microphone on and off (MICROPHONE ON/OFF Function);
- to see oneself on the screen (SELFVIEW Function);
- to "freeze" the picture on the screen (STILL PICTURE Function);
- to transmit the picture from a ETR Camera when you wish to show to the other person a document or object (DOCUMENT CAMERA Function).

A number of switches or buttons are needed for making use of these functions of a videophone. The manufacturers of modern equipment sometimes print small pictures next to a button to remind the user of what it does. This kind of picture is called a "Pictogram" (you may know pictograms from places like train stations and airports where they are used to indicate "Information", "Exit", etc.). ETSI is studying pictograms which may in the future be placed next to the buttons of videophones, and we would like you to help us choose the best pictograms.

Pictograms for videophones

Above, we have introduced a number of special videophone functions like CAMERA ON/OFF. We have collected seven proposals for how these videophone functions can be represented as pictograms. Each of these proposals, known as pictogram families, comprises seven pictograms, one for each of the seven videophone functions. Our aim is to find out, which family is best suited for this purpose.

For this reason we would like to give you three tasks, and we have also arranged this questionnaire in three parts.

Part 1

This deals with the pictograms of Family 1. On each of seven consecutive pages, all pictograms of this family are printed. On the top of each page, one videophone function will be briefly described. Your task will be to cross out the one pictogram which you think belongs to the videophone function in question. Following this you will be asked to express, on response scales, how certain you are of your choice and how well you think the pictogram represents the function. The same tasks follow for pictogram families 2 to 7.

Part 2

We ask you to choose among all the candidate pictograms that belong to one function the one pictogram that you think represents best the function in question.

Part 3

Which of the seven pictogram families you prefer.

If you have any questions at this point, please ask the experimenter.

Part 1

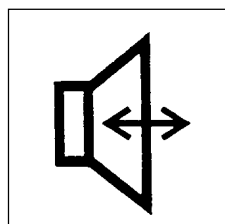
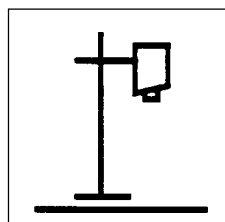
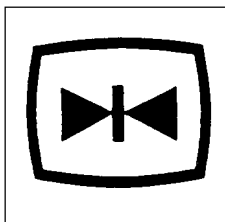
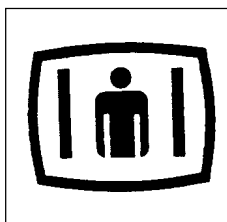
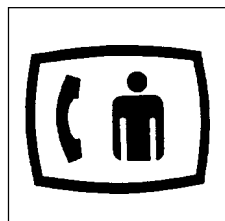
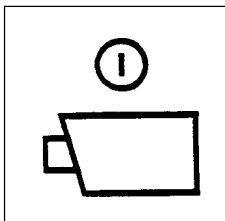
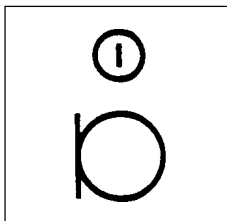
On each of the following pages we would like you to cross out the pictogram that you think represents the function described at the top of the page. Use the response scales to express how certain you are of your choice and how well you think the pictogram represents the function.

Family 1

Function 1: VIDEOPHONE/TELEPHONE

This function allows you to switch between a telephone call (sound only) and a videophone call (picture and sound). Among other reasons, this function is important because a videophone call will be more expensive than a regular telephone call.

Please cross out the pictogram that you think represents VIDEOPHONE/TELEPHONE.



How certain are you of your choice?

very uncertain very certain

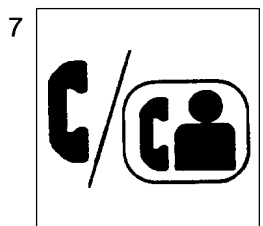
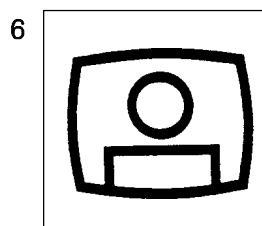
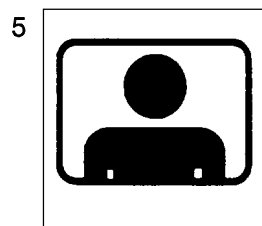
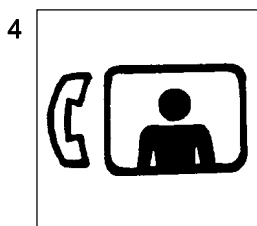
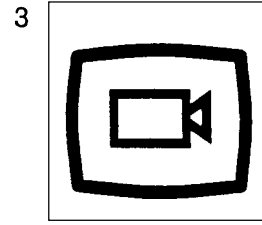
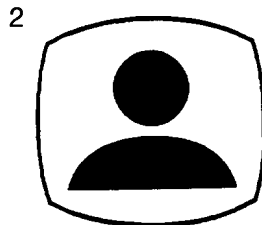
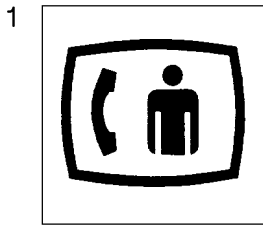
How well does the pictogram you selected represent VIDEOPHONE/TELEPHONE? The pictogram represents VIDEOPHONE/TELEPHONE?

very badly very well

Part 2

On the next pages you see all our candidate pictograms for each function. For each of the seven videophone functions, we would like to know which candidate pictogram you prefer.

On this page you see seven pictograms that represent the VIDEOPHONE/TELEPHONE function. As you know, this function allows you to switch between a videophone call (seeing and hearing) and a telephone call (hearing only).



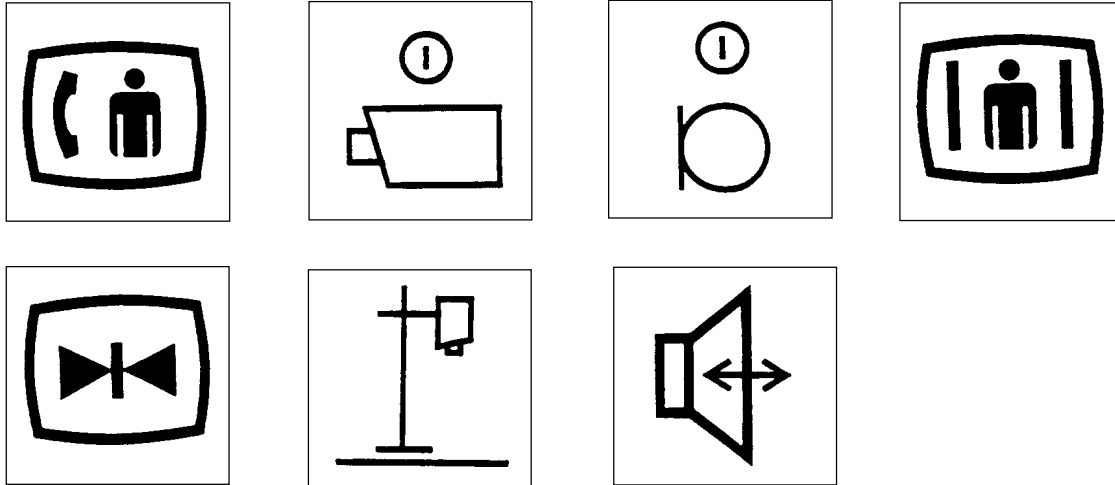
Which pictogram do you think represents best the VIDEOPHONE/TELEPHONE function?

I prefer pictogram number _____

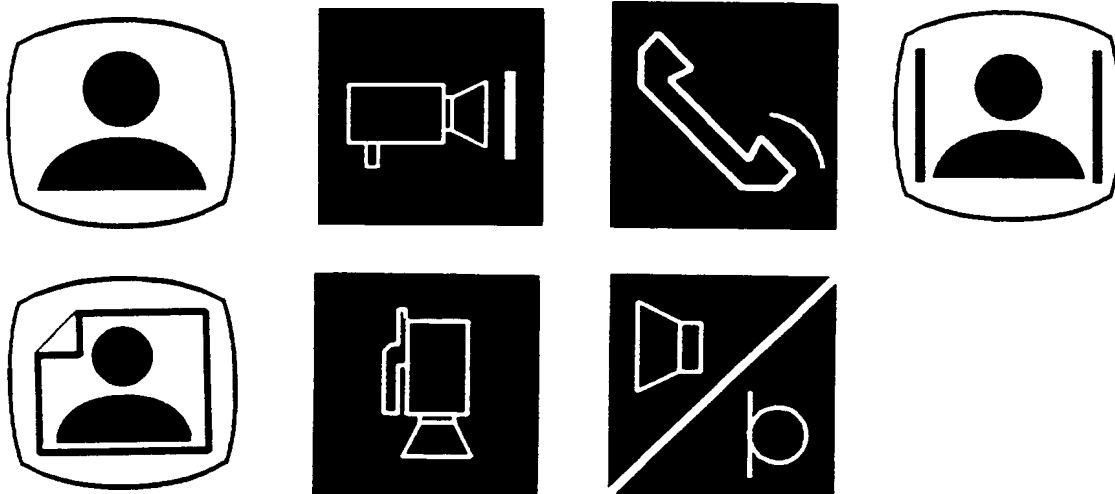
Part 3

On the next pages, you will see once again all seven pictogram families. Please look at them again and write onto the line below the seventh family which of the seven families you prefer.

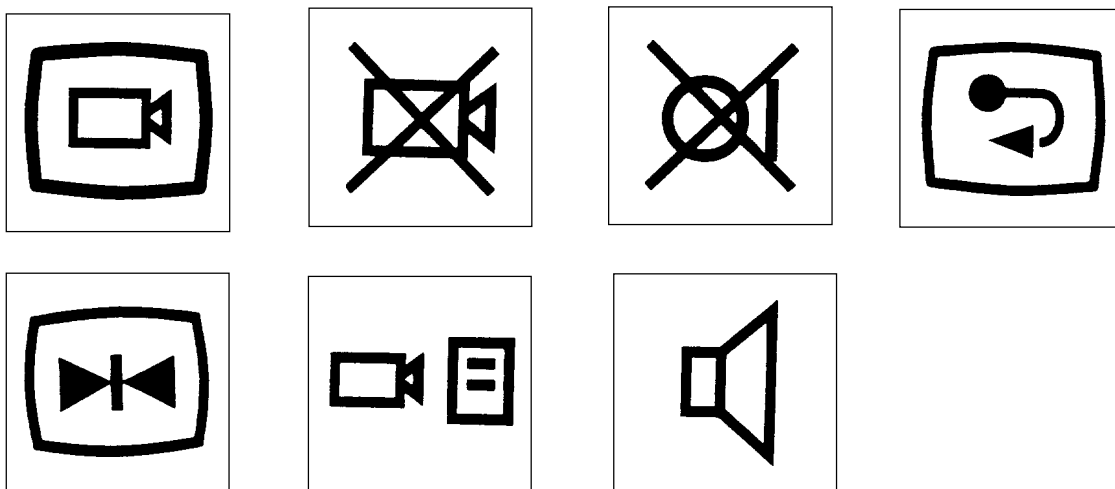
Family 1



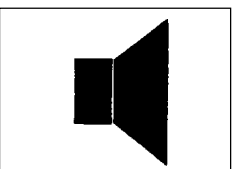
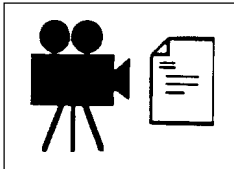
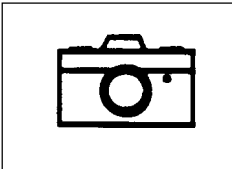
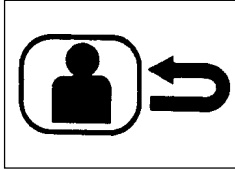
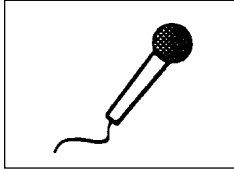
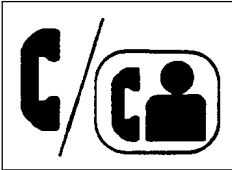
Family 2



Family 3



Family 7



Which pictogram family do you prefer?
I prefer pictogram family number _____

On this last page of the questionnaire we would like to ask you some questions about yourself:

Age: _____
female male

Profession: _____

Have you ever used a videophone?
 never once more than once

The next three questions are about your attitude towards technological progress. Please express your opinion by crossing one of the boxes of the scale.

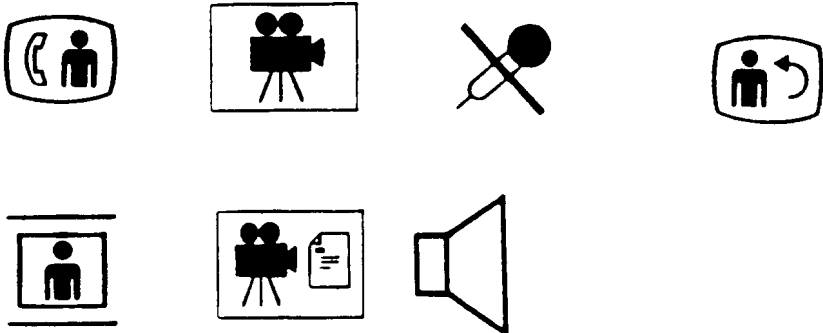
1. The advantages of technological progress outweigh the disadvantages.
[1] [2] [3] [4] [5]
do not agree at all totally agree

2. Progress in technology makes life a lot easier.
[1] [2] [3] [4] [5]
do not agree at all totally agree

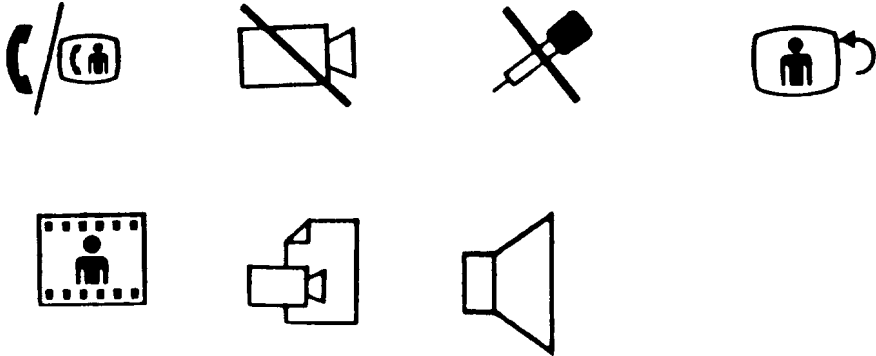
3. Some aspects of today's technological progress are worrying.
[1] [2] [3] [4] [5]
do not agree at all totally agree

Annex E (informative): The three pictogram families tested in the post-test

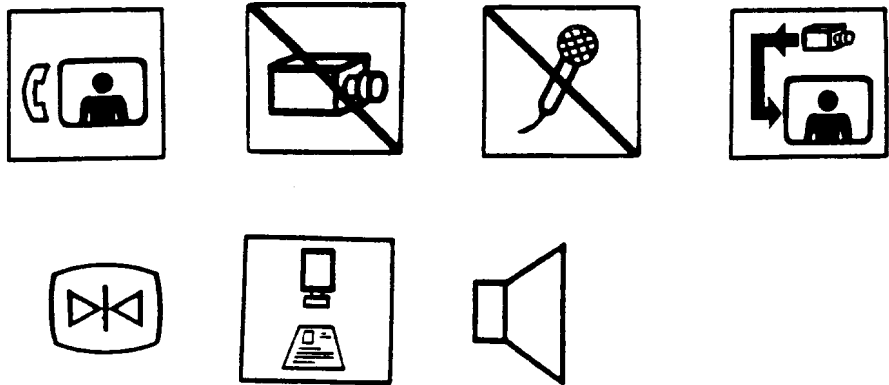
Family 1:



Family 2:



Family 3: Philips



**Annex F (informative): Results of the post-test sample (n = 62) - Task 1:
 Selection Matrices**

Table F.1: Selection Matrix Family 1, (Total Sample, n = 62) in %

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	58,1	17,7				14,5	15,3
Camera	3,2	48,4	16,4	14,5	3,3		
Microph.		12,9	63,9	12,9	1,6		18,6
Selfview	4,8	11,3		50,0	8,2		1,7
Still Pic.	19,4	4,8		16,1	67,2	17,7	5,1
Doc. cam.	14,5	1,6		4,8	4,9	67,7	
Handsfree		3,2	19,4	1,6	14,8		59,3
Missing	0	0	1,6	0	1,6	0	4,8

Table F.2: Selection Matrix Family 1, (Total Sample, n = 62) in n

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	36	11				9	9
Camera	2	30	10	9	2		
Microph.		8	39	8	1		11
Selfview	3	7		31	5		1
Still Pic.	12	3		10	41	11	3
Doc. cam.	9	1		3	3	42	
Handsfree		2	12	1	9		35
Missing	0	0	1	0	1	0	3

Table F.3: Selection Matrix Family 2, (Total Sample, n = 62) in %

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	64,5	18,0	16,1			16,7	5,0
Camera	1,6	63,9					
Microph.			64,5			13,3	6,7
Selfview	17,7	13,1		55,7	6,6		3,3
Still Pic.	1,6	1,6		26,2	60,7		
Doc. cam.		1,6	16,1	3,3	3,3	70,0	16,7
Handsfree	14,5	1,6	3,2	14,8	29,5		68,3
Missing	0	1,6	0	1,6	1,6	3,2	3,2

Table F.4: Selection Matrix Family 2, (Total Sample, n = 62) in n

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	40	11	10			10	3
Camera	1	39					
Microph.			40			8	4
Selfview	11	8		34	4		2
Still Pic.	1	1		16	37		
Doc. cam.		1	10	2	2	42	10
Handsfree	9	1	2	9	18		41
Missing	0	1	0	1	1	2	2

Table F.5: Selection Matrix Family 3, (Total Sample, n = 62) in %

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	65,6	16,4		3,2	10,0		1,7
Camera	1,6	65,6				16,1	13,3
Microph.	16,4		67,7	12,9		16,1	6,7
Selfview		1,6	16,1	66,1	15,0		
Still Pic.	1,6			3,2	56,7		18,3
Doc. cam.	1,6	16,4			18,3	67,7	
Handsfree	31,1		16,1	14,5			60,0
Missing	1,6	1,6	0	0	3,2	0	3,2

Table F.6: Selection Matrix Family 3, (Total Sample, n = 62) in n

Pictogram selected	Function						
	Vid / Tel	Camera	Microph.	Selfview	Still Pic.	Doc. cam.	Handsfree
Vid / Tel.	40	10		2	6		1
Camera	1	40				10	8
Microph.	10		42	8		10	4
Selfview		1	10	41	9		
Still Pic.	1			2	34		11
Doc. cam.	1	10			11	42	
Handsfree	8		10	9			36
Missing	1	1	0	0	2	0	2

Annex G (informative): Results of the post-test - summary

Table G.1: Family 1

Pictogram	Parameter					
	% Hits	n False alarms	% Miss. values	Certainty	Represent.	Preference %
Vid / Tel.	58,1	29	0	4,2	3,9	21,0
Camera	48,4	23	0	3,9	3,7	35,5
Microph.	63,9	28	1,6	4,3	4,1	49,2
Selfview	50,0	16	0	3,8	3,4	48,3
Still Pic.	67,2	39	1,6	3,6	2,0	47,5
Doc. cam.	67,7	16	0	4,6	4,2	40,3
Handsfree	59,3	24	4,8	3,4	3,0	---
Mean	59,2	25,0	1,1	4,0	3,5	40,3

Table G.2: Family 2

Pictogram	Parameter					
	% Hits	n False alarms	% Miss. values	Certainty	Represent.	Preference %
Vid / Tel.	64,5	34	0	4,4	4,2	59,7
Camera	63,9	1	1,6	4,4	3,9	46,8
Microph.	64,5	12	0	4,5	4,0	18,0
Selfview	55,7	25	1,6	4,2	3,7	25,0
Still Pic.	60,7	18	1,6	4,0	3,5	45,9
Doc. cam.	70,0	25	3,2	4,4	3,8	37,1
Handsfree	68,3	39	3,2	3,8	3,1	---
Mean	63,9	22,0	1,6	4,2	3,7	38,8

Table G.3: Family 3

Pictogram	Parameter					
	% Hits	n False alarms	% Miss. values	Certainty	Represent.	Preference %
Vid / Tel.	65,6	19	1,6	4,2	3,6	19,4
Camera	65,6	19	1,6	4,3	3,7	17,7
Microph.	67,7	33	0	4,5	4,2	32,8
Selfview	66,1	20	0	3,9	3,2	26,7
Still Pic.	56,7	14	3,2	3,2	2,5	6,6
Doc. cam.	67,7	22	0	4,4	3,5	22,6
Handsfree	60,0	27	3,2	3,8	3,2	---
Mean	64,2	22,0	1,4	4,0	3,4	21,0

Annex H (informative): Acknowledgements

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Monika Reischl
- at the Deutsches Institut für Normung, DIN, Berlin:
Herr Bergner
- in Denmark: at the Dansk Teknologicenter, Århus
Åse Brandt
- at Frystyk Consult, København
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