



Stockholm Institute of Education
The Disability and Handicap Research Group

Bibliography on Videotelephony and Disability 1993-2002

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FOREWORD

This report is part of the work at the FUNKHA-group at Stockholm Institute of Education, The Disability and Handicap Research Group. It is also a complement to an earlier report published in 1993 within the European project RACE 2033 (Research in Advanced Communications Technologies in Europe), TeleCommunity. The earlier report was a compilation of references collected from nine databases on the subject of videotelephony. That report presented comments on 190 references from 20 years of publication, most of them related to disability. It is still available and the information is still valid.

The present report wishes to follow up on that earlier study, almost exactly a decade later. We have made similar literature searches in similar databases. The main difference between the present and the earlier report is the fact that the field is more difficult to grasp today because there are more information sources, especially the Internet itself which did not exist in any extensive form at that time. This means that the present report is more focussed on projects and activities and less on formal research reports and papers. The final result in numbers, however, was almost the same as in the first study in 1993, a total number of 188 formal references.

We have tried to give a short and condensed picture of the situation as we see it in the world today in this very special, promising and dynamic field.

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1. INTRODUCTION

The rapid technological development, especially in the wake of the computer technology brings about many new technological applications. Since the technology is multifunctional, the applications become multifunctional and often not easily described nor defined. This means that consumers in general and students of technology alike have to accept an abundance of new words and concepts, covering applications and phenomena which are not often clearly understood. Words like telematics, multimedia, PC etc. are clear examples of this development. The words “videotelephony” and “videophone” which we have chosen to describe and define the technology for this report are other difficult and somewhat vague words. However, the development of concepts and words are reflections of the development of the technology that they describe.

A few decades ago telecommunications technology was clearly a technology connected to hearing and talking. The invention of the telephone more than a century ago, meant that distance communication was dominated by hearing and talking for almost a century. However, the earlier invention of the telegraph was also built upon seeing but never became the same type of general accessible and private “everyman’s” technology that the telephone became, probably partly because the telegraph was built upon the usage of a very special code, which was not easily learnt. The creation of the film and television media built a foundation for one-way audio-visual world-wide communication systems but not until the creation of the telefax did the world attain an interactive person-to-person visual tele-medium, albeit for still-pictures. And today we have the technology for direct interpersonal audiovisual communication and interaction through a technology which has not reached its maturity neither its clear definition.

We still use the term “videotelephony” which was used in our earlier report (Brodin & Magnusson, 1993) which seems to be the most widely used term. There are competitive terms, however, as for instance the more general term distance-based multimedia communication, picture-telephony or the widely used concept video-conferencing. In this report, however, we will use the concept videophone to cover the tool for interpersonal communication, the concept video-telephony for the technology in general and the concept video-conferencing for group-communications using this technology. We will also use the word multimedia to describe technology in general integrating applications for several senses at the same time. We will use the word telematics to describe general telecommunication technology, a term which is not fully accepted all over the world. Those concepts are used as keywords – isolated or in combinations - in our database searches together with the final concept – disability, which we have chosen since it is a more general term than handicap and more widely used when classifying information about disabilities, impairments, handicaps and special needs.

Several pilot activities regarding the usage of videotelephony by people with disability were already going on in different parts of the world at the time of the first report. We would have expected that ten years of intensive development should have produced quite a number of more extensive projects today, resulting in the technology being an integrated part of the general infra-structure. However, as will be shown in the report, this is not the fact. There are quite a number of projects going on in the world but there seems to be a newness to the technology resulting in there being very few established networks etc. In short, the technology seems not to have become a part of the general infra-structure yet.

An exception which will be discussed more in detail below is the usage of web-cameras as a peripheral to PC:s in Internet communication.

The information is still categorized with respect to a specific field of disability. The headings refer to some references of general interest. The references focus on a specific area of disability and contain information about videotelephony applications. The references exemplify efforts in the field of videotelephone based remote communication for disabled as well as non-disabled people and the ambition is not to cover everything produced during the last ten years. Instead, the ambition is twofold. Firstly, we find it important to give a representative description of projects from different parts of the world, where there are important activities going on and how can they be described. Secondly, there are more different types of references available which means that we have chosen to focus on projects and not on specific references. In other words, this is not so much a literature reference catalogue as a project catalogue and there is no ambition to be complete, rather representative.

In the earlier report we covered quite a number of references on the technology itself. Today there is no need for more exact technological information, just a general overview of the most important trends in the world and what might be expected from them. There are however a large number of sites on the Internet, describing videotelephony and different commercial products as well as different type sof technology.

In 1993 the use of videotelephony celebrated its inofficial twentieth anniversary. In 1973 The police district of central Philadelphia and seven external police districts in the same city installed an analogue videotelephony system which has been in use for a few decades. It has initiated followers in other parts of the world, for instance in Sweden where videoconferencing systems will be used at court in certain types of trials. For a while, one member of the Swedish government took part in part of the governmental work, regularly using a videoconferencing system. Norway, however, has been the earliest and most extensive developper of the technology as has been shown in the earlier report. Australia was very early to establish a number of distance communication projects in different fields, especially educational ones very early and in North America Canada has followed close behind but not so much the US where there have been a few local projects but very few federal initiatives..

Relatively speaking, few trials have been made to evaluate the use of videotelephones for people with disabilities. In Europe and especially in the Scandinavian countries several projects have been running since 1993, at national as well as at international levels. Today the technological development and the broadband communication have illuminated a new interest in technology. Once again the goal of having general visual remote interaction over the telephone network seems to be a dream on the verge of realization. It can be seen especially in the US where the last decade has given birth to many new ventures in the field of tele-communication, especially in the field of tele-medicine. Concludingly, our experiences show that a majority of telecommunication initiatives, focussing on disability, are found within the framework of telemedicine, to a lesser degree within an educational framework.

2. DATABASE RESEARCH

2.1 The database Survey in 1992

Within the project RACE 2033, TeleCommunity, two literature surveys were made in the field of telecommunication for people with disability. The first literature search was done in January 1992 in LIBRIS, PEPSY, ERIC, PsycLit (PsycINFO), TUDOR and MEDLINE (MEDLARS). Few references were found. In November 1992 a new survey was done in the following databases: LIBRIS, ERIC, ECER, PsycLit (PsycINFO), MEDLINE (MEDLARS), PASCAL, ARTIFICIAL INTELLIGENCE (ARTIF) and INSPEC.

The first search covered the same references as the second with the exception of PEPSY and TUDOR, which were not included as few references were found. **PEPSY** is a Scandinavian database where all literature published in education and psychology in Sweden, Norway and Denmark are published. **TUDOR** was an informal database from the European project with the same name. This latter database is not generally accessible.

In the second search three new databases were included: PASCAL, ARTIF and INSPEC.

LIBRIS is a Swedish database where all literature published in the country is registered. LIBRIS is common to all Swedish research libraries.

ERIC (Educational Resources Information Center) is a large database covering all areas of education, which means that there are references also in the field of special needs and disability. The educational material is collected by the U.S. Department of Education. The database consists of subfiles, for instance: 1) Resources in Education (RIE) and 2) Current Index to Journals in Education (CIJE).

ECER (Exceptional Child Education Resources) is a database in education of disabled children and gifted children. The database is a comprehensive, bibliographic database on education and development of people of all ages with exceptionalities. About half of the references in ECER can also be found in ERIC.

PsycINFO, ONTAP (ON-line Training And Practice) and PsycLit (CD-rom) cover primarily psychological, educational, anthropological, psychiatric and sociological references. The material represents substantive articles selected on the bases of relevance to psychology from journals and technical reports published all over the world in more than 20 languages.

MEDLINE (MEDLARS) is held by the U.S. National Library of Medicine and covers references in the medical field. The database collect material in dental medicine, nursing, communication disorders, population and reproductive biology. The articles are published in over 70 countries.

PASCAL is produced by the Institut de l'Information Scientifique et Technique (INIST) of the French National Research Council. It covers scientific and technical literature. Most abstracts are in French but the documents come from all over the world and are written in 100 different languages. The database cross-scientific and the principal subjects cover fundamental physics

and chemistry, life sciences, applied sciences, technology, earth sciences and information sciences.

ARTIFICIAL INTELLIGENCE (ARTIF) is a cross-scientific database where psychology, education, medicine, technology and sociology are included. The subjects covered are expert systems, software logic, computer vision, neural network and machine learning. The database covers all aspects of artificial intelligence and related technologies and is the online version of the monthly abstract journal *Artificial Intelligence Abstracts*. This database is held by the European Space Agency, Italy.

INSPEC (The Database for Physics, Electronics and Computing) covers electrical engineering and electronics (e.g. telecommunications), computers and control systems and information technology.

The number of references in different databases changes extremely fast. The information about the number of references in each database was collected from The Swedish National Library for Psychology and Education in the middle of December, 1992 (Krister Lagerborg, personal communication).

Database	Number of References
LIBRIS covers	3.200.000 references
PEPSY covers	31.000 references
ERIC covers	753.852 references
ECER covers	76.138 references
PsycINFO covers	814.843 references
MEDLINE covers	6.856.539 references
PASCAL covers	9.000.000 references
Artificial Intelligence covers	14.000 references
INSPEC	3.987.318 references

LIBRIS

Videotelefoni (videotelephony)	0
Stillbildstelefonering (still picture telephony)	0
Bildtelefoni (image/picture telephony)	0
Videointeraktion (video interaction)	0
Videokommunikation (video communication)	1
Telekommunikation (telecommunication)	0
Telefoni (telephony)	14
Kommunikationsteknologi (communication technology)	18

Most of the references in this area have been classified as communication technology and telephony only include ordinary telephoning. The only references in the area of disability found in the database are already mentioned in this report. No new references have been found.

ERIC (1985-1992)

Telecommunication	226
Telecommunication and disability/handicap	8

Video and communication	6
Video and disability/handicap	0
Communication technology	1966
Communication technology and disability/handicap	29
Videotelephony	0
Videophones	0
Picture telephones	0
Still picture telephones	0
Pictorial telephones	0
Image telephones	0
Telematics	20
Telematics and disability/handicap	1

Telecommunication and disability (8 references). The references were about the ADA (Americans with Disabilities Act), deaf and hearing impaired and financial matters. Two of the eight references were of special interest and are included in the report. Both were in the area of education and technology.

Video and communication (6 references). These references covered media investigations. Two of them were in the field of education. The first one was about teletraining in the navy and the second one was about video-mediated communication and leadership in small groups. No one was of interest for the area of disability.

Communication Technology and disability (29 references). Nine references were about legal acts and rules for using the telephone, eight references were about information about the possibilities to use the service, one about databases, six in the area of education and five about deaf and hearing impaired. Two references were included in the report:

ECER (1985-1992)

Almost the same results as in ERIC. The references were mostly about education of disabled children and highly intelligent and talented children. No new references were found in the area of telecommunication and disability.

PsycINFO (1985-1992)

Telecommunication and disability/handicap	1
Video and communication	83
Video and communication and disability/handicap	0
Video and disability/handicap	1
Videotelephony	0
Videophones	0
Picture telephones	0
Still picture telephones	0
Pictorial telephones	0
Image telephones	0
Telematics	1

Telecommunication and disability (1 reference). This reference contains information about difficulties to use telephones for hearing impaired but is not related to videotelephones and thus not relevant for this report.

Video and communication (83 references). These references covered the effects of video on humans, public media investigations about the use of video and different psychological aspects with regard to video communication. No one was in the area of disability.

Video and Disability (1 reference). This reference was about human factors for people with visual impairment and not specific for the area of telecommunication.

Telematics (1 reference). This reference was about electronic post in general and was of no interest in the area of disability.

MEDLINE (1991-1992)

Telecommunication and disability/handicap	0
Video and communication	41
Video and communication and disability/handicap	0
Video and disability/handicap	4
Videotelephony	0
Videophones	0
Picture telephones	0
Still picture telephones	0
Pictorial telephones	0
Image telephones	0
Telematics	2

MEDLINE is one of the largest databases for medicine, rehabilitation and related areas. Most of the references are in the medical field.

Video and communication (41 references). General references about video communication: No one was in the area of disability.

Video and disability (4 references). Two references were about medical assessment and treatment of Parkinsons disease and two about ergonomics. No one was related to the area of telecommunication.

Telematics (2 references). Both references were in the medical field, one about ECG and the other one about electro therapy. These references were not relevant for videotelephony.

PASCAL (1973-1992)

Telecommunication	60.704
Disability/handicap	13.939
Telematics	371
Telecommunication or telematics and disability/handicap	44
Videotelephony/videophones	7
Picture telephones	0

Still picture telephones	0
Pictorial telephones	0
Image telephones	0
Videotelephones and/or telecommunication or telematics and disability/handicap	50

Telecommunication (60.704 references).

Disability/handicap (13.939 references).

Telematics (371 references).

The above mentioned keywords were not useful if they were not used in combinations. When combining these three keywords the result was 44 references. These references could be useful, but many of them were too general. Most of the references in Telematics were general. Many of them were included in the last literature research with combination of the four key words.

Videotelephony/videophones (7 references). These references were included in the combination below with four key words.

Videotelephones and/or telecommunication or telematics and disability/handicap (50 references). This would most exactly relate to the area in which we are interested.

The 50 references were in the following areas:

physically disabled	2
deaf and hearing impaired	12
speech recognition	3
blind and visually impaired	9
ergonomics	6
education	6
technology	22
moving images	2
elderly	2
medicine, telefax	2
others	3

Most references were in the area of technology (22) and deaf or hearing impaired (12). Disability covered 26 references, ergonomics 6 and education 6. The references relevant to telecommunication were included in the report. No reference in the area of mental retardation was found.

ARTIFICIAL INTELLIGENCE (1966-1992)

Telecommunication	115
Telecommunication and disability/handicap	2
Video and communication and disability/handicap	0
Videotelephony	0
Videophones	0
Picture telephones	0

Still picture telephones	0
Pictorial telephones	0
Image telephones	0
Telematics	1

Telecommunication (115 references). Most references were in the technical field and discussed questions about network, transmission of signals etc. These references were not relevant for videotelephony.

Telecommunication and disability/handicap (2 references). Only two references covered the area of disability and were included in the report.

Telematics (1 reference). This reference were about technology and had nothing to do with telecommunication and disability and we therefore excluded it from the report.

INSPEC (-1992)

Telecommunication	36.500
Disability/handicap	2.355
Telematics	316
Telecommunication or telematics and disability/handicap	110
Videotelephony/videophones	27
Picture telephones	0
Still picture telephones	0
Pictorial telephones	0
Image telephones	0
Videotelephones and/or telecommunication or telematics and disability/handicap	16

Disability/handicap (2.355 references). As this keyword was too wide we continued with *mental retardation*. This resulted in 28 references. Most of these references were related to damages caused by the atomic bomb and the irradiation from it. Questions related to prenatal irradiation and diagnostics covered 15 references, education covered 2, support services 2, incontinence 2 and medical issues 7. Most studies on the atomic bomb were made in Japan. No references in the area of mental retardation illuminated social integration or communication.

Telecommunication or telematics and disability/handicap (110 references)

Videotelephony/videophones (27 references). Four new references were found.

Videotelephones and/or telecommunication or telematics and disability/ handicap (16 references). These references are in the area of deaf and hearing impaired (8), elderly (2), videoconferencing (2), general issues and human factors (4). No new references were found.

To conclude, there were few references in the area of videotelephony for people with disability in the databases mentioned above. There were also other databases, but we chose some of the most comprehensive with regard to the concept special needs. HILITE is a British database, which was recommended to us, but we were not able to collect information from it from Swedish research libraries.

The purpose of the original report was to give the state of the art of the videotelephony field for people with disabilities. Some references were not included in the report, but we tried to collect the most relevant literature in this sub-area of telecommunication and disability. As can be seen today as in 1993, the content of the databases vary enormously.

2.2 The database Survey in 2002

Databases

In our analysis of the data found in the 1993 survey, it was evident that some of the databases were of less interest. The major databases covered most of the information found in the smaller databases. Since “disability” was our main focus, it was clear that the databases focussing on technology contained little information on disability, while the databases specializing on education and medicine contained a lot of information on technology AND disability.

Today, the database market is very different from the situation in 1993. First of all, research-literature as found in the traditional databases is not the only valid source of research and development information. The Internet offers a wide and divers source of general information about projects, institutions general research etc which offers a complement to the traditional information in databases like ERIC or MEDLINE. Therefore we have chosen only the largest databases and one Swedish database and the special database AEA for our survey. Instead we have used the Internet and three search motors available on the net today. Information research or retrieval on the Internet is very dependant on the different search motors, meaning that we have found it necessary to try more than one search motor. Totally we have chosen the following sources

LIBRIS

ERIC

PsycINFO

MEDLINE

PASCAL

AEA

INTERNET:

- Yahoo
- Altavista
- Google

We have also modified the keywords of our search to be more in tune with the development of the concepts as will be discussed below in section three. Especially we have excluded the combination dealing with picture and still picture since those concepts do not seem to be in use anymore in connection with videotelephony. We have chosen the following words and combinations of keywords:

Telecommunication

Telecommunication and disability/handicap

Telematics

Telematics and disability/handicap

Disability

Videotelephone
 Videotelephone and disability
 Videoconference
 Videoconference and disability

The key questions for our study are of course the final four questions. However, it is important to see whether the databases contain a clear background for either telematics/telecommunication or disability so that it is possible to validate the results. In certain cases it has been unnecessary to make some of the searches since the results have been evident from another search. The composite words have been used both in two-word and one-word combinations (for inst video conference vs videoconference) to exclude possible mismatches. In general, the references have been classified in the different databases with one-word combinations more often than the opposite, as we find it. In the Swedish database we have of course used Swedish keywords with the same meaning as the English ones. Below we have added searches from both types of combinations together.

LIBRIS (1993-2003)

Videokonferens	43
Videotelefoni (videotelephony)	4
Bildtelefoni (image/picture telephony)	3
Telekommunikation (telecommunication)	635
Telematik (Telematics)	337
Telekommunikation + handikapp	4
Telematik + handikapp	7
Handikapp	
Videotelefoni + handikapp	

The small and local database of LIBRIS still contains information of the type of books that are available in Sweden and it is immediately possible to see that there are very few references with bearing on our subject. The few references we find have a direct connection with the work performed by ourselves back in the early 90's and afterwards. This means that no direct research or developmental work in Sweden, apart from our own has been documented in Libris for the last 10 years.

ERIC (1993-2003)

Telecommunication	2.844
Telecommunication and disability/handicap	1
Telematics	132
Telematics and disability/handicap	1
Disability	3.797
Videotelephone	3
Videotelephone and disability	0
Videoconference	23
Video telephone and disability	3
Video conference and disability	0

Technology is not a main feature of ERIC. Information on Disability is much more frequent. However, it is interesting to see that the keyword telecommunication is much more frequent

than the word telematics although clearly many of the telecommunication references easily could be classified as telematics. Since the database is focussed on education in general, it is no real surprise to find quite a number of references dealing with videoconferencing in an educational environment. However, in combination with disability there are only three references for any form of videotelephony and two of them, as before in LIBRIS, came from our earlier work.

PsycINFO
Social Services Abstract
Sociological Abstracts (1993-2003)

Telematics	71
Telematics and disability	0
Telecommunication	238
Telecommunication and disability	0
Disability	17.805
Videotelephone	5
Video telephone	0
Videoconference	0
Video conference	20
Videotelephone and disability	0
Video conference and disability	0

PsycINFO and the closely connected sociological databases contain even less technological information than ERIC and quite a number of references dealing with disability in a social context. No focal information on our subject is found.

MEDLINE
Exceptional Child Education Resources (1993-)

Telematics	259
Telematics and disability	0
Telecommunication	377
Telecommunication and disability	0
Disability	25.563
Video telephone	2
Video conference	46
Video telephone and disability	0
Video conference and disability	0

Medline contains some technological information and also information on disability from a medical aspect. Together with the specifically disability-oriented database with special education content we get a very high number on disability references. However, once again, very few references on our specific subject.

Academic Search Elite

Academic Search Elite provides full text for nearly 1,850 publications, including nearly 1,300 peer-reviewed journals. In addition to the full text, indexing and abstracts are provided for all 2,900 journals in the collection. This database offers information in nearly every area of academic study including: social sciences, humanities, education, computer sciences, engineering, physics, chemistry, language and linguistics, arts & literature, medical sciences, ethnic studies and more. Examples of titles offered in Academic Search Elite include: Acta Sociologica, American Historical Review, American Journal of Political Science, American Libraries, American Sociologist, British Journal of Psychology, British Journal of Sociology, Central European History, Contemporary Literature, Early American Literature, Journal of Social Psychology, Library Journal, Social Forces, Sociological Review, Theological Studies, Women's Studies, etc. In addition to journal coverage, Academic Search Elite provides full text information from a variety of source-types such as scholarly monographs. The majority of full text titles are available in native (searchable) PDF, or scanned-in-color. Full text information in this database dates as far back as 1985 (From the home-page on the web).

Telematics	611
Telematics and disability	0
Telecommunication	43.062
Telecommunication and disability	0
Disability	18.763
Videotelephone	1
Videoconference	218
Videotelephone and disability	0
Videoconference and disability	0

This database was not used in 1993 but is certainly covering a field of greatest interest for our study. However, even though we find great numbers of references both on telecommunication and disability and also on videoconferencing, there are no references to be found with the special focus of our study.

PASCAL

(See description above)

Telematics	268
Telematics and disability	0
Telecommunication	798
Telecommunication and disability	5
Disability	15.085
Videotelephone	2
Videoconference	2
Videotelephone and disability	0
Videoconference and disability	0

This database contains many references on disability and relatively speaking quite a few on telecommunication. However, the combination is almost nonexistent. The database is considered to cover references generally not found in ERIC which makes the information from PASCAL highly valid and relevant as a compliment. However, the three references of special interest that we found between 1993-1998, dealing with videotelephony with disabilities, were also found in

other databases as well. A fourth reference dealing with telemedicine in a more general sense, based on multimedia usage, was found and added. This reference has been included since it is related to part of our own work, referring to Stroke therapy using telemedicine.

Telemedicine Information Exchange

<http://Tie.telemed.org/>

12.595 articles available plus different news sources.

Telematics	207
Telematics and disability	1
Telecommunication	1.208
Telecommunication and disability	7
Disability	23
Videotelephone	3
Videoconference	125
Videotelephone and disability	1
Videoconference and disability	0

The final literature database in our study was the very special telemedicine database where we find a relatively high number of references on video-conferencing in the medical field and one reference of special interest to us, which happens to be one of our own reports, once again. Evidently, videoconferencing is a popular tool to try and develop new ways of communication and supervision or educational activities between caregivers and clinicians within hospitals today.

Concludingly for the searches in the traditional databases, we find very little information for our special question and we will get back to this further on in our study. Approximately the results should be seen against the background that all databases together which we have used, probably cover some 5.000.000 items for this specific time-period. However, if we look below at the results from the Internet, the results are quite different. The amount of information in the Internet is probably impossible to measure or validate today in any trustworthy figures.

In general and traditional databases the rules and regulations are quite clear. The journals covered in the databases often have a peer-reviewed content, thereby limiting the information-flow. There are also professionals classifying referenses according to references with a common content, even if there remain problems like the relation between telematics and telecommunication. The Internet, however, is open to almost any type of classification or non-classification. Besides, different search-tools cover different groups or areas of information. When doing Internet searches it is absolutely imperative to use different search tools and to be prepared for highly selective usage of the information. In this study, we have used three search tools and probably we cover at least 10's of millions of items available.

Internet through

Altavista

Telematics	122.731
Telematics and disability	3.250
Telecommunication	1.081.354
Telecommunication and disability	20.960

Disability	2.999.509
Videotelephone	597
Videoconference	81.122
Videotelephone & disability	38
Videoconference & disability	3.160
Google	
Telematics	296.000
Telematics and disability	5.330
Telecommunication	1.740.000
Telecommunication and disability	40.400
Disability	6.220.000
Videotelephone	1.020
Videoconference	200.000
Videotelephone & disability	104
Videoconference & disability	4.660
Yahoo	
Telematics	297.000
Telematics and disability	5.170
Telecommunication	1.750.000
Telecommunication and disability	38.900
Disability	6.240.000
Videotelephone	1.020
Videoconference	201.000
Videotelephone & disability	71
Videoconference & disability	4.680

Yahoo and Google give about the same number of references to our different questions while Altavista offers about half the number of references, straight across, with one exception, the combination videoconference and disability. When we look at the type of references found, we discover that there are research reports, commercial analyses, private information, project reports, institutional reports, pure advertisements etc in a strong mixture. However, it is very interesting to see that there is such a high number of research reports easily found over the Internet which are not found in the traditional literature databases.

Finally one general problem in relation to the search strategies is the fact that the concepts telematics and telecommunication are used in a very unspecific and (probably) varies in content between the databases. In our search our aim has not been to unfold the deeper meaning of both words in their usage, we just want to point out the problem and to point out the importance of making parallel searches for both concepts in different combinations. Below, we have tried to establish our own framework for using the different concepts.

3. DEFINITION OF THE TECHNOLOGY

In this report we have included all types of videotelephony, i.e. still picture telephony and any form of transmission of moving pictures. Today, however, the focus in general seems to be, either on ISDN/ADSL/LAN-based forms of communication, or on web-based forms of communication, where the ambition is to create optimal broad-band networks for the fastest and most powerful data-communication as possible.

During the last decades a few central concepts have been more or less established in this field. We are mostly discussing the following concepts

Telecommunication

Telematics

Communication(s) technology

Multimedia

Video(-)telephony

(Picture Telephony)

Videoconferencing

Telepresence

Virtual reality

Broadband

Mobile phone communication

Satellite communication

Telecommunication and *telematics* seem to be more or less synonymous terms, even if the results from our search seems to indicate that the term telecommunication is more widely used and probably more in relation to descriptions of a specific technological application whereas telematics is used more to describe technology as such. Since the term telematics originated in France, it might be expected that there would be differences in usage between databases, depending upon origin. Both terms indicate using technology in communication processes over a distance.

Communication technology is a very wide and vague concept which seems to cover anything from telecommunication devices (= distance communication devices) to type-writers. In the literature it is very unspecific and not very usable as a tool when looking for applications of telecommunication technology.

Multimedia is another general and rather vague term which indicates that you have to use more than one of your senses when using a specific application. It is a very commonly used term in the computer games or the advertisement industries. It sometimes is used when talking about videotelephony or video-conferencing, mostly in connection with educational applications.

Videotelephony and *picture telephony* are synonymous although the latter term is used hardly anymore. It is a more exact term but probably the combination is not as “catchy” a term as videotelephony. The term which seems to become the general term for interpersonal videotelephony is probably “videophone”. During the last century, quite a number of literary works in the science fiction field have envisioned the technology, using a number of more or

less “catchy” terms like vid-phone, pic-phone, viso-phone etc. None of these terms have caught on in the marketing of today’s technology, however.

Videoconference is a term used for group-communication involving audiovisual technology, over a distance, mostly one-way in educational or supervisory settings.

Telepresence is a term for technological applications where the aim is to give the user the feeling that you can exist in another given physical space than your own. It is closely related to the term *virtual reality* where the aim is to create the simulation of an alternative physical reality to your own through technology. The difference between the terms is not very clear and from the literature in the field we feel that telepresence is more related to extensions of real and existing spaces while virtual reality is more connected with fictional space.

Broadband is a term for describing many different forms of (transmission) networks for information distribution and interaction at a higher speed than the general narrow-band telephone network. Examples of commonly available networks are ISDN or ADSL where the minimum speed is 54 kb/s or multiples of it. However, confusion exists around this concept since it can include physical as well as virtual networks. A good example is the fact that ISDN can be defined as broadband communication but it is physically transmitted over the old copper-line based physical tele-lines which can be defined as narrow-band. Present trends include using the electrical lines, cable-TV networks etc and the field is developing rapidly.

Mobile phone communication (=cellular phones) is the most common form of person-to-person distance communication technology not using a physical line. At present, the mobile transmission technology is offering a limited form of picture communication between users which in a way means that the newest cell-phone models are a type of portable videotelephone. Most of the mobile communication is transmitted through land-based networks based upon a rapidly growing number of transmitting poles or towers. A small part of the communication is transmitted over satellite.

There have been four main technological trends during the last decade for the audio-visual distance-communication technology if we use that concept as an umbrella term.

1. One trend is the one exemplified by video-conferencing where the communication is used as an intended cost-effective means to giving courses and supervision sessions over great distances, thereby saving travel money and work-time. All over the world there has been a great expectancy that video-conferencing technology would develop into a common form of interactive class-room technology. The results are so far quite contradictory.
2. Another trend is the telephone-related interpersonal technology exemplified by the usage of videotelephones. Since the technology has been very expensive, developers have tried to create cheaper systems by building monitors into telephones or creating special graphical processors and cameras for videotransmission in a common personal computer, thereby creating the concept desktop videotelephony.
3. Portability is another trend where the desktop systems can be seen as one example and the cellphones with built-in cameras as another.

4. The fourth and final trend is the trend to use the Internet as the main network for videotelephony as any sort of computer-based digital communication form, where it is possible to get software for using your computer as a simple videophone over the Internet, in combination with a compact (and cheap) camera (= web-camera) as a peripheral.

The most complicated thing today when we discuss the technology is not the hardware we use. We have telephones, cameras, PC:s, videophones etc and they are fairly understandable even if the multifunctionality of the technology sometimes causes us problems. As users we have difficulties in optimizing our usage and understanding of a complicated technology which in many ways corresponds to our thinking.

The most difficult thing is to understand the concept of the “net” or the “network”. We have physical nets consisting of the lines that transmit our telephone calls or LAN:s transporting data over short distances between computers. We also have nets using radio-waves, in other words non-physical but airborne nets. We also have computer nets where the concept net takes on another and more abstract meaning. We also have nets within nets as when we talk about THE Internet and within the Internet we talk about nets, meaning groups of people joining together in a form of common interaction. We also use the word net when we talk about the form, speed and structure of the communication like ISDN as a technical standard for data transmission. Language is going through a very rapid development in this field. However, in this report we have no intention to try and make a list of new words in this field or to make any deeper speculation on the processes involved in this socio-linguistic process..

A different kind of trend which might be described as ergonomic, has been the trend to look upon the technology as an extension, of the body as well as of the communicative space between people. This trend is most clearly described by the two words telepresence and virtual reality. In the former concept lies the intent that we all are present in a room which is non-physical but spatial in the sense that we meet through more senses than just one. In the latter concept lies the intent that we create not only a (new) room or arena but in a sense new selves in a common arena of our own choice. In both cases the result and the expectation is that our interaction becomes alleviated by lessening demands on physical transportation which has been the main pre-requisite for direct communication until now. In the extension, our ideas on direct and indirect or mediated communication might get a new content.

The concept *net* is in other words vague and nebulous and hard to grasp and we have been careful in this report in our usage of this word. We will use the word communication to describe what is happening on the level of the Internet, that is, what we do with the system as users when we interact with each other or the computer itself. We want to call this the content-level. We have used the word transmission to describe the (physical) dataflow-level which in a way might be called the form-level. If we look at networks as belonging to either of those categories it might become a little easier even if the form-level can be physical as well as non-physical, even if a dichotomy like this always has to be considered as an oversimplification.

4. TELEMATICS AND DISABILITY State of the Art

We were discussing different trends in the earlier section three. We were describing the difference between videoconferencing as a one-way collective communication tool and videotelephony as a more interactive two-way form of communication. Another way of describing this is to use the words official and private communication as a dichotomy which is valid also for disability-related technology in general as well as for technology, even tool-using in general. There is always a public dimension to the usage of a tool as well as a private. There is also an interactive, as well as a non-interactive dimension to tool-usage in general.

This certainly is valid for disability applications for telecommunication as well. The last two decades have given birth to a large number of telematical applications connected to disability all over the world. The text-telephone for people with deafness or speech or hearing difficulties is probably the oldest and most wellknown application as well as specific tool which might be called a telecommunications disability aid. It can be found all over the world and there are international standards for the form and transmission rate of the communication. We should remember that the birth of the telephone came as a trial by Bell to invent a communications aid for a person with hearing problems, his wife.

This probably explains why people with hearing problems have the most technical telecommunication aids to choose from today. Even when the visually oriented distance technology comes, the one group which has found it easiest to accept videotelephony for their own use is the group of people who use sign language. There are many reports available in the world today from using videotelephony between sign-speakers in the world (see the reference list).

For other groups with special needs or disabilities telematics has not been so evident. People who use Braille can use a point-writer as a terminal or get tactile or haptical aids connected to their computers while connected to the network. Some interesting work in this field has been done in Canada (Treviranus, 2000) and also earlier at Trace Research Institute although in the latter case, not specifically in connection with telematics. So far, the main senses used in telecommunication are vision and hearing. The rest of the sensory channels have to wait for new applications in the future.

For people with motor problems, there are many different ways of controlling communications systems with your voice or different types of non-impaired muscular activities and many telecommunications systems today contain self-explanatory software, describing functions and usage in a way specially adapted to people who might need special assistance.

So far we have focussed on the private form of telecommunications technology where there are a number of tools and aids with different functions, according to your needs. However, if we look at the public side of it all we are discussing standards for constructing different types of technology, including networks and systems. From that viewpoint we can see that the Internet as a communications system and the broadband technology as a transmission system are the two most interesting components when we discuss the public aspect of telecommunication and disability applications.

Broadband has been promising all users unlimited speed and volume over any net for several years. The first generation of computerized telecommunicators had to be satisfied with slow terminals or computers with slow modemes with a capacity far below today's widespread everyman's broadband connections which we still feel are quite unsatisfactory when we want to find our way around the Internet a bit quicker.

In the disability field and among the public or official systems the usage of e-mail has been the great continuation from the earlier computer conferencing systems which were very popular in the eighties and early nineties – pre-Internet. Today, Internet offers

- information
- chatting
- person-to-person private contacts through e-mail
- commercial exchange
- personal service

These applications about cover most basic forms of human communication even if the physical part of it leaves much to be wanted – yet. It is possible to get in touch with not virtually everyone but quite a lot of people around the world today if you have the right tools to compensate for a possible disability. It is also possible to find an amazing array of information about everything and nothing or general and highly specific information and you can also become part of communities of different sorts. The only thing that technology has not been able to solve completely is the problem of money. All the fancy technology costs and many specialized disability applications cost extra and when you have a disability you are not often the world's most wanted worker. A good example of this is the true story related in a very recent communication in one of Internet's many specific communities where a spouse is telling the story of her husband who is fired immediately after getting back from hospital from a stroke, and asking for support from others on the net on how to deal with the situation.

However, computer-based tools have dropped in price very quickly so that it relatively speaking is not impossible to get access to computers in many but not most places in the world. What has not necessarily dropped in price is the services that we find through the Internet for instance. Telecommunication costs in terms of time and usage and not so much in terms of getting tools. So, we do have an economical problem which is quite sizable if we put it on a global level.

Since a lot of the access to public service and to society in general is available over the Internet we get a large problem of democracy if people in many parts of the world cannot afford access to the computer-based communication-systems like Internet. The so called third world which means the larger part of Africa and half of Asia will probably not get this access for a very long time, if ever. At least not if we by access mean that every single citizen should have the right to this. Since many of the countries lacking these possibilities are lacking a working infra-structure in the form of developed and trustworthy physical networks for transmission, maybe the development of more mobile communication systems where the mobile cellphone will become a central tool of hope.

A more optimistic vision is presented when we look at the more under-populated areas of the world like the far northern or southern hemispheres where countries like Canada, Australia, the

Scandinavian countries etc have created infra-structures with a lot of telematics to support medical and educational services. Distance education is a very widely spread concept in those parts of the world and there are many different projects for giving special services to people with disabilities using telematics, including our own (Brodin, Magnusson, 1993-2002).

In Sweden one of the most recent projects for people with speech problems is a public service called Taltolk (Speech Interpreter) where a person can get interpretation support over the telephone or the Internet, with sound or visuals when making contacts with official institutions or private individuals alike.

In several countries the medical services are trying different forms of outsourcing their services under the common name of telemedicine which also can include supervision and direct education. We have found projects in the US (Trepagnier), Canada (Treviranus), Norway (Flydal), Sweden (Brodin, Magnusson), Austria & partner countries (Zagler), UK (Leal), Australia (McCaul) just to mention the more wellknown examples where videoconferencing or videophones are used in direct contact with the end-user, the single individual with a disability or another type of medical problem.

To conclude, We think it is correct to say that the computer is the basic telecommunications tool for any citizen in the industrialized countries today, with or without disabilities, where the computer is the main access tool to telematical services.

5 ASPECTS ON VIDEOTELEPHONY

Videotelephony as a private and interpersonal tool for communication and videoconferencing as a more public form of communication tool are the central concepts for the present as well as for the earlier study. Although they may be physically very similar, the conferencing systems in general are larger and not built upon a standard PC and more often using more powerful ways of communication like multichannel ISDN or different types of megabit-nets, or even gigabit-nets. Since the more powerful nets are covering limited areas in the world, access to the more qualified forms of videoconferencing is also very limited. However, the technology is worldwide and it is very common within the medical as well as the educational (= universities) systems in the world that videoconferencing is used in lectures or even in diagnostics (Fulmer & al, 1996).

Videoconferencing is till the more common tool described in reports on research and development meaning that the person.to-person type of communication which is covered by the videophone technology is less investigated. The reason for this is probably purely economical. To develop a new technology you need sizable areas of application and it stands to reason that developpers and evaluators (=buyers) alike, try to include as many users as possible in their trials. And the largest groups of users can be found in group situations, for instance in classroom situations. No surprise then that most trials in this field have been focussing on using the technology in educational settings.

The videophone, however, definitely exists today as an available and usable commercial product on the market. It has developed in two different directions, First there are several models with

large or small monitors with the single function of being a telephone for audiovisual communication, mostly built for ISDN or direct computer-connection. The first models on the world market were developed for narrow-band use by companies like the American AT&T, the British Telecom or the Japanese Panasonic. Today, there are several models available on the market and most models tend to prefer a small monitor of a few inches' size.

The second direction is the one where the videophone function is integrated into the computer. The first models came from companies like AT&T or PictureTel and were intended for ISDN with special graphical processors and ISDN-cards added to the computer. Today, a PC is constructed with those graphical facilities as standard and most solutions are built upon the usage of the Internet as a communication arena. When you buy a PC a small so called web-camera is included, thereby pointing out that the picture handling is meant for Internet, where there are special areas with programmes for direct audiovisual communication, even for just watching something. The quality is very varified.

As already mentioned, there are already mobile-phone based videophones on the market.

5.1 Adaptation of Equipment, General Aspects

The opinion of most users of either video-conferences or videophones today could very roughly be summed up like this:

"It's OK but it could be better, much better".

This is a very blunt way of describing the basic problem of lack of capacities for the systems. Picture transmission is extremely demanding in space over a common (physical) network. If we compare the capacity of a common broadband system for Internet or videophone communication with the networks used by a TV-company we are talking about very large differences. Since TV-watchers are accustomed to the quality of TV, even digital TV, the visual quality of a common videophone call is at its best second-rate albeit functional. This basic ergonomical problem will probably last for another decade before resolved.

Another problem is the correlation between actual seeing and what the camera picks up on the other side. In the physical meeting all participators are in control of their own perception in the sense that the room or common space is "senseable". In the videophone call there is the limitation of the camera which makes it difficult to define the common "room" in the same natural way. A related problem is the awareness of your own physical position in relation to the person you are talking to. In general, there is a problem of shared awareness which can be defined as an ergonomical problem.

5.2 Social Aspects

New telecommunications technology will contribute to social and sociological changes. One major consideration we have to make is the fact that technology for a certain means may be available but only within limitations, for instance economical ones. During the last decade, enormous amounts of money have been spent to establish distance-education and telemedicine, where videoconferencing is a major tool.

Since videotelephony still is considered as being on a pilot stage, many applications are in the forms of evaluation projects within specific contexts. The development indicates that physical meetings between teachers and students at college level or in professional developmental courses tend to become fewer and that travelling to the place for a course is no longer 100% necessary. Although no general studies have been performed, it can be presumed that the percentage of lectures that are performed through a videoconferencing system is very small in comparison with the total number of lectures at college level. A hybrid-form is the one where physical lectures are recorded on video and then distributed on cassette to students directly or to schools and work-places. However, the old type of distance education through correspondence institutes have largely been transformed into Internet-based courses.

Videoconferencing in Telemedicine seems to be at a similar developmental stage as videoconference-based lecturing. One difference is the greater need for immediate and acute interaction between cliniques regarding specialized diagnostics, including transmission of data like X-ray pictures. Person-to-person diagnostics is still very limited in its usage.

Special forms of videoconferencing and videophone technologies have been used to a lesser extent in legal and political environments, for instance in witness-protection or in making it possible for a politician to simplify local representation at central meetings. Videoconferencing seemingly adds to existing patterns without changing too much the form of education or professional customs. Here the technology connects to existing television broadcasting structures.

Videotelephony, however, could change a lot of behavioral patterns between individuals. Telephone communication follows patterns today which have been established during a century where we keep a certain distance since we never see each other and never really get the feeling that we meet. According to Hugh Miller at British Telecom (1993) this will change since the real problem of videotelephony is “... *that although you can stop others from seeing you, you have to have an acceptable reason for doing it, and you have to find a way of doing it without giving offence.*”

Visuals will add to the feeling of a real physical meeting where there are more definite rules established for communication and where it is important to establish borderlines between the individuals involved in interaction. To put it very bluntly, since we all become closer the more senses we use in interaction, we have to think more about the way we interact.

Sofar, very few large-scale studies on videophone interaction between individuals in society have been performed. Miller also reports on a study made in France already in 1990 where 1.000 families were offered the use of videophones at home: “ *in 1990 Francis Jaur, guiberry of the University of Pau reported on a study in Biarritz, in which more than 1000 videophones were used in private homes. This showed how people reacted to the possible intrusion of the public world into their private space. They found a compromise. Performance on the videophone was public: the instrument was often put in one of the more public spaces in the house - the hallway, the main living room - and many members of the family would "drop in" on the calls, but the calls tended to be made within the extended private domain. The videophone was used for calls to family and friends, people you don't mind being seen by just as you are. Other calls were made by ordinary phone. One feature of the videophones used was that the number of the caller*

was visible before answering, so people were likely to know who was calling before they chose to answer”.

Probably videophone-usage is inevitable. All our meetings do not follow the same patterns and we will welcome choices for distance communication as well as in eye-to-eye communication. When interacting with certain people you watch each other, you hug, you kiss the cheeks, you combine audiovisuals with touch. In other forms of interaction you just exchange a formalized message, maybe one sentence which could be printed or said. The videophone will simply enrich and enlarge the possibilities of the private communication forms.

5.3 Psychological Aspects

Little work has been done in the psychological field regarding picture-based distance communication. We have only found several reports analyzing psychotherapy over a distance and in a telemedicine context (Ball, 1992, 1995; Gammon, Bergvik, Bergmo and Pedersen, 1996; Yellowlees, 2000; Day, 2000; Kaplan, 1997, 2000; Mielonen, 1999). A study with a psychological approach is a study on the spoken aspects of videotelephony (O’Conaill & al, 1993). No broad studies on the psychological effects of videophone usage are available even if one can assume that there will be added emotional demands on people in distance communication when they have to be seen and to see other people. We have found studies on videophone communication in palliative care which really is more of a telemedical application (Elsey, 1994) and also a study on this type of support in persuasion (Ferran-Urdaneta, 2001). There the author finds support for the assumption that it is easier to persuade someone when you have the added sense of vision.

5.4 Medical Aspects

Medical aspects on picture based remote communication are found in several reports. The number of 125 references found in the database Telemedicine Exchange on the keyword combination video conferences (see above) is a clear proof of this. A popular application is to analyze X-Ray pictures transmitted from a distance over various networks which was exemplified in our earlier report. In general supervision, education or training and diagnostics are common videoconference-based medical applications and the term telemedicine is very closely connected to videoconferencing. Among the telemedical applications there are quite a number who focus on stroke-rehabilitation which is not so surprising since Stroke is one of the most common of illnesses or disabilities, whatever perspective you happen to prefer. The reference list contain several examples of reports from projects and departments where there is work going on evaluating videophones as tools for professional support or supervision (Levine & Gorman, 1999; etc.).

5.5 Educational Aspects

Several reports describe various experiments and methods for education. This is probably the most common field of applications for videoconferencing. Norway is one of the first countries to really use videotelephony in distance education. One of the earliest actors on the videoconferencing or videophone market was the Norwegian Telecom and Tandberg company

which developed a Tandberg videophone which was one of the first commercial videophones on the open market and which was used extensively in many projects for several years from the late 1980's. One early project of cooperation was the ChalNor-project which studied distance education from a Nordic perspective (Ödegaard, 1993) and which was closely related to the later Fresko-project which in many ways became the major videophone-project in the Nordic countries and presented a framework for educational usage of the videophone in Norway (Frilseth, 1995, 1997).

The Norwegian experiences were among the first and there are similar projects in other parts of the world, for instance in Canada (Shale & Kirek, 1997) or UK (Robinson, 1997; Smith, 1997; Leal, 1997). However, educational studies have seldom focussed on videophone/videoconferencing technology, rather on distance education in a more general sense. When videoconferencing has been analyzed or rather described as an educational tool it has mostly been within telemedicine where it is commonly accepted to use this technology in lectures for many different groups. In the reference list we have collected some representative examples. The text book on the "teleclass" might be mentioned as a very clear example of literature and although it is 10 years old it is still valid (Ostendorf, 1993).

6. VIDEO TELEPHONY AND DISABILITIES

In this chapter the subject is divided into sections with regard to disability. In some cases we have chosen to categorize the content with regard to their primary focus and disability, but sometimes they could have been found under more than one heading. People with mental retardation e.g. often have additional problems, but the projects are presented according to the main disability which is mental retardation. We have chosen to describe projects or activities which we see as representative and there is no ambition to cover everything.

6.1 Disability in General

The early initiatives which were described in the first report have given birth to new projects in the last decade. We would like to mention a few initiatives with a general disability focus.

In the USA there are several initiatives for people with disabilities within the Telemedicine framework. In 1993 Grigsby and colleagues presented an extensive analysis of the needs of medical services by people who lived in rural areas and the general need for what was called telemedicine services. The report is one of the major analyses in the USA and it pointed out that telemedicine as a concept had existed since the early 1950's. During the years afterwards we have for instance seen in Missouri the Missouri Telerehabilitation Training Program (www.telerehab.net/) or the Shepherd Center's Telerehabilitation Program. In both cases the focus is on professional training and supervision and exchange of diagnostics and not directly on contact with patients through the new medium.

A similar focus can be found at the Bloorview Remote Rehabilitation Project in Canada or the recent Telenet-project in the UK, where centres working with children with disabilities were connected.

In Canada the Resource Centre for Academic Technology at the University of Toronto has been involved in several projects where the goal is more consumer-contact focussed. The aim of the centre is to make technology understandable and usable for end-users, especially for people with disabilities. One special project worth mentioning that was initiated from this centre was project PEBBLES with the robot-like videophone for children having to spend some time away from home and their original class while going through periods of treatment (Weiss, Whiteley, Treviranus and Fels, 2000). This work is a clear example of the proximity between videophone applications and the field of virtual reality. Additional works from the centre will be found in the reference list.

Finally we would like to mention the work on the many facets on using videophones in rehabilitation at the Department of Psychology at The Catholic University of America, in Washington, DC where a major framework with the videophone in focus has been built up during the last five years. The focus is on stroke-related therapy, autism just to give a few examples (Trepagnier & al, 1999). Additional references from the centre will be found in the reference list.

6.2 Mental Retardation

To use a telephone may be difficult for many people with mental retardation due to cognitive, operational and sociorelational factors. Being mentally disabled means having an intellectual impairment which affects the ability to understand concepts connected with time, space, quality, quantity and cause. A person with mental retardation has a more concrete concept of reality than normal. The difficulties are related to the way perception, guiding and symbolizing of the thoughts are structured and to memory functions. Few studies have been carried out regarding people with mental retardation within the telecommunication area and most of the work has been done in Sweden and Portugal.

The work in Sweden at the Stockholm University and the Stockholm Institute of Education has included pilot trials with telefaxes, still-picture telephones and videophones and the focus has been on social and emotional development. The projects have also focussed on the usage by the end-users themselves (Brodin & al, 1996). Additional references will be found in the reference list.

6.3 Motor Disability

Although most experiments in videotelephony for disabled people mention people with motor disabilities and conclude that their needs of distance communication is great, not very many videophone experiments concentrate on the problems of primarily motor disabled people. Two reports in Norwegian are excluded because their content is well covered in the two last parts of this section. The Pebbles project might be said to represent children with motor impairments. Within telemedicine, work on gait analysis using videophone could be mentioned as a valid area of interest (Winters, 2000).

6.4 Hearing Impairment

This is the area where the most as well as the oldest experiments in the field of videotelephony are found. In all places where videotelephony has been evaluated as a tool for persons with disabilities, the main and first question seems to have been: in what ways videotelephony could facilitate the distance communication for hearing impaired and deaf persons. Since the field is so well established we will simply focus on two areas:

Swedish projects together with the user organizations have dominated the field since the mid 1980's when the then future videophone technology was perceived as the possible inheritor to the text-telephone. The early 1990's were full of projects, often in cooperation with the Norwegian Telecom and by the late 1990's we might say that videophone communication had become an established complement to the text-telephone (Delvert, 1997 a&b). As late as 1997 a literature survey related to the one we made in 1993 was made, focussing on the hearing disability needs of video telephony (Revelius, 1997). That survey, however, excluded a lot of the references not dealing explicitly with hearing impairment, including our own initial survey.

Australian projects – In 1997 a final report was published (McCaul, 1997), summing up a large project covering the Commonwealth of Australia and developing and evaluating the same type of services and resources as had been done in the Scandinavian and Swedish projects (see above). The aim was to provide communication resources for end-users and to build a general communication network in the same way as the usage of text-telephones.

6.5 Speech and Language Impairment

This is an area where very little extensive work has been done, yet. A few experiments with still picture telephony and fax communication as well as experiments with graphical text and symbol-based distance communication were the only experiments in the early 1990's. Language impaired persons such as people with Aphasia have however been in focus in a couple of projects since then and in that area, speech and language impairment seems to be subordinated to the more general concept of stroke, for instance in the work which is being done at the Catholic University in Washington DC. It is also worth mentioning the trials made in Germany early in 1993 (Peters, 1993).

We would like to point out three projects:

VITSI, TELELOG and related Swedish projects were among the earliest in the world to evaluate videotelephony for language and speech impaired persons, especially people with Aphasia (Magnusson, 1999/a-c). Between 1992 – 1999 there were several projects looking at professional exchange (TELELOG), Therapy (VITSI) and interchange in general for people with Aphasia (Videotelephony for people with Aphasia). During the last few years, videophones have been added to the lists of free technical aids in several county councils in Sweden.

The RESORT-project, which started in Austria was partly directed towards the same groups even if the focus was evenly directed towards stroke-patients and their general rehabilitation.

In Denmark a new project called “Ansigt til Ansigt” (Face to Face) has started recently with the explicit intent to study language therapy using videophones . The project will take place in the county of Northern Jutland.

Furthermore, several experiments have been made in the US as well as in Sweden and other places, focussing on stroke diagnostics and supervision (including Aphasia support) using the technology. Several examples are found in the reference list (Scheideman-Miller & al, 2001; Tran & al, 2002, etc).

6.6 Elderly

In Finland the work has continued which was started in the late 1980’s, especially for home-care services in the northern part of the country (Ekberg & Salminen, 1996; Mielonen, 1999). In Sweden the European project Action has led to a very succesful pilot trial using videoconference systems as a tool so help care-givers to be in constant contact with elderly people living at care centers (Magnusson, L. 1997).

7. CONCLUSIONS

It has been our intention to illuminate and focus on the need of new and pertinent information in this dynamic field. The ambition of the report has been to select the most useful references about videotelephony and disability published during the last 10 years as a compliment or update to the earlier report. The data has been collected from some of the most frequently used and largest databases in this area as well as from lists of already published reports and articles and of course the Internet. We have largely excluded reports from related telematical fields or reports of a more specifically technological nature since we find that this field we have chosen to call the videotelephony field does exist in its own right today.

We have excluded all references available before the year of 1993 which has become the borderline. Our main intention has been to create a tool of relevant information and knowledge for all those who are working in the field of picture based distance communication with an empahis on videotelephony and disability. We welcome contacts from people working in the field or from people who are interested in the field and most of all we welcome additional information.

Although we have discovered several projects and trials from diferent places in the world, the quantity of trials is not so large as might be expected from a presumably expanding part ot the so called synamic IT-area. One explanation which we have touched upon is the fact that the technology still is far from optimal which means that all trials, reports and papers experience the technology as unfinished and in other words all usage as pilot usage. In other words, we feel that most people who work with videotelephony experience the technology as not having come of age yet. Maybe a future update of this report in another ten years will show a vastly different result.

However, in the face of the rapid development of the Internet, it is probably realistic to assume that reports of this nature might become outdated since the search structures on Internet in a way presents a sort of report structure as an integrated function of the system..

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