



EUROPEAN COMMISSION

DIRECTORATE GENERAL XIII

Telecommunications, Information Market and Exploitation of Research

Technological developments relating to telematics applications (networks and services)

Telematics for the integration of disabled and elderly people

Brussels, 21st March 1995

Background to the Workplan

FOR THE IVth FRAMEWORK PROGRAMME

TELEMATICS for the Integration of Disabled and Elderly people

(TIDE)

BASED ON THE WORK OF THE TECHNICAL PANELS

(FEBRUARY-APRIL 1994)

AND

A WIDER CONSULTATION WITH SECTOR ACTORS



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PREFACE

This document is based on the views of the technical panels which met during February, March and April of 1994 to collaborate on the specification of the work of the sub-programme 'Telematics for the Integration of Disabled and Elderly people' in the IVth Framework Programme. 69 experts from the rehabilitation technology field met three times, each time for three days, to produce the overviews and tasks given in chapters 3, 4 and 5. The experts came from all the major sections with an interest in the sector, including major ICT (Information and Communication Technology) industry, SMEs, research and rehabilitation institutes, government organisations, universities and user organisations. Experts came from both the Member States of the European Union and from the EFTA countries. Commission staff from DG XIII, XII and V also participated.

The work was structured into five major areas within two key action lines, with panels considering each area and developing the several subareas identified in each. A main panel considered accompanying actions.

Following the planning exercise this document was circulated to a larger number of experts as well as the representatives of the Member States on the TIDE Expert Committee for comment and suggestions. Following the approval of the Telematics Applications workprogramme by the ad-hoc programme committee, this document was edited to bring its content into line with the workprogramme annexe. This largely involved bringing the support actions into line with the workprogramme annexe since a number of the support actions suggested should now be carried out at the Telematics Applications programme level rather than at the sector level.

1. OVERVIEW

1.1. Introduction

Older people and people with disabilities are a large and growing proportion of the European population. There is a large overlap between these two groups since disability is strongly related to age, with 70% of people with disabilities being aged 60 or over. In the Member States of the European Union the number of people who are elderly and/or disabled is estimated at between 60 and 80 million. The changing European age structure means that by the year 2020, one in four of the population (25%) will be aged over 60, and the largest increase is expected in the oldest age groups (75+) where disability is most prevalent.

People are regarded as disabled if they suffer from impairment to the extent that they have difficulty in leading independent lives without additional help in the form of personal assistance, specially adapted environments or practical aids to daily living. Older people do not automatically fall into these categories but with advancing age, increasing numbers of them do so. This is reflected in the use of technical aids. Figures from Norway, for example, show that about 70% of users of technical aids are aged over 70. Many older people do not see themselves as disabled yet may have a combination of minor impairments and may require some support with daily functioning. It is a major challenge to the European Union to maintain and improve the quality of life, integration and independence of these citizens, as well as to contain the associated rise in the cost of care. Technology can play an important part in responding to this challenge.

Technology can directly, improve the quality of life for older people and people with disabilities by helping them to lead fuller and more independent lives. It can also improve the efficiency and effectiveness of the services provided to older people and people with disabilities and so help contain the cost and improve the quality of care. Technology can facilitate the achievement of everyday goals and activities, can compensate for impairments, and can help people realise their potential. However, technology is a double edged sword since it can also exclude and disadvantage elderly and disabled people by failing to take their needs into account. For example, new video communication services can help to provide remote care and more social interaction opportunities for older, housebound people, while in contrast the new GSM mobile telephony wavelengths cause considerable disruption including painful, noises to some hearing impaired people using hearing aids. Access by elderly and disabled people to generally used technology and technology based services is a major issue in enabling and facilitating their integration.

In order for technology to serve the needs of older people and people with disabilities it is important that their requirements are taken on board throughout the technology development process and incorporated into the development of all equipment and services available in the market. This involves the application of the 'universal design' or '**design for all**' principle. Application of the principle can help ensure that general consumer products and services can become accessible to and usable by as large a grouping of people as feasible, including disabled people and people with disabilities. Thus the market for such products and services is enlarged. Not surprisingly, costs incurred in the application of the principle are usually covered since a wider market can be addressed.

In addition to the products and services available in the general market which can service the needs of older people and people with disabilities, sectors of these user groups create a demand for specialised technologies which address specific or particular needs. This requires the development and production of so-called 'assistive devices' which are of two main types. Firstly devices, interfaces, specific adaptations etc. applied to products and services available in the general market and which allow the disabled and elderly user access to mainstream facilities despite his/her specific functional limitation. Secondly, products, services, stand-alone systems etc. for the specific compensation of limitations in vision, hearing, mobility, speech, cognition etc. experienced by some people with disabilities and older people in their daily lives i.e. at work, study, leisure, communication, in the home.

Accordingly, Assistive Technology is defined here as *technology which can help compensate for functional limitation, facilitate independent living and which can enable older people and people with disabilities to realise their potential.*

The scope of the TIDE programme includes research and development into products and services which are targeted towards the general market and which can assist older people and people with disabilities fulfill their needs, maintain their independence (design for all); devices and interfaces which render products and services available in the general market accessible to users with functional limitations and dedicated technologies and stand-alone systems for the specific compensation of sensory and cognitive limitations (assistive technology). The application of the 'design for all' principle requires a profound knowledge of the needs of disabled and elderly people and the way technology can meet these needs. This knowledge has been built up over many years by assistive technology experts.

The European Commission, in consultation with experts from industry, universities and user organisations in the Member States, has come to the conclusion that using advanced technology to provide equal access to telecommunications, information and control systems for all people is both a social goal supporting the full integration and equal rights for all European citizens, as well as being desirable from an industrial and economic viewpoint. The fragmentation of the European market, the scarcity of resources across the Community, particularly human resources, along with the social and economic imperatives, together require a collaborative action at Community level. The Commission initiated the TIDE (Technology Initiative for Disabled and Elderly people) action in 1991 with a pilot phase of 21 technology development projects and a major study of rehabilitation technology in Europe. The pilot phase demonstrated that the sector actors were willing and indeed eager to respond to the challenge of the internal market. In 1993 the Council approved a further phase of TIDE¹ to bridge between the pilot phase and the IV Framework programme. With a budget of 42 MECU the TIDE bridge phase is supporting some 55 projects, horizontal actions and accompanying measures. This present document is intended to extend the work and maintain the impetus generated by TIDE.

¹ Council decision on a Community technology initiative for disabled and elderly people (TIDE) 1993-1994. OJ L240/42 of 25.9.1993.

1.2. Issues and opportunities

The challenges and opportunities facing Europe in the field of rehabilitation technology can be considered at three different levels;

- The level of **society** faced with rising costs and demands for care.
- The level of **market and industry** striving to overcome the present fragmentation.
- The level of **user groups** and the quality of life for individual European **citizens**.

These three levels are analysed in more detail in the sections following.

The demographic imperative; containing the rising cost of care.

The structure of the population of the European Union is expected to become increasingly elderly. This will include a notable increase in people aged over 75, which brings an increased probability of disability, typically resulting from several impairments (visual, hearing, speech, cognitive and motor). In contrast, there will be a reduced proportion of younger people to act as carers and to finance the social security systems, and so the ability of society to staff and fund care for elderly and disabled people will be much reduced. In the past the burden of caring for elderly and disabled people has fallen particularly heavily on women, however their changing role, including increasing participation in the workforce, means this is unlikely to continue.

Other factors increase the rate of disability in the population, including better survival rates resulting from improved medical practice. One unfortunate example concerns increased neonate survival under 27 weeks of pregnancy but with a 60% probability of disability.

The actual cost of care is strongly related to age and disability. For example, in medical care it is estimated that if each person under 65 each cost one unit per head per annum, then the 65 to 74 age group cost 6 units per head, while the 75+ age group cost 11 units. The projected demographic changes suggest that the major rise in costs will be from increased numbers of old people. Technology which can enable people to overcome disability and solve functional problems in the activities of daily life can reduce dependence and so help contain the rising cost of care, particularly expensive residential care. It is important to the social and economic future of Europe that the technologies and the technology-based services that can help contain the cost of care are developed now.

The industrial imperative; improved competitiveness in a coherent market.

The rehabilitation technology market is potentially very large but very fragmented. The fragmentation of the market is mirrored by the fragmentation of the industry, characterised by SMEs addressing particular disabilities with a very small portfolio of products at a regional level. The market and industry are fragmented in several ways at present and this leads large industry to effectively ignore such markets on the grounds that they are too small to be of interest. Factors implicated include:

Fragmentation of technical areas: Rehabilitation technology is based on technologies coming from many sectors, including telecommunications, information technology, control technology etc. What distinguishes rehabilitation technology is

an eclectic, multidisciplinary approach using base technologies from a variety of areas. This is difficult to achieve but necessary for the integrated solutions and extensions to mainstream technology which are most useful to solving functional problems of daily living.

Fragmentation by impairment: Rehabilitation technology products tend to address one impairment or solve one functional problem. This emphasis on micro analysis leads to 'micro-solutions', ignoring issues of multiple problems or multiple impairments. Different technical solutions may be required for people with similar impairments but different task requirements. Furthermore, solutions may address more than one problem; for example, speech synthesisers can be used by blind people to access computers and by people with speech impairments to participate in conversation.

Fragmentation through regulation : National regulations and standards such as in the health and safety area have a strong effect on the market since they tend to vary by country. Reimbursement lists regulate items for which purchasers may be reimbursed by public or insurance bodies and have tended to favour local products and particular types of products. Getting onto lists has been time consuming and costly and inclusion on lists in all Member States across Europe has been beyond the means of most SMEs.

Fragmentation through culture: Different European States prefer different rehabilitation technology solutions for different functional problems. Different technologies and different cultural values are prioritised. For instance, in the market for prosthetic hands there are differences concerning the relative importance of aesthetic\cosmetic aspects versus technical aspects such as grip.

The advent of the progressive completion of the internal market is making a huge change to the market conditions as described above. Community legislation including the very broadly drafted Medical Devices Directive² and other directives such as that laying down a procedure for the provision of information in the field of technical standards and regulations (83/189/EEC) will reduce the national technical barriers. Reimbursement lists will need to adopt Europe-wide standards, and as this legislation progressively takes effect from 1996, the larger part of the rehabilitation technology market, which is funded by public and semi-public sources, will become a Europe-wide market for the first time. This creates the larger markets which are more financially interesting to both larger companies and foreign enterprises alike, and provides an opportunity for new entrants into the market.

In contrast, SMEs who now provide rehabilitation technology may find that the consequences of the strengthened internal market are not wholly positive. Exposing them to competition for which they are ill prepared financially, organisationally and technically, may risk losing the strengths and knowledge which they provide. Risks for SMEs are compounded by large enterprises' ownership of patents required for technology exploitation, and by the substantial costs of updating technology to compete.

² Reference OJ L169 of 12.7.1993

An additional influence on the rehabilitation technology market in Europe is provided by the 'Americans with Disabilities Act' (ADA) of 1990. This act empowers a whole series of earlier acts on equal access by people with disabilities, including access to all Telecommunications and Information Technology equipment purchased by the Federal Government (mandatory since 1988). Suppliers to US Government, including European industry, must comply with such provisions. In addition to the US Federal Government, major corporations will follow and adopt such policies, particularly the big multinationals who also tend to consolidate their equipment purchase specifications world-wide. Indeed, major banks were publishing equipment procurement specifications requiring compliance with ADA requirements for the first time in Europe in 1993.

Where Japan is concerned, rehabilitation technology is a sector where the diffusion of technology and trends such as miniaturisation are evident. The Single European Market makes such diffusion more commercially interesting. The Japanese rehabilitation technology industry, per se, is not as well organised as the US industry for historical and cultural reasons, but there is evidence from a recent study of rehabilitation technology in Japan that SME/Corporate cooperation is underway.

It is particularly important to address the field of rehabilitation technology **at this time** because of the structural change in the market environment which is being driven by one major internal European factor - the internal market legislation- and one major external factor - the Americans with Disabilities Act (ADA) of 1990. The net effect of these two factors is to put the competitiveness of the European industry, principally characterised by SMEs with regional or national markets, under considerable stress.

The European suppliers wishing to be competitive in the Information and Communications Technology (ICT) markets should also understand the variety of user requirements and form strategic relationships with 'assistive technology' SMEs to adapt equipment designs. It is extremely important for large companies to recognise that small companies with specialist knowledge of the users are the consumers for their new technology and provide a channel for sales of that technology.

The quality of life imperative; enabling greater independence and social participation.

Following the broadening of the terms of reference for the Community's Framework Programme for RTD under the Maastricht Treaty, there is a duty to exploit the advantages of the single market to improve Europe's competitiveness and the quality of life. This has become a key criterion in selecting the main lines of Community research, and there is pressure from user organisations for suitable technical solutions, and an increased emphasis on equal access to society's benefits as a civil right.

Enabling European citizens through effective use of technology offers scope for restored autonomy, independence and self-determined social participation. Applications of technology and technology services tend to address those with average abilities, yet much can be done to extend or adapt technology to include a wider range of people, particularly disabled and elderly people.

For example, the TIDE pilot phase project AUDETEL (TP169) set out to provide television (TV) access to blind and visually impaired people by using added audio description. Most blind and partially sighted users of TV are aged over 60 and some also suffer cognitive impairment. It was further suggested that commentaries could help sighted elderly people with cognitive impairments to follow what was going on. Providing technical features to satisfy both sets of users is extremely complex (e.g. the amount and level of detail of description to avoid cognitive overload for elderly people, traded off against the demands of younger blind people who want as much and as detailed information as possible). Solving such problems stresses the general need for multidisciplinary approaches to design, clear definition of requirements, and modularisation where necessary to address heterogeneous user groups.

1.3. Rationale for Community research and technology development in rehabilitation technology

The benefits of cooperative research

A number of factors indicate a need for Community level action. In particular, the special history of the development of the Rehabilitation Technology industry and market. The fragmentation of the markets referred to previously, particularly exacerbated by the fragmentation by national regulations, reimbursement lists etc., will change in the medium term of 2 to 4 years. The industry sector actors, many of whom are very small companies, need to prepare to address the larger markets that are resulting from the internal market changes, and require Community level support to face this challenge.

SMEs face considerable challenge and risk in extending their operations to a pan-European level. They lack resources in capital and expertise to market, distribute and maintain their activity across the Member States. They need help to develop European perspectives - understanding cultural preferences, differences in service provision and procurement regimes etc. An important way in which this can be addressed is through cooperative research and technology development programmes at the European level. Cooperation between large companies and SMEs in different Member States will allow SMEs to keep up with the rapid change in materials, techniques, software and microprocessors, and will allow larger industry to find new markets and outlets for their technology.

In addition, clear and consistent user requirements for pan-European products and services are needed by both engineers and marketers, and this requires international cooperation. Taking account of the majority of needs through design for all will provide a wider market for products and services at little or no extra design and manufacturing cost.

Many of the activities of daily life critical to empowering independent living can be supported by new technology assistive devices. Such developments require multidisciplinary, collaborative efforts at Community level since the required expertise is distributed across market sectors and across Member States. Action

must be taken at Community level to attain the critical mass and bring those with the knowledge of user needs together with those who understand the technology.

The development of norms and standards provides for a more 'open systems' modular approach. This allows greater interconnection and integration of devices and services, from Braille displays for computers to smart houses and navigation systems for the blind. Thus a wider range of economic and social activities necessary for daily life are supported by the integration of technology. The overall result of new norms and technical standards on the rehabilitation technology marketplace should be to improve the effective coverage of handicaps through integratable technology and to reduce prices. It is not always immediately apparent which norms and standards need to be developed or influenced to improve access by disabled and elderly people. For example, the TIDE pilot phase project CAPS (TP136&218) has been fostering the definition and implementation of the European Interchange Format (EIF) using ISO standards to facilitate the exchange of electronic newspapers to make them accessible to people with visual impairment. This work is now having some impact on the European and non-European publishers and is being well accepted in the USA. The prenormative work required to develop the appropriate new norms and standards is well suited to a Community research and technology development programme.

The internal market requires new relationships to be built where separate commercial interests must form partnerships, particularly in the European Information and Communications Technology (ICT) industries, to exploit new opportunities. Specialist SMEs, the ICT industry, the research institutes and universities provide complementary expertise. Bringing them together to share expertise to develop rehabilitation technology, and to consider the needs of disabled and elderly people in mass market product design, can be facilitated by Community research and development actions.

A focus provided by the TELEMATICS programme

To maximise integration of disabled and elderly people, their needs must be taken into account by all Community policies and programmes. It is also necessary to provide a special focus for research and technology development applied to the specific needs of elderly and disabled people. Experience in the Member States and elsewhere has shown that without such a focus, the efforts to incorporate the requirements of disabled and elderly people become fragmented and dissipate. Additionally the necessary expertise is scarce and needs to be bolstered and supported through multidisciplinary research. A focus is needed to supply leadership, training and transfer of specialised knowledge. Prior to the IV Framework Programme, this was provided by TIDE (Technology Initiative for Disabled and Elderly people). In the IVth Framework Programme the focus will be provided by the subprogramme on Telematics for the integration of disabled and elderly people which will carry out a number of selected activities, including;

- RTD projects; These will carry out research and technology development work in selected areas with a strong involvement of users throughout the project and with the results validated by them in field trials and demonstrators.
- Accompanying actions and horizontal measures. These will increase the impact of the RTD on the rehabilitation technology sector.
- Co-ordinating and stimulating complementary activities in the Member States. Under the Maastricht Treaty it becomes incumbent upon the Community and the Member States to co-ordinate their activities so as to ensure that national policies and Community policy are mutually consistent.
- Co-ordination with other Community programmes, especially RTD programmes. Complementary activities are foreseen in this field and in a number of other specific research programmes. Close co-ordination will be established with the communications experiments within the ACTS programme, and with 'Biomedicine and health' and 'Industrial and materials technologies', which also aim to use generic technologies, including biotechnologies or new materials technologies, for the benefit of disabled and elderly people. There will also be a close link with the specific programme on 'Targeted socio-economic research', and with the social programme in favour of handicapped people (HELIOS).

All the work foreseen is intended to be co-operative and pre-competitive. In addition it should be pre-normative, that is concerned with accelerating the progress towards standards but not directly concerned with implementing existing or emerging standards. The work should clearly demonstrate European added value since only that work which clearly requires action and collaboration at the Community level is eligible for Community financial support. The work should have exploitation potential and should not distort competition. Each organisation involved acts under its own responsibility and with its own view of the market needs.

Conclusions: A strong rationale for a Community RTD activity now

The principal reasons why a programme of work in Assistive Technology is necessary in Europe now are:

- To support a rehabilitation technology industry with strong potential, but which needs help to improve its competitiveness, particularly in the context of the Single Market.
- To respond to strong international competition, particularly from the US.
- To compensate for the inadequate supply of Rehabilitation Technology products with a good cost/performance ratio.
- To address the growing market or user population for whom Rehabilitation Technology can help contain the rapidly growing costs of care.
- To improve the quality of life and employment possibilities of a substantial proportion of the population in Europe.
- To spread the technology and know - how across the Community to improving economic and social cohesion.

2. SELECTED PRIORITIES AND THEIR RATIONALE

2.1. Objective of the action

To promote research and technological development in the application of information and communications technology for the improvement of the quality of life and socio-economic integration of people who are elderly or disabled and to stimulate the internal market in these technologies.

2.2. The strategic focus and scope of the action in the IV Framework Programme

The strategy to achieve the overall objective of the action, particularly the market aspect, must of necessity pursue three closely related types of technological activity. The first type of technological activity aims explicitly at 'design for all', where the philosophy is to render the mainstream technology appropriate and usable by the widest possible range of the population. The second involves the development of devices, interfaces, adaptations which render mainstream products and services accessible to and usable by people with specific functional limitations. The third type of activity is to stimulate innovative technological applications of more basic building blocks (including hardware, software and methods such as multimedia, virtual reality or opto-electronics, perhaps coming from RACE or ESPRIT) and create new specific solutions contributing to the autonomy and socio-economic integration of older people and people with disabilities. The last two might be termed 'specific approach' or 'assistive technology' approach where the solutions are tailored to the specific and particular requirements of groups of elderly and disabled people.

In the TIDE 1993-1994 phase, most proposals addressed the second and third types of technological activity - the development of specific solutions or assistive devices. In the present activity, whilst the momentum of the work on solutions will be maintained, an increasing emphasis on the 'design for all' approach will be stimulated. This is essential to ensure that the requirements for accessible technologies coming from the disabled and elderly users are taken into account early in the development of new generations of equipment and services. Examples of applications where this approach can be implemented are in the fields of multimedia, virtual reality, advanced user interfaces, and smart houses etc.

The activities in this area are expected to yield tangible results in terms of new devices, new applications of technology and access to existing technology, as well as knowledge of user requirements and of the ways that technology can be used to improve the autonomy and quality of life of disabled and elderly people and facilitate their socio-economic integration. The key elements of the strategy are therefore to:

- Identify, assess and document user needs and requirements.
- Identify and assess technology options.
- Develop both assistive devices and 'design for all' technological solutions.
- Develop technology-based tools to improve the effectiveness and efficiency of services delivered by rehabilitation professionals

- Encourage innovation, multidisciplinary collaboration and technology transfer in the rehabilitation technology sector.
- Accelerate the development of technical norms and standards, particularly those addressing integration, connectability and accessibility.

Activities combining these strategic elements will reduce the general risks that accompany bringing new and innovative technological solutions to the market. This reduction in risk is obtained by understanding user needs, prototyping and understanding how to construct solutions, and by discovering and validating how the technology works in practice and how the user interacts with it.

2.3. Principles

The work in Telematics for disabled and elderly people is expected to conform to the following set of principles which are considered fundamental to the work in this sub-programme.

User Focused principle

Telematics for disabled and elderly people is a user-focused initiative with emphasis on the market and the customer. Users or potential users of the technology to be developed should be involved early and appropriately in all projects. Projects should deliver statements of end-user requirements and clarify the anticipated benefits of the technical solutions to their end users. All projects are expected to validate their results with users. Projects should take into account the level of acceptability across Member States and cultures, and should strive for Pan- European solutions.

Market Oriented principle

Assistive Technology developed under Telematics for disabled and elderly people must have clear market orientation. Projects should emphasise exploitation of Single Market opportunities. Whilst the R&D is pre-competitive and pre-normative, projects should have a clear vision of the market for the technology in order to commercially exploit their results. Technology developments should be closely targeted to identified customers, and so understanding and satisfying user needs and desires are essential objectives. The market oriented approach is critical to developing the market for Rehabilitation Technology and to competing in the single and global markets. Projects should seek to develop prototype products and services with good commercial potential in a competitive environment. Projects are required to explicitly describe the market segment (or potential customer base) which their technology addresses, and partners will be required to submit plans for exploitation of the results of the project. Projects may request that the detailed information on exploitation plans be kept commercially confidential.

Technology Adaptation and Innovation principle

Assistive Technology developed under Telematics for disabled and elderly people must make best use of mainstream technology development and standards. The emphasis is on adapting existing technology where this approach is feasible and cost-effective. A further emphasis is on injecting the disabled and elderly user requirements into mainstream technology development and standards where this may satisfy the needs of these customers (the design for all approach). Whilst the development of new basic technology is not ruled out, a very strong case for this would have to be made to show there is no more cost-effective alternative through adapting mainstream technology. It is important, therefore, for projects to show the positioning of their intended Rehabilitation Technology development with regard to industrial and international norms and standards. Projects will also be expected to indicate where contributions could be made to standards resulting from their work. Projects should recognise that accelerating the formulation of standards in Rehabilitation Technology is seen as a major result of the subprogramme addressing Telematics for disabled and elderly people.

Multidisciplinary Approach principle

Assistive technology and 'design for all' require the involvement of designers, rehabilitation specialists, human factors engineers, end users, researchers, manufacturers, and SMEs who recruit and exploit new technology opportunities. The successful development of technology solutions in this area can only occur through the successful cooperation of the contributory disciplines, and projects will be expected to demonstrate an appropriate balance of disciplines to support their particular technology development objectives.

Technology Validation principle

It is necessary for the projects to make an assessment of the rehabilitation technology they have developed within their project. Projects are required to make explicit provision for such testing, reporting the results of testing with users and revising the definition of user requirements where necessary. (Methods and other considerations regarding technology validation are discussed in more detail below.)

2.4. Validation and exploitation

Validation and exploitation are strongly interconnected in the subprogramme 'Telematics for the Integration of Disabled and Elderly people'. Validation is used here to mean the assessment of whether the technology solutions and developments are answering the user needs and requirements - is the technology doing the right thing? Exploitation is used here to mean the optimal usage of benefits and opportunities arising from the work - are we doing all we can with the technology? The results of the technology development projects are to be validated with users in demonstrators and field trials to allow testing of the market and exploitation potential of the system or service. The validation process will focus on user groups, user acceptability and benefits.

It is particularly important to validate results in rehabilitation technology since the independence and integration of people are dependent on good design. In some

cases the physical safety of the user may depend on the performance and reliability of the technology, and its 'goodness of fit' with the requirements.

Validation requires testing with users and the technology in realistic usage scenarios to examine whether the technology meets real user needs. Solutions should be validated in a real life context since the primary aim is to assess the technological enablement of independence, and to determine the real impact on the user's life. Where it is not possible to mount large scale demonstrators within the funding and timescales of the project (eg large scale telecommunication based services over a geographically significant area) it is necessary to find alternative means to draw valid conclusions. This may be done through smaller but well controlled user trials perhaps addressing only some categories of intended users, or by testing against usage scenarios reflecting intended use.

For devices intended to compensate for impaired functions, validation by a network of rehabilitation centres across different member states might be useful to producers and users of assistive devices. Such pan-European validation might ensure that cultural differences are detected and may strengthen the exploitation potential of new devices since knowledge of devices and their capabilities could then be disseminated widely.

Validation of the technology designed to enhance the efficiency and effectiveness of services supporting independent living must address 'ease of use' and consideration of benefits and/or disadvantages to all parties concerned. This includes service providers, therapists, and carers, as well as the end users of the services. Solutions should be validated in terms of economic and social implications as well as technical relevance and usability. Where technology forms a component part of a service delivery chain, the effect on the entire chain needs to be considered.

It is a requirement of the subprogramme that all Research and Technology Development work has a good exploitation potential and that all the major results of work be exploited by the partners. It is expected that all projects will make explicit provision for exploitation of their results. Specific exploitation issues should be identified for each area and each project, and may include technology transfer between small and large enterprises, and between research and rehabilitation institutes and industry. In addition, issues such as moving from prototype to product, marketing, distribution and support, training and financing should also be addressed.

It is necessary to establish a broad awareness of the results from the subprogramme among elderly and disabled people, in the organisations which support and represent them, and in their funding and social support organisations.

Publicity actions through publication, conferences and exhibitions, the media and all other available channels should be seen as an essential component of the dissemination and exploitation actions of the Programme.

3. DESCRIPTION OF THE SCOPE OF THE R&D WORK

Introduction

The proposed work is organised into two lines of research and technology development (RTD) plus a set of horizontal actions and accompanying measures designed to add value and impact to the technical work.

The research lines are subdivided into specific research areas, and each area has identified subareas addressing highly specific task groups. In this document, the numbers of tasks related to a subarea is given with the sub-area heading (in brackets) and the tasks themselves are described in section 4.

Task descriptions are intended to be indicative rather than prescriptive, and it should also be noted that a task does not necessarily equal a project. Projects may address several tasks (even from different areas) or only part of a task.

The work proposed for horizontal actions and accompanying measures is sub-divided into 7 areas and a number of sub-areas. These are included in section 4.

The structure of the remainder of the background document is as follows :

Section 3 (this section):

LINE 1: Access to technology and services

Area 1 - Access to Information and Communication Technologies (ICT);

Area 2 - Integrated systems supporting the activities of independent living, education, work, leisure, mobility and training;

Area 3 - Information and Communication systems for enhancing the efficiency and effectiveness of services supporting independent living.

LINE 2: Compensation for functional disability and enhancement of capabilities

Area 4 - Applications of manipulation and control technology;

Area 5 - Technology supporting assessment, restoration and enhancement of function.

Section 4:

Horizontal actions H1 - H4

Section 5:

TASKS 100 - 511

LINE 1: Access to Technology & Services

The 'Access to Technology and Services' line is primarily concerned with accessibility. Elderly and disabled people, particularly those with cognitive and sensory impairments, must be allowed to play a full part in economic and social life. The work will develop equipment, particularly audio-visual aids and interfaces, which will permit elderly and disabled people to use existing and developing telematics systems and services to facilitate their access to tele-working, information and distance training, or to cultural programmes. Telematic systems can enable more effective and efficient service provision.

The work will also involve the development of 'intelligent' systems such as remote control, alarm systems or systems for guidance outside the home, for managing working or private environments. Appropriate systems will be developed for training people in the use of the technical aids developed.

The line is divided into three RTD areas. These are::

- Area 1 - Access to Information and Communication Technologies (ICT)
- Area 2 - Integrated systems supporting the activities of independent living, education, work, leisure, mobility and training
- Area 3 - Information and communication systems for enhancing the efficiency and effectiveness of services supporting independent living

3.1 Area 1 - Access to Information and Communication Technologies (ICT)

(Tasks: 100-109)

Overview of the area

Information and communications technologies represent both a threat to, and opportunity for improving, the quality of life of elderly and disabled people. Products and services using technology increasingly permeate many aspects of the social, cultural and economic life of the community. Elderly and disabled people find barriers to access at the equipment interface, the systems and service interface, the application interface, and in the structure of interactive dialogues for human interaction with technology.

Addressing the needs and preferences of elderly and disabled people at the design and development stages will deliver benefits, including fuller, more effective and independent participation in social and economic life. Failing to meet their needs will add restrictions bringing direct and indirect costs for the individual and for society, and industry will lose out to developers making products outside Europe in response to national legislation such as the Americans with Disabilities Act (ADA).

Objectives

To improve accessibility and usability of present and future ICT products and services for elderly and disabled people through the development and application of 'design for all' principles, through appropriate adaptations and through the development of special services, applications and equipment.

Issues

The design techniques and tools used by the ICT industries do not, in general, take account of the needs and abilities of elderly or disabled users. Approaches to eliciting, analysing and documenting requirements often ignore design issues concerning elderly and disabled people. Consequently, products and services do not generally support the level of flexibility and configuration required to benefit disabled or elderly users.

The tasks defined for this area fall into three groups:

- Adaptation and augmentation of ICT services and equipment which exist or are in development.
- Providing designers with the information, tools and techniques needed to ensure accessibility and usability of their products.
- Development of specific services and applications to meet interpersonal telecommunication and information access needs of elderly and disabled people.

Particular emphasis is placed on the concept of 'design for all' which implies that products must be capable of being configured to meet the needs of the widest possible number of consumers. It also emphasises verification, applying it not only to technologies and designs but also to architectures and design processes which many of the tasks within this area must develop.

The target users of results from this line include:

- Elderly and disabled people.
- Designers and engineers in industry who create information technology and telecommunications based products and services both for the general market and for the rehabilitation technology sector.

Rationale for pan-European action

In addition to the general rationale for pan-European action in the subprogramme, this research area identifies particular issues.

Addressing needs only at the local level drives products and services on a small scale, yet the widest impact on the quality of life of disabled and elderly people can be achieved only by influencing international developments.

Close co-ordination with progress in the areas of industrial standards, legislation and regulation is required. Influence here requires convincing demonstrations of the engineering, human factors and commercial aspects of information and telecommunications technologies to complement disabled and elderly user opinion and to inform the legislative and commercial policy makers at all levels in the Community.

Scope

Even in so called 'user centred design' there is a tendency towards 'normative' design, ignoring the needs of disabled and elderly users. Tasks in this area place particular emphasis on the real involvement of users in the requirements definition process and on documenting and analysing the relationships with existing requirements and constraints.

The results must demonstrate the potential of prototypes for development into real products and services, implying that the results of projects should have already left the laboratory. Testing and validation of results requires realistic demonstrators and their evaluation in real usage situations with a wide cross section of disabled and elderly users.

Real user involvement implies full participation of disabled and elderly users in evaluating prototypes throughout the definition, design and implementation phases and requires :

- An appropriate architecture allowing evolutionary design while maintaining coherence in the development .

- An implementation technology allowing iterative development cycles and the delivery of early prototypes.

A product definition and design process should be implemented, providing continuous user review mechanisms throughout the development life-cycle.

It is important that a concerted approach is developed within the area and across the subprogramme to ensure that clear and coherent recommendations are submitted to appropriate standards bodies. Additionally dissemination of results will benefit from contributions to certification, standards, legislation and publication.

Results and impact

Project results must show how they contribute to ensuring equal rights and full participation for disabled and elderly citizens in the civic, social, economic and cultural life of the community through access to a wider range of products and services.

The work must also contribute to :

- Development of a market sector, focused on the needs of the elderly, whose numbers will grow over the next decade.
- Development of the means of broadening the markets for products, equipment and services through greater configurability and adaptation to a wider range of user needs and preferences.
- Development of tools which support the ‘design for all’ concept.

For groups of users and for individual disabled and/or elderly people, the activities in this area must contribute to :

- Reduction in the number of barriers to participation in the civic, economic, social and cultural life of the community resulting in a higher quality of life.
- Improvement of the ability of users to express requirements and to articulate needs and demands on the ICT sector.
- Availability of a wider range of products and services suited to the needs of elderly and disabled people.

Sub-areas

3.1.1 Access to Telecommunications services and Information Technology Products (Tasks 100 - 102)

Overview of the sub-area

This area is concerned with improving access to current and emerging telecommunication services and IT applications as well as with more advanced telematics applications.

For existing services equipment and infrastructure, access problems must be addressed in terms of augmentation and adaptation.

Objectives

To develop prototype interfaces and adaptations to current and emerging services, applications and equipment thereby achieving the widest practicable accessibility and usability.

Issues

Access to the services and products from ICT is important for participation in the economic, social and cultural life of the Community. Existing investment in equipment and infrastructure requires short term solutions addressing current ICT products and technology-based services.

Scope

Standard telecommunications services, including voice telephony, fax and E-mail are within the scope of this area. Improving accessibility of these universal services offers greatest immediate potential benefits. The full involvement of telecommunications operators, service suppliers, equipment manufacturers and users is of particular importance.

Advanced telecommunications services, such as video-telephony, represent a second focus for improvement of design for access by elderly and disabled people.

This area also addresses devices such as the multi-media PC, interactive television, and personal digital assistants, along with applications being developed to exploit their capabilities. Tasks should address the creation of appropriate adaptations and additions rather than fundamental re-design and re-engineering.

Additionally, this sub-area addresses integration of telecommunications and information technology, including computer assisted co-operative work, distributed education and training, participative leisure, social and entertainment applications. Issues of accessibility and usability should not present barriers to full participation in these activities.

Results and impact

Projects in this area will make existing technology and services more accessible and usable by a wider spectrum of elderly or disabled users. This must be demonstrated through realistic field trials and be documented and disseminated to encourage industrial uptake and delivery to the market.

3.1.2 Interfaces and Tools (Tasks 103 - 106)

Overview of the sub-area

To achieve the objective of the 'design for all' concept, industry must be supported by tools, components and other resources delivering practical support to designers and engineers.

Realisation of the design for all approach requires not only tools and methods, but concrete demonstration through development and evaluation of examples showing full involvement of users in the formulation of requirements and the evaluation of results. Designers need examples of good practice.

Objectives

To develop systematic approaches and tools and demonstrate prototype user interfaces to support designers addressing the needs of disabled and elderly people in user interface design.

Issues

Design requires verification from many different points of view in order to fulfil the 'design for all' principle. The consumer must see that the needs of elderly and disabled people can be fulfilled without penalties for others. This requires a high degree of configurability and user choice in the means and mode of interaction, and must not cause increased complexity for the users. Commerce must see that the cost of 'design for all' does not adversely affect competitiveness or market size. Developing and demonstrating the business case for the approach is an important activity in this sub-area.

Scope

The work addresses the development of tools and methods supporting design from the initial analysis of user needs and the definition of concepts, right through to implementation. The needs of disabled and elderly users must be elicited, documented and satisfied by designers and developers while still meeting the needs of other user groups. The scope of this sub-area covers the development of tools and methods to help designers select, adapt and integrate technologies to meet the interaction needs of elderly and disabled users, and demonstration of their integration through development of interfaces tested in a real situations. Requirements elicitation and structuring are important steps in the product development process. Manuals of procedure and training materials are required to ensure the transfer of tools and methods to design practitioners.

Results and impact

The work in this sub-area will generate user interfaces incorporating appropriate technologies and flexibility in configuration of interactive dialogue and control structures. These will exhibit features such as adaptation

and prediction of user goals and needs and provide concrete validation of the tools and methods developed to allow the 'design for all' approach to be implemented in the product development processes.

3.1.3 New ICT- based services and products (Tasks 107 - 109)

Overview of the sub-area

Information and communication technologies (ICT) can provide specific solutions for interpersonal telecommunications and information access for elderly and disabled people.

Objectives

Develop and demonstrate specific services, applications and equipment to address the telecommunications and information handling requirements of elderly and disabled users.

Issues

The 'design for all' approach cannot fulfil all information access and telecommunications handling needs of elderly and disabled users. There will always be categories of disability which cannot be overcome by adaptation and augmentation of standard products, yet ICT can still provide solutions capable of delivering specific benefits to particular groups of disabled users.

Scope

Characterisation of user ability allows definition of requirements for special products and services which must be matched to users through appropriate assessment methods and criteria. Development of products and services responding to specific requirements must involve users in design, development and evaluation to ensure goodness of fit at all levels.

Results and impact

Demonstration and field testing of innovative special products and services will show specific contributions to increased quality of life, and must be supported by :

- Clear definitions of target user groups.
- Methods for assessing suitability of solutions for particular users.
- Tools and resources to deliver products to new users and to provide user support to acceptable levels.

Results of work in this subarea must satisfy organisational and social needs as well as the challenges of technology, design and engineering.

3.2 Area 2 - Integrated systems supporting the activities of independent living, education, work, leisure, mobility and training

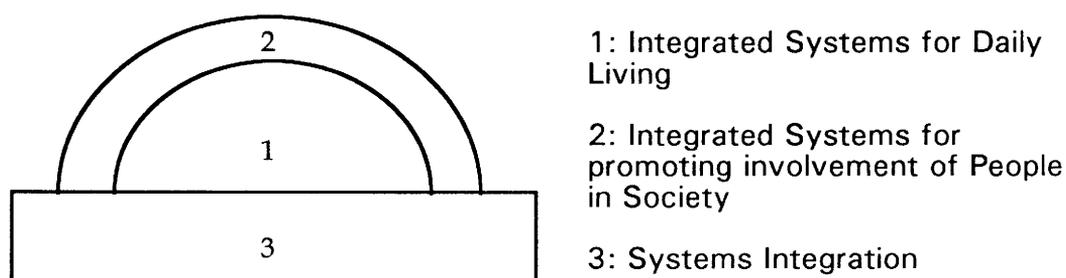
(Tasks: 200-214)

Overview of the area

Through disability and ageing, people may need a set of technology based systems to enable them to function at home and take an active part in society. People may often experience multiple impairments, particularly as a consequence of ageing and there may be effects on others such as family and dependants as well as care staff.

There is often a requirement, then, for multiple technical components to be brought together in a user's system or suite of systems to relieve dependence on the family or other support, and to restore autonomy and control.

Technology integration should be built on principles, techniques, standards and specifications which ensure consistency in design and quality.



Every device or part of an integrated system is interconnected through one network where each can be controlled from a common interface. Integration is technical as well as functional.

Technical integration includes examples like a door opened by a PC coupled to the home bus, or by a remote controller, a push button next to the door, or even by turning the knob and pushing.

Functional integration addresses distinct functions that are normally performed together but are integrated, as for instance the TV voice being controlled by the 'control TV' mode and also by the 'telephone control' mode.

Integrated systems may also have subsystems. A control interface can be used to control two or more subsystems and a subsystem can be controlled by one or more control interfaces

Objective

To develop and demonstrate integration of different devices and systems to support daily living and promote the wider involvement of users in society

Issues

The activities of the preceding phases of TIDE and other national and international initiatives have exposed a number of outstanding issues associated with the process of developing integrated systems for older people and people with disabilities. These are outlined below.

Individual

The users in this area are clients and those who care for or assist them. The key issue is the increase in autonomy which technology may provide, and the degree of control that the users have over the technology. With the widening of opportunities for community care, 'home' may range from living independently in a private dwelling through to having a degree of independence within a sheltered institution. Autonomy through technology may restore dignity and improve the quality of life of both clients and carers so it is imperative that the interface between the user and the technology is sufficiently intuitive and well presented that the user can gain access to the full set of functions that the system provides.

Demographic changes in the population indicate a smaller workforce as a proportion of the population, and a larger proportion of the population living to a greater age. The likely result will be a more severe set of age related impairments within a larger group. Technology may reduce the burden associated with handling daily living activities, whilst giving people greater freedom and dignity through providing an integrated suite of tools.

Social isolation is poorly understood and must be addressed where telecommunications services are involved. Technology can provide a gateway to involvement in the life of society, including employment, educational, cultural and social activities, and includes remote access to activities for those living in rural and urban environments.

Implementing integrated systems requires that sensitive information is handled securely and that legal liability is taken into account. This is especially true in remote monitoring of medical data or navigation and tracking systems for older people or those with learning difficulties.

Disability and ageing result in degrees of ability and impairment unique to each individual. Solutions to loss of ability in one person may provoke or add to it for another. Integrated system should focus on the value of specific solutions to both client and carers through long term evaluation.

Market

Large companies generally provide infrastructural and mass produced components, whereas smaller organisations provide the more specific or

specialist components, the configuration of the system and its maintenance and support. In general, components are brought together from a number of suppliers and united into a tailored system.

Work should conform to agreed specifications and standards adopted and approved by key players, including the producers, users and customers.

Market acceptance of the results requires validation both of the technology and its impact on the life of the users, particularly where it is applied in critical or life threatening situations. Thorough market analysis is needed to understand the risks for manufacturers and vendors, and to make the merits of developments evident to purchasers, be they private individuals, (local) government departments or commercial or charitable care providers.

Societal

There are benefits if all members of society are in a position to participate fully in the cultural, community and vocational activities of society and to play a full part in family life. The infrastructure necessary to ensure that this involvement takes place is now available, but success requires bringing together the needs, aspirations and disparate technological achievements into integrated solutions.

Disability is an issue for the individual and for others such as relatives and care providers. Advanced technology may meet the needs of the wider circle of people affected by disability, including the training and support needs of carers.

Technical Issues

Assistive technology is often reactive and based on solutions which are far from state-of-the-art. It is sensible to build on established technology rather than to expend resources on new research, but it is unacceptable to build solutions on technology that is close to becoming redundant. A practical implication of this issue can be seen when people seek to integrate an assistive device with a computer system at work. Many assistive techniques are developed on previous generation computer systems given as gifts to rehabilitation or occupational centres and therefore not suitable for porting to modern high power personal computers running graphical user interfaces. Urgent attention is therefore needed to ensure that older and disabled people have access to the most advanced technology relevant to their needs.

Experience has shown that demonstration and verification of integrated systems is needed, but that it can be an expensive exercise, particularly at the level of home based or wide area network based systems. This should be recognised and realistic proposals and resource requests submitted.

Rationale for pan European action

In addition to the general rationale for pan-European action in the subprogramme, this research area identifies particular issues. Support systems facilitating social participation may make travel possible for previously

isolated people, especially those who are migrants or who have emigrant families elsewhere within the European Union. Freedom of movement requires interchangeability and interoperability of support systems, requiring consensus and cooperation at the European level in system design and in standards development.

Scope

The RTD work undertaken requires a multidisciplinary approach addressing technical, user, organisational, architectural, sociological and ergonomic issues. In order to facilitate the design of suitable systems, work should adapt existing technologies where possible, develop new applications of technology where necessary, and develop specialised or adaptable user/machine interfaces tailored to user needs.

Applications design should address the needs of clients and client groups who have cognitive, sensory or physical impairments or who are frail or forgetful due to old age.

Interfaces should be designed to be ergonomic, clear and easy to understand, and safe to use.

Work should result in prototypes showing the application of technology to specific areas. These should serve the real needs of individuals and should exhibit potential for commercial exploitation in the long term. Work in this area should review, consolidate and exploit existing results where applicable.

Results and impact

Deployment of integrated systems for independent living will decrease care systems costs through restoration of autonomy and independence from expensive services. The formal care services will be able to care for more people and to allow informal carers to be freed from certain tasks. The cultural and working life of society will be enriched since people may again play an active role, and those currently excluded from doing so may be introduced.

Common specifications and standards developed in the projects will bring together SMEs and large corporations and provide a framework within which the market can expand.

Community level cooperation will ensure a scale of market which is more viable than when considered at a national level.

Non RTD actions needed

For this work to be a success collaboration is required between the actors influencing underlying social, legal and care policies, and resourcing.

Sub-areas

3.2.1 Integrated Systems for Daily Living (Tasks: 200-205)

Overview of the sub-area

Practical solutions are needed to allow people to function at home and to achieve the degree of autonomy, independence and dignity appropriate to their needs and aspirations.

Work in this area concentrates on developing systems that allow people to function with a greater degree of independence. These systems will integrate other assistive technologies in the home, data transport infrastructures and gateways to the outside world. Developments should contribute to a cost reduction for systems, so widening deployment.

The principle focus is to ensure that any system installed in the home is usable and the functions and operations are readily understood. This is particularly important for those users with mental impairment. Clear evaluation of user requirements is therefore a prerequisite for the work.

Objective

To develop technically and functionally integrated systems for the home with common operational procedures and presentations which are adaptable to the needs of individual users and which enhance or enable daily living.

Issues

The issues associated with the development of integrated systems for daily living are outlined below.

Individual

Each system has an interface through which the user gains access to its functionality. As more products and services are introduced, the problem of remembering how to control each one becomes acute, and so standardisation of interface, in terms of style and function, will be necessary.

When users require adaptations to the interface, such adaptations must be suitable across a number of products or systems. Solutions must be carefully evaluated, and the issue must be addressed of reducing cognitive load while allowing access to the full set of products and services.

Market

It is generally recognised that SMEs will provide the majority of adaptations, involving the generic components and systems from major producers. They may even be responsible for component selection, configuration, installation, commissioning and maintenance of the systems. Risks can be reduced by promoting agreement on specifications for the principle infrastructures to be

deployed. There are high risks for users and purchasers, and many have experience of becoming dependent on products that have no support because the producer has ceased to operate. Projects in this area should contribute to the process of promoting and verifying the appropriate technologies so that stability is achieved quickly.

A goal of work in this area should be to promote acceptance by major suppliers of domestic as well as rehabilitation products to ensure that they can penetrate and develop these markets.

Societal

Resources available for care provision in the member states are reducing, including the availability of people traditionally engaged in the care services. Coupled with the drive for greater autonomy on the part of disabled and older people, this provides a catalyst for the development of technical solutions to labour intensive tasks. If user populations achieve greater efficiency and autonomy at home, they will be free to play a more complete role in the cultural, social, educational and vocational life of the community.

In systems involving information passing between people at home and service provision centres, the security of data and the outcome of decisions made using such data must be addressed within legal and ethical frameworks.

Technical

The key issue here is the integration of components in systems that will support daily living. Whether integrating components such as medical sensors with a data gathering station and alarm and care service technology, or whether integrating subsystems in a domestic information system based round a television system, interface and data packaging issues must be addressed.

The absence of modern amenities in poor rural areas may require special attention.

Scope

The area covers the development of systems integrating discrete components, as well as the integration of a number of systems into an overall technological infrastructure such as the 'Smarter Homes' concepts.

The scope of the sub-area activities is to develop modular components, devices and services that can be used in the home system, to adapt commercial products to meet the needs of older and disabled people, and to evaluate them in a real environment.

Building blocks for home systems are available, but action is needed to integrate them in systems meeting needs in ways that are usable, technically feasible and commercially viable with a realistic chance of exploitation.

Action is needed at the following levels:

- Systems to support a specific daily living activity, using components that have not been integrated in this way.
- Systems giving user control over environment, and home, particularly where mobility and dexterity are limited.
- Systems giving access to remote support or assisting in daily living activities, such as remote health care services and teleshopping.

Such systems require infrastructures evolving at a European level.

Results and impact

The results will help the user to cope with activities of daily living thus reducing the need for support whilst increasing self esteem and autonomy.

The novelty of the market as well as the strong position of European care systems will support the fast expansion of industrial activities in this area. The elements for elderly and disabled people are especially attractive for SMEs.

Non RTD actions needed

Exploitation and uptake will require shifts of expenditure by public services to ensure new products are available to those people that need them, and that the new systems are integrated with the need to provide care services.

3.2.2 Integrated Systems for promoting involvement of People in Society (Tasks: 206-210)

Overview of the sub-area

This sub-area addresses integration of technologies to provide systems allowing people to play a more involved role in society, and reducing isolation. The focus includes access to systems widely used by the population at large (e.g. bank ATM's) and systems allowing people to participate in wider forums and activities from a remote location (e.g. teleworking or services that allow participation in leisure activities)

The application of technology to daily life may bring autonomy and greater independence to elderly and disabled people. Accessibility of the wider life of society, however, exploits and enhances the freedom arising from increased autonomy.

Objective

To bring together latent human resources and state-of-the-art technologies to develop integrated systems by improving existing systems or by adapting them for disabled and older people, so that the integration of people into society will be a reality.

Issues

Issues associated with this area are outlined below:

Individual

Access to the wider life of society requires complex and innovative technologies. Shielding users from the technical complexity whilst enabling transparent access to the functions and services will be a key problem area. Developing integrated systems that can allow involvement in all social and cultural activities demands user interfaces which avoid confusion and reduce cognitive load.

Societal

Society can benefit from the contributions of older and disabled people. Examples include the re-introduction of people into the workforce following a trauma, or the involvement of people in political and cultural activities.

Services allowing people to take part in activities at a distance will reduce travel and movement of personnel.

Technical Issues

Moving developments from laboratories into real homes will expose the limitations and possibilities, both in performance and cost, of developing systems. Component compatibility and the technical demands of implementing usable interfaces should be exposed and investigated.

Technical solutions should be developed in response to the experience and requirements of users rather than presenting users with outstanding technological achievements that are not appropriately targeted or implemented.

Scope

The area covers the innovative integration and assessment of the widest possible selection of types and combinations of (existing and emerging) interfaces, technologies, systems and infrastructures to allow people to play a full part in the society of the European Community.

This includes the development of systems that provide access for older and disabled people to current and emerging technologies upon which society is becoming increasingly dependent. These may include virtual reality techniques, telecommunications services, distributed computing and information dissemination and retrieval, and the development of navigation and orientation systems.

Available systems and modules can be included or adapted to meet the needs of the target users.

Results and impact

A key result will be increased involvement of older and disabled people in society and community life. This will improve the quality of their family and personal lives and will enrich European society.

Success in these activities will allow companies to address wider markets. This is especially true for companies not traditionally involved in the provision of rehabilitation technology products.

3.2.3 Common Specifications, Standards and Principles for Integration (Tasks: 211-214)

Overview of the sub-area

This area addresses development of generic principles for integration of components from different rehabilitation disciplines and different suppliers; the various levels of integration that are relevant to different users; the user interface issues associated with bringing different functional components into common interaction and control user interfaces; and the adapting of equipment for people with different and/or changing physical and cognitive impairments.

It is expected that all projects concerned with integration activities will contribute to work in this sub-area, and that they might have a common interest group as part of the project.

Objective

To develop a set of design integration principles to form a foundation for integrated rehabilitation systems covering issues such as user needs, interface design and common specifications for system integration.

Issues

Issues to be addressed by this area include:

Individual

The customer for the integrated systems is not necessarily or always the user of the systems. Users must be able to influence the customers (purchasers of the systems) to include their needs in the agreement with suppliers for the common specifications.

Market & Technical Issues

Different elements of the integrated system may have different producers. Agreement about common interfaces at the hardware, software and signal levels will assist the new markets that these systems will fill.

Common specifications leading to standards have the additional benefit of allowing purchasers to construct integrated systems from the most suitable

examples in a range of modular components. This will promote competition, thereby improving quality and reducing prices of components.

In order to promote the exploitation of results of integration projects, and in order to ensure that the projects have realistic market potential, they should contribute to activities such as common interest groups.

Societal

Member states welcome reductions in the cost of care service provision. This work promotes cost reduction and improved quality through dissemination of good practice, common specifications and standards. This allows better targeting of resources but also wider coverage of the services, bringing more older and disabled people into influential positions in society.

Scope

The scope of the RTD in this work area includes both integration of existing systems to provide new services/facilities and integration of new software and devices. The research and technology application work needs to identify the interfaces and determine their broad definition so as to allow different design implementations using different technical solutions.

The integration principles must be validated in demonstration projects and in collaborative activities such as special or technology interest groups.

The activity provides a focus and model for building on generic technology and its adaptation to the user needs.

Results and impact

The results for the Industry/Market actors will be a market that is open to competition within a realistic and verified framework of standards and good practice.

This will benefit the users as there will be more stability in the market, with lower risks for specialist producers, and more actors moving into the rehabilitation technology marketplace.

3.3 Area 3 - Information and Communication systems for enhancing the efficiency and effectiveness of services supporting independent living

(Tasks 300-314)

Overview of the area

This area covers RTD in Information and Communication systems for enhancing the efficiency and effectiveness of services supporting autonomy and quality of life for elderly people and people with motor, sensory or mental impairments. It deals with the utilisation of information and communications technology (ICT) systems in the service provision process, including both service delivery and service consumption.

This area is important for four main reasons.

1. It can improve the quality of service provision for the target user groups and contribute to an improvement in their quality of life.
2. It can improve the coverage of existing services by extending the geographical range and the targeted sectors.
3. It can improve the efficiency of service delivery by reducing costs and by reducing time spent on administrative and other support activities.
4. It can improve the quality of life and opportunities for employment or other forms of socio-economic activity for family members or other informal care providers, by providing opportunities for respite from caring burdens and new ways of supporting those in need.

There are different stakeholders in the development and usage of ICT systems in service provision. These include elderly and disabled people, their informal carers (relatives, neighbours), their formal carers (doctors, nurses, social workers, home-helps), service organisations (public, private and/or voluntary), re-imbursers (public and private), manufacturers, application developers, and telecommunications service providers.

Three main sub-areas are included in the domain :

1. Social information networks: ICT can improve information flows between service providers and make information more accessible to elderly and disabled people. ICT systems may improve co-ordination and integration of service providers, and allow direct access to information by elderly and disabled people themselves. ICT can also enable service users to share experiences and technical information.
2. Remote service provision: ICT in the delivery or consumption of services for social support, activities of daily living, care and security.
3. Value added network services (VANS): basic network services have been expanded with control facilities such as supplementary services,

information and transaction services, and interactive services. There is a growing demand for adaptation of these services for use by people with special needs.

Objective

To improve the quality of services supporting autonomous living by using ICT to improve their efficiency and effectiveness³

Issues

There is increasing social and economic pressure for new technology opportunities to be deployed to support individuals in the home rather than in institutions. For the individual this can increase his or her control of service delivery and participation in society, and requires innovation in both the technology and social organisation of service delivery.

There is a need to maintain an appropriate level of opportunity for social communication. Automation of services must not degrade the social environment for the client or reduce the human elements of service provision.

The end user will require increased access to information to make informed choice, and service providers need enhanced access to information to improve the quality of their work. Communication is a major problem for both the client and the professional and failure to address this may result in:

- A gap between demand and provision of information.
- A lack of process for innovation.
- A lack of a precise common language for service description.

These problems of communication are barriers to the gains in quality that could be obtained through new technology and methods of work organisation. Knowledge and information that will empower the service provision are not sufficiently accessible to those who would benefit most.

Informed consumer choice and participatory design will improve service delivery. Active participation by the consumer can also reduce costs through more effective use of resources.

Replacement of local face to face delivery of services with remote ICT-mediated delivery may cause social isolation or reduce everyday activity by elderly and disabled people. Furthermore, it is unclear who is the beneficiary from usage of ICT in the delivery of services. In some cases the informal

³In this context quality is taken to be fitness for purpose, and thus includes client benefits, coverage and cost effective use of resources. Autonomous living is taken to be a free choice to select services and products in order to enable autonomy and social integration (It is important for tasks in this area to prevent the threat of social exclusion arising out of service automation).

carer may be the direct beneficiary (e.g. in remote surveillance of people with dementia) and conflicts of interest and ethical concerns may arise.

It is important that new approaches to service provision are integrated with existing strategy. Co-operation between key-organisations and institutions is necessary, including agreement on technology usage in services for elderly or disabled clients.

Liaison may be required with relevant CEC health telematics programmes to prevent overlap and provide integration with new medical systems which may be deployed to support elderly people, or people with a motor, sensory or mental impairment.

There are opportunities to drive down costs and improve service quality and effectiveness through the exploitation of new network infrastructure currently being introduced in Europe. Cable TV infrastructures are in place and in the near future public network operators will be able to offer video on demand services. The potential of these changes in telematics provision should be exploited by people with special needs as well as other groups in Europe, and the specific technology may be particularly relevant to distance learning applications.

Rationale for a pan-European action

There are special reasons for a pan-European dimension to this subarea.

A shared view of the generic components required for ICT-based service provision can ensure that, for critical components, compatibility and interworking between systems is achieved

In addition, access to services even while mobile is important to European citizens because of retirement or occupational migration, or more general mobility for business or leisure purposes

Scope

Efficiency gains can be obtained through activity at the individual or social level and through exploitation of new technology or novel use of old technology.

Pan-European developments are of particular importance for the development of cost effective delivery in a single market. Representation of differing national groups within a project is not sufficient on its own.

The scope of work in this area includes the impact of service automation on the opportunities for social interaction by the client and by the service provision staff. Automation of service provision has the potential danger of reducing human contact and thereby increasing social exclusion. Where this presents a problem in the automation of a service, adequate solutions will be required to deal with it as part of the design output of the project.

Results and impact

Community/Society:

The main benefit here will be contributions to the solution of problems emerging from the interaction between demographic and social pressures on the one hand, and economic and cost-containment pressures on the other.

Industry/Market:

Four main results may be expected:

1. The actions can open up new large-scale markets.
2. There will be opportunities for opening niche markets for emerging technologies, so paving the way to mass production.
3. The application domain provides a bridge between industry and the marketplace, with the service providers acting as a form of mediator between the user/consumer and the technology.
4. New opportunities in offering and using services bring about new needs for ICT products.

Sub-Areas

3.3.1 Social Information Networks (Tasks 300 - 305)

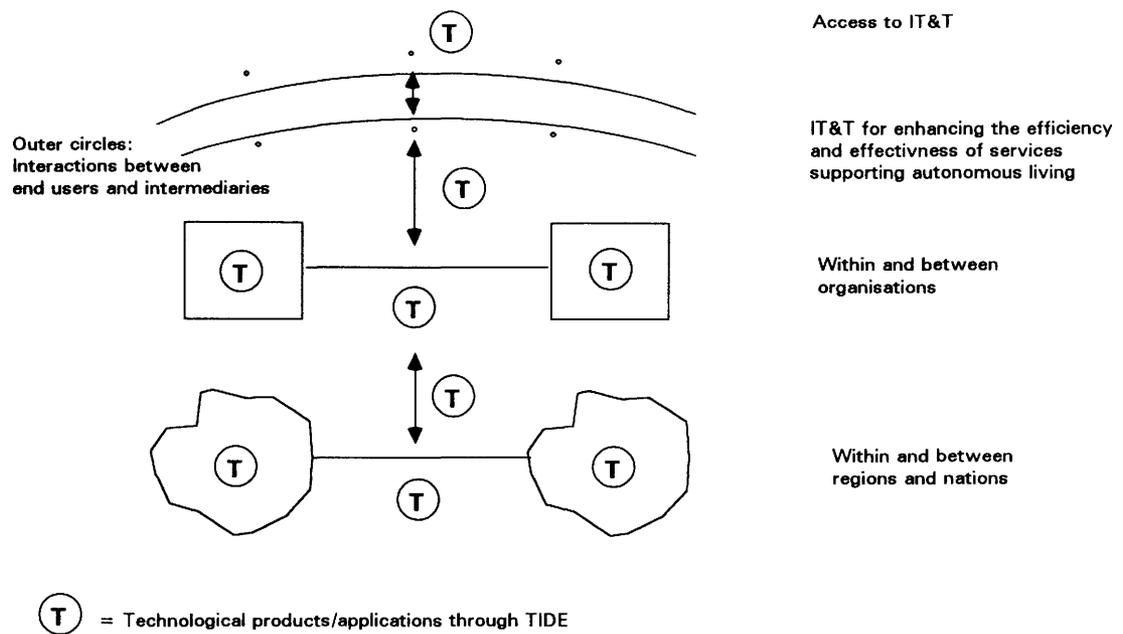
Overview of the sub-area

Network technology can empower the service provider and service client through informed choice about service provision. There are existing databases on rehabilitation technology which, through improved access, could inform decision making. Communities of common interest could share their experiences and information on technical adaptation and maintenance.

Improving the quality of services supporting autonomous living through ICT usage within social information networks requires an organisational network of people, institutions, organisations and administrations already existing and dedicated to this task.

The following diagram represents the possible new technological products (T's) and applications that may facilitate the logical and physical connections between the different parties.

The innovation process through which these new tools are introduced also involves the adaptation of methods to new opportunities. In such a network an interdisciplinary approach can cross existing partitions.



Objective

To introduce logical or physical connections between people or organisations within the same service activity, for enhancing active social co-ordination and communication through the use of ICT by and for disabled and elderly people.

Issues

Networks should be user-oriented, cost effective, harnessing unobtrusive technology, providing user-adaptable solutions, and exploiting multimedia. Additionally, they should provide a transparent system :

- The user must see it as one single coherent system and not as a collection of modules and modes.
- Complicated tasks must be simplified through support by intelligent systems.
- Systems must be completely transparent for the user, as long as his/her actions are standardised or compatible for different countries/regions in the European Union.

The work should identify technologies to enable social informatic and ICT systems. It should include pilot networks to test concepts and pre-competitive products.

Scope

The scope of work in this subarea includes introduction of technology and tools to enhance or enable connections between organisations and individuals who are part of the support service networks.

It may be both necessary and desirable to build upon existing organisational networks.

Results and Impact

By using the appropriate technology, the end-user and/or the intermediary will be able to :

- Access social information (databases, kbs, etc.).
- Access remote expertise.
- Access tools and automatic services.

3.3.2 Remote service provision (Tasks 306 - 310)

Overview of the sub-area

A variety of support services are needed to maximise the participation and integration of elderly and disabled people in society. These services include provision of social support, help with activities of daily living, health and social care, and provision of security. They may be provided either formally by professional or other service staff, or informally by family and other members of the local community.

Traditionally, these services have had a high human component and a low technical one. This low level of technical innovation has applied both to service delivery and to more general administrative arrangements in support of service provision. Innovations in ICT now offer opportunities for increased utilisation of technology in both of these areas.

Developments in ICT now offer opportunities for services to be offered remotely. In particular, services can now be accessed by, or delivered to, elderly or disabled people in their own homes. The focus of this sub-area is on remote service delivery in the key areas of social support, activities of daily living, care provision and security.

Remote service provision must be viewed in its social context since it can significantly change the nature of care and contact. The overall aim of the work is to offer choice, so that the most suitable form of service provision (human and/or technological) can be selected and deployed in a given situation. ICT-based services can enhance service provision by improving service quality, service coverage and service efficiency. However, the focus must be on complete services, of which ICT is just one, albeit important component. The key to success will be to implement ICT as part of an overall socio-technical system, involving appropriate mixes of human and technical components.

Objective

To improve the quality of services supporting autonomy and quality of life by using ICT to deliver services remotely where appropriate.

Issues

The main issues to be considered in the context of remote service delivery are:

- To ensure that it is appropriate to deliver the particular service on a remote basis, taking account of the social context within which the service is needed.
- To ensure that remote delivery of service does not increase social isolation or lead to reduced activity or participation in society .
- To recognise the different interests on the parts of the service provider and recipient and to ensure that an appropriate balance is reached between these needs when services are delivered remotely.

Scope

The focus in this sub-area is on ICT in support of service providers and the service provision process. This means that the focus is not on the development of the various end-user systems such as sensors or access devices which are dealt with in other areas, but on the content of service delivery such as remotely signalling of need and remote response to that need.

Results and impact

Community/society:

Remote service provision can allow more efficient utilisation of resources in two ways. First, some services can allow scarce resources to be shared across a larger client base. Second, some can provide more detailed information about the immediate needs of clients and so allow an appropriate response.

Industry/market:

Widespread diffusion of services can open large markets for end-user terminal equipment (especially in the home), for service provider terminal equipment, and for telecommunications infrastructure and services to link the two.

Users

Benefits can include better quality care and more autonomous lives for elderly and disabled people, and respite from caring for informal carers.

3.3.3 Value Added Network Services (VANS) (Tasks 311 - 314)

Overview of the sub-area

There is a wide range of existing and future service facilities in spoken and/or written form based on access through telephony. It is a growing area and currently available services include supplementary services (such as follow-me, second calls and group conferences) provided by network operators, non-interactive services (such as weather forecast, news), different kinds of transaction services (such as tele-banking), interactive services (such as consultation of professionals and participation in leisure activities) and relay and mediation services.

These services are designed for the general public who have few problems in accessing and using them through simple technologies based on voice or text interaction. For people with disabilities and sensory impairments however, access to these services is severely limited. For elderly people with an impairment of cognitive functioning it can be almost impossible.

As the number of services increases and the technologies merge (e.g. telephone and cable television), the exclusion of elderly and disabled people becomes an increasing issue.

Objective

To make the existing and future services accessible to all by developing methods and technologies to enable service providers to transport their services across different technological platforms.

Issues

The growing problem of the exclusion of large parts of the population from network services, aimed at the 'general' public.

The awareness of service providers of the special needs and limited access opportunities of elderly and disabled persons.

The awareness of consumers of the existing and emerging services and the merging technologies being used, limiting their participation in the design and development of these services.

The technical and non-technical (copyright, legislative, etc.) barriers to the transportation of services across multiple technology platforms.

Scope

This sub-area deals with the service provider perspective. It deals with those aspects of the management, organisation and provision of a service. Specifically, the adoption of facilities within the organisation and delivery of public network services to provide access for customers with special needs.

RTD activities in this subarea must take account of new developments in terminal technology, research, and service integration.

Results and impact

Community/society:

Since numbers of people with special needs are increasing in Europe due to changing age profile, developing methods and techniques to increase transoperability of national services will be more cost effective than developing special services targeted on small national groups.

Industry/market:

Introducing services which are operable across technology platforms will increase the diffusion of services, so enlarging the group of potential users and stimulating a growing market.

SMEs can provide equipment and tools to enable the transoperation and integration of different modes of access and operation.

Users

Users with special needs will be given access to a range of networked services enhancing and maintaining their autonomy and quality of life. They will regain what has been lost and keep pace with future developments.

LINE 2: Compensation for impaired functions

Work in the 'compensation for impaired functions' line will develop applications using information and communication technologies to restore all or part of the functional capacities of disabled and elderly people. Particular emphasis will be placed on systems for improving mobility, inter-personal communication and the ability to cope with the immediate environment. This work will also exploit recent progress in virtual environments and remote control ('telepresence').

The work in this line is divided into two areas;

- Area 4 - Applications of manipulation and control technology
- Area 5 - Technology supporting assessment, restoration and enhancement of function

3.4 Area 4 - Applications of Manipulation and Control Technology

(Tasks: 400-409)

Overview of the area

The area 'Applications of Manipulation and Control Technology' aims to give disabled people direct influence over their immediate environment and greater integration with the rest of society. Physical activities like handling goods and personal mobility underpin social and vocational integration. This work area addresses the use of manipulation and control technologies to support physical and mental functions and is concerned with underlying feedback and control when humans are in the control loop. Work on manipulation and control technologies might be seen as one facet of a larger project, or dealt with as a specific project.

Objectives of the area

To enhance personal mobility and transportation, control of the immediate environment, and assistance with manipulation and carrying.

Issues

Work in initiatives such as the Open Microprocessor Initiative (OMI) ensures the availability and affordability of high technology sensors, actuators and control hardware/software by the end of the century. The work under this sub programme means devices, facilities and services will be needed in a closer time-frame, and priority may be (in some cases) to improve existing technologies or to use them in new ways to solve existing problems.

Elderly and disabled people will directly apply manipulation and control technologies to gain control in their own lives, though they may be assisted by their immediate carers. To these ends, proposers must recognise that the users will be part of the control loop for new equipment. Projects must take full account of the psychological and physiological capabilities of the users.

Previous work has addressed technical aids to perception or action. The current work also includes coverage of cognitive impairments and so has important implications for design of effective control loops. Multi-way feedback (internal and external) is as important for humans as for electronic or mechanical systems, yet feedback for users is often inadequate or missing from current systems.

Users' needs and abilities can span a very wide range of handicap or dysfunction. These may be single or multiple impairments and may vary from slight to profound. In addition to addressing severely disabled people, the work should also address the needs and abilities of people with low to medium disabilities since this will significantly increase the market for such technologies. Many elderly people, for example, are more likely to have mild but multiple dysfunctions rather than severe disabilities, and impairments of memory, decision making and other cognitive processes also have to be

considered. Furthermore, many people will only experience a temporary need for assistance (eg people recovering from strokes or other serious illnesses and accidents). The aim is to integrate elderly and disabled people into European society rather than to isolate them further by providing aids which make them more dependent or conspicuously different

Scope

The main focus of this sub-programme is on technologies that might be made available from 2000 to 2005. Thus proposers should concentrate on developments and enhancements of existing technologies rather than anticipating entirely novel technical developments. Solutions should also seek to assist people with low to medium disabilities and dysfunctions.

For these reasons, the following sub-areas are selected as being most important and are described fully in sections 3.4.1 to 3.4.3 :

3.4.1: Personal mobility and transportation

3.4.2: Control of devices, facilities and services in the immediate environment

3.4.3: Assistance with manipulation and carrying.

Results and Impact

The work must deliver solutions for improvement to the quality of life of the target users and the stimulation of a better market for manipulation and control technologies for European companies.

An expected impact is better mobility for people with handicaps and impairments, including a direct benefit for able bodied people by a wider and better access to public transportation. In addition, interoperability of devices will further enhance independence and autonomy.

The accessibility of enhanced technology to disabled and elderly people will open up other consumer sectors to manufacturers, and this will lead to reduction of price to the user through economy of volume.

Further specific results and impacts are described in each of the sub-areas.

Sub-areas

3.4.1 Personal Mobility and Transportation (Tasks: 400-403)

Overview of the sub-area

Restricted mobility reduces quality of life - either through a sense of being dependent on others or through being unable to take part in the social, vocational or recreational activities enjoyed by everyone else. In the European Union, the number and proportion of people with mobility handicap - especially walking difficulties - is increasing as a result of longer

life expectancy. These people can be helped by the application of manipulation and control technologies.

Three separate but related problems need to be highlighted: problems of improving access to public and private transportation; problems of self-help transfer in and near buildings (eg advanced lifters and hoists); and problems of improving the mobility of wheelchair users. These are selected as being likely to benefit a very large number of people with restricted mobility and their carers.

Objective

To enhance access to and safety in transportation, to develop self-help facilities for living space mobility, and to improve mobility both indoors and outdoors.

Issues

The main issue in this sub-area is the improvement of the quality of life of elderly and disabled people by reducing mobility handicap (WHO, ICIDH, 1980). Loss of direct interaction with others and direct access to the environment causes isolation and exclusion. Integration requires physical mobility in its widest sense, i.e. inside and near peoples' homes, in public areas and buildings, in vehicular traffic and public transportation. In order to improve the quality of life for the greatest number of people, RTD should be directed to the enhancement of personal independence and mobility for people with low to medium scale mobility handicap as well as to those with severe disabilities. This target group includes many elderly people. Particular issues are: to increase access and safety in transportation; and to improve compatibility between access procedures and devices for mobility.

Integrated transfer systems (to help people to enter, leave buildings, get up, sit down, go to the toilet, get into and out of the bath, and so on) and indoor navigation aids (which help people to move around and avoid obstacles) are needed to facilitate mobility in and around buildings.

Wheelchairs are common for people with locomotor disabilities. In the extreme, users sit and move in their chair for almost the whole day for all activities of their life. Wheelchair accessibility of places and facilities in the living space and public areas is very important for this group of users. In contrast, the wheelchair, as a tool used several hours a day in very different places, needs to combine a set of capabilities. At the moment, a variety of special chairs exists for different purposes (eg for sports, indoor, outdoor, stairclimbing and office). There is a need to re-examine existing solutions and to produce designs which allow the same wheelchair to be used in many different places. Basic requirements for safety and comfort must be considered in the search for new applications of advanced technologies.

Rationale for pan European Action

Mobility problems exist inside and across national borders, and so there is a need for solutions to personal mobility and transport problems across Member States to enable freedom of movement for all European citizens.

Scope

Public transportation infrastructure access and safety : Outside the home, there is a need to make private and public transport systems more accessible to people with mobility handicap. All modes of passenger transport should be considered: bus, local taxi, metro, train, car, plane, ship and so on. It is unlikely that the existing infrastructure will be replaced in the short to medium term but there is considerable room to equip and adapt standard transport systems with devices that increase access for users with special needs. Passenger assistance systems should allow travellers with special needs to inform the transport system of their requirements and to receive information and advice on how to proceed. In general the need is for accessible and safe transport systems. Proposers should take note of related technical developments elsewhere in the world (eg USA) since a Europe-only solution may not be appropriate.

Assistance for short distance transfer of passengers with mobility handicap : In large and crowded public places (such as city centres, airports, railway stations and large shopping centres) people with mobility handicap have serious problems in moving about, especially with luggage. Pushed wheelchairs are not always acceptable, since they make the user dependent on other people and create a psychological barrier to using public transport and facilities.

There is a need for better short distance trolleys and mobile platforms that allow for (semi-automatic) navigation in the crowded yet structured environment. Users require information about possible destinations and routes. This domain is characterised by the application of existing technology and components (like mobile bases and navigation modules) coupled with developments in control technology and personal devices. The main issues are expected to be acceptance by the occasional user (including elderly people) and design of affordable solutions applicable throughout Europe without the need for substantial user training. Ideally these systems will also be of use to the population in general.

Increased mobility for wheelchair users : RTD is needed to provide chairs which meet the demands of many types of surroundings. Of particular concern is the investigation of the interaction between users, wheelchairs and the environment. The variability of users requires a wide range of input devices for control, so drives and actuators have to be carefully selected and combined with suitable intelligent control techniques to tailor functionality in different surroundings. Modularity in software and hardware will support system adaptation and extension, and 'Intelligent' features with sensor assistance could release users from navigation tasks and improve occupant

safety (eg with respect to collisions or uneven surfaces). These features would also support people with intellectual impairments (eg loss of memory, restricted attention). The compatibility and interaction with other devices in the surroundings, by physical and technical interfaces, will improve usability. Additionally, the opportunity should be taken to develop postural support - very important for a 'go anywhere' wheelchair.

Personal transfer systems within and near buildings : The quality of life of many disabled and elderly people and their carers would be improved if they had independent movement around and near their homes. For many people who have mobility problems, movement is further complicated by obstacles and lack of space to accommodate mobility aids. Inside and near buildings, the main need is to develop integrated transfer systems; that is, systems to help people to enter and leave buildings, to get up and sit down, to go to the toilet, to get into and out of the bath, etc. Additionally, there is a need for indoor navigation aids to help people move around and avoid obstacles. Architects and builders should be involved in the design of such systems since there will be implications for building design.

Results and Impact

The main anticipated impact is better mobility for people with handicaps plus benefit for able bodied carers or occasional users (eg if tired or ill).

Non RTD actions needed

Knowledge of the issues and technologies is uneven throughout the EU so a pan European round table on mobility handicap may be needed. Related to this is the need to consider pan European legislation to encourage greater accessibility to public facilities for travellers with mobility handicaps and impairments.

The relationship with the activities under Telematics for Transport and DGVII should also be considered.

3.4.2 Control of Devices, Facilities and Services in the Immediate Environment (Tasks 404-406)

Overview of the sub-area

Technology plays an important role for users with all types of disability and dysfunction. It can enable control of the immediate environment in the domestic, leisure and vocational spheres, and can significantly improve quality of life. Control brings about a greater degree of independence, and autonomy for both the direct users, their associated carer(s) and professionals in the rehabilitation, educational and geriatric disciplines. Therefore emphasis is placed upon RTD in controls and interfaces which will produce effective, usable, attractive and economic (to both user and manufacturer) technologies suitable and acceptable to all. Since the variety of equipment to be controlled is large, it is essential that new control devices are shown to be interoperable with existing and future equipment.

Objective

To improve controls for devices, facilities and services in the immediate environment with an emphasis on interoperability.

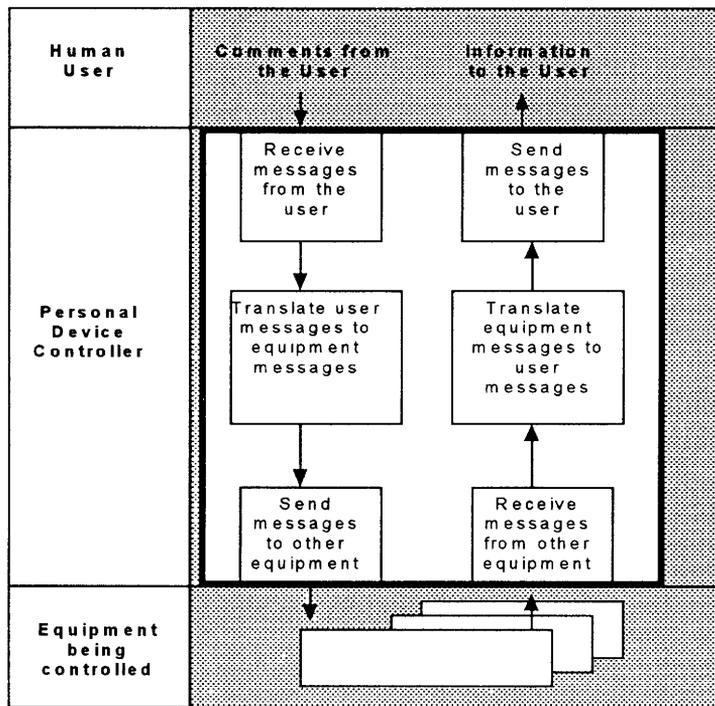
Issues

The range of products to support daily living is steadily increasing (e.g. video recorders, information appliances and specially designed aids to living such as automatic doors or home transfer systems). Most lack any form of inter-connectivity, compatibility and modularity of control function. This argument can also be extended to many public facilities, e.g. public building access systems, vending machines, banking machines (e.g. ATMs), pedestrian controlled traffic systems, access to transport information systems and so on. The inherent complexity of the range and type of controls of these products makes them difficult to understand and use especially for people with physical and/or cognitive disabilities or dysfunctions.

The complexity and diversity of control technology will continue since the cost of customised or specifically developed devices is high due to small production runs.

Scope

Personal device controllers and control technologies : This part of the work addresses ways in which users may control their immediate environment in domestic, leisure and vocational situations. Consideration of users' desired lifestyle patterns and their physical and intellectual abilities should be included since these will dictate the desired and preferred input device and interaction style. Other equipment already in use by the user (eg remote controls for TV and hi-fi equipment) could be extended thus avoiding unnecessary retraining.



The preceding diagram shows the functional outline of a possible personal controller. The user interface is tailored to the physical and intellectual capabilities of the specified user and the machine interfaces to the equipment being controlled. The device translates messages to and from the equipment to be controlled, and the ideal might be a single device which can control a wide variety of equipment.

User-preferred control strategies should be identified and included in design criteria. Projects should also involve equipment manufacturers and user groups to ensure that state-of-the-art technology is exploited to greatest benefit.

There is a particular need for a personal passenger assistance system to be developed to allow people, whilst on the move, to inform the transport system of their requirements and to allow feedback and advice on how to proceed. Arguably, the whole population could benefit from the research to develop more widely applicable personal controllers of this type

Postural Support : Many people with restrictions in body movements suffer from health problems (eg pressure sores and tissue trauma) and require means of being moved to reduce such problems. In addition, restricted movement limits a person's capacity to join in a wide variety of leisure and vocational activities. In both cases, postural support systems are required to give dynamic support under user control.

Results and impact

Interoperability of core technologies will lead to an improvement in quality of life through increased accessibility of consumer appliances. This will open up another consumer sector to manufacturers. Fragmentation in the rehabilitation technology sector will be decreased allowing economies of scale.

3.4.3 Assistance with Manipulation and Carrying (Tasks 407-409)

Overview of the sub-area

Assistance with manipulation and carrying is one of the key issues for people with disabilities and dysfunctions who wish to gain independence within domestic and vocational settings. The high expectations of the original proponents of rehabilitation robotics have yet to be fully achieved. A number of intelligent manipulators and robots for rehabilitation have been successfully demonstrated and positively evaluated by the end users and providers. However, market penetration is difficult due to a combination of high prices, restricted user groups and limited functionality.

At present, three types of systems can be distinguished: wheelchair mounted manipulators; fixed robotic workstations; and mobile platforms with or without a robot arm. Mobile systems are primarily intended to work in an unstructured human environment, while fixed workstations are designed for pre-programmed manipulations in a structured setting. All three concepts merge with the docking of mobile systems to fixed workplaces, world modelling, and direct user control for workstation systems. There is potential for the application of new technologies to rehabilitation (eg sensors and controls, mechatronics, robotics, AI). Opportunities exist to extend benefits to wider groups of users and so improve the market. Critical factors include reducing cost, adapting user interfaces to the individual needs of new target groups, and extending the systems' capabilities to a wider range of tasks.

Objectives

To increase and prolong the independence of elderly and disabled people through cost-effective intelligent devices for manipulation and carrying.

Issues

Existing rehabilitation robots and manipulators are designed for the more severely disabled user. There is scope for addressing a larger market of less-severely disabled people who wish to expand their domestic, vocational and leisure activities, and also elderly people wishing to retain an independent lifestyle.

Laboratory examples of rehabilitation robots for high-dependency users have been demonstrated, but very few have found wide user acceptance. Very few systems have yet successfully completed the transition from research demonstrator to product. In the area of high-dependency, therefore, the emphasis is on addressing those aspects of currently available robots which

need to be improved before they find general acceptance amongst the user group. In RTD terms, these include cost reduction, improvements to the user interface, and enhanced functionality based on an understanding of actual user needs

The much larger market of low to medium dependency users requires a different approach based on an understanding of user needs. Elderly people need assistance with fetching and carrying, and possibly with personal stability when walking, rising or sitting, and coping with steps and stairs. This requires a simple user interface to compensate for memory loss. Intelligent mobile platforms, which may move independently within an approximately known environment, or which may accompany a user in a structured or unstructured setting, can fulfil many requirements for assistance.

There is a general requirement for sensing and world modelling, along with facilities for adaptive interaction with the environment. The ability to dock at structured workstations in order to undertake more complex tasks could be an advantage, and particular attention to issues such as safety, reliability and maintainability is required.

Rationale for pan European Action

The absence of any large companies in the rehabilitation technologies robotics sector is a major barrier to the development of an infrastructure for supporting the wider distribution of robotic products, or the dissemination of information to alert users to the potential benefits from these devices. Alternative mechanisms for developing infrastructure must be found.

Scope

Improvements to existing systems: Opportunities exist for reducing cost, developing user interfaces adapted to the individual needs of new target groups, and extending the systems' capabilities to a wider range of tasks. There is potential to improve solutions by transfer and application of new technology (eg navigation and docking facilities).

New systems: Most rehabilitation robots and manipulators are aimed at people with high levels of dependency and are based on some kind of manipulative arm and hand. People with low to medium dependency typically have different needs, such as difficulties in rising, walking, stability in carrying and lack of strength. An important segment of this group is found among elderly people, and work should address the combination of multiple impairments often found here.

There is scope for development of intelligent domestic and vocational devices designed to assist with tasks such as support whilst walking, rising and sitting, fetching and carrying (eg 'intelligent strollers and tea trolleys'). These devices require mobility, but not necessarily a classical robotic arm. In some cases these devices will be accompanied by the user, in others they will have the ability to move autonomously to collect and deliver payloads such as trays of food, medicines or books to or from the user.

Successful implementation of devices requires careful attention to the user needs and the environment in which they will be operated. Many previous attempts to develop 'domestic robots' have failed due to inadequate functionality, poor reliability and a lack of appreciation of the multi-functional nature of user's requirements.

The issue of user friendliness is of particular importance in this context. For example, elderly people may appreciate functions such as memory support and surveillance. People with cognitive impairments may welcome more elaborate prompting and guidance.

Results and impact

Appropriate application of intelligent robotic aids offers users substantial opportunities for increasing or maintaining their independence in leisure, vocational and community spheres. This opens the way for increased home-based care of elderly and disabled people, through a reduction in the demands on carers who can then concentrate on non trivial tasks.

3.5 Area 5 - Technology supporting restoration and enhancement of function

Tasks (500-511)

Overview of the area

This work area covers all aspects of RTD in Telematics for restoration and enhancement of human function. It addresses a range of needs in specific sub-areas including :

- assessment and training of abilities,
- technology for alternative and augmentative communication,
- compensation or enhancement of sensory function,
- technology for restoration and enhancement of motor abilities, and
- support in enhancing mental abilities.

This work area is important for specific reasons.

1. It can increase the quality of life for people with disability by improving assessment and training; by increasing communication ability; by compensating for sensory disability; and by enhancing motor and mental abilities.
2. It can bring the abilities of the individual into closer focus to develop a clear specification of how and which technologies can be utilised for greatest benefit. This requires, in addition to the clinical and formal approaches to assessment, task-related ability profiles reflecting the everyday world in which people must function.
3. It can restore control and quality of communication for people with communication difficulties. This requires special attention to the preferred means of communication (mode and style) and the required forms of expression.
4. It can reduce the professional, social and educational isolation of people with sensory disability. This requires attention to the scope for amplification or recoding within the same sensory modality (enhancement), as well as transformation to other available sensory modalities (substitution).
5. It can improve the autonomy of people with motor impairment, and addresses both the need to delay the normal degeneration of motor ability with age, as well as the need to exploit residual ability in people with temporary or long-term disability through motor impairment.
6. It can improve the quality of life for people with mental impairment, and for their carers, by utilising technology to help capitalise on ability and improve the scope for delivery of support when and where needed.

7. It can improve the quality of the service delivered by professionals through the development and provision of equipment and assessment methods to allow the selection of solutions whose functional requirements match the user's functional abilities.

Objective

To develop and improve technologies for assessment and training of people with disability, for augmentative communication, and for restoration or enhancement of motor, sensory and mental abilities.

Issues

Ability must be clearly defined to allow specification and supply of suitable training, technology and services to elderly and disabled people. This requires systems suitable for conducting assessment in real-world contexts, as well as standardisation of assessment approaches to allow wide applicability of technology.

Portable, user-paced, and user-driven communication technology is required for satisfactory and effective interpersonal interaction. This will allow effective communication for work, social, educational and leisure purposes, and can be greatly assisted by the development of systems allowing improved opportunity for language learning in young children.

Technology solutions must make best use of existing sensory abilities, and should be portable and fit for a general market including diverse cultures and languages, as well as different usage situations.

Solutions for enhancement of motor ability must be properly attuned or adaptable to the application of technology in specific contexts of usage, and should address the aesthetic and social determinants of acceptability, as well as portability and usability issues.

Development of technology supporting people with mental impairment suffers from a lack of expertise, low status and marginalising of the target group, along with the extreme technical difficulty in this application area. Nonetheless, the demand for improved quality of life, along with the evident social burden through chronic dependence, demands a European action to improve technology support in this sector.

As in any human/technology area, the ergonomic design issues are important, but especially so where technology is necessary for personal support.

Rationale for pan-European action

Assessment and training systems embody the principles of the assessment and training approaches. Thus, delivery of effective technical solutions for Europe requires collaboration of the experts in member states for harmonisation of methods and approach.

The lack of widespread expertise in areas such as technology support for people with mental impairment, coupled with their social marginalisation and

lack of an established technology culture, means that no single member state can offer general solutions. Cooperation through RTD projects will allow exploitation of the limited resources of skills, knowledge and technology awareness for widespread benefit in this area.

Scope

This work area addresses the requirements of a European market for technology supporting restoration and enhancement of function: assessment and training tools; all aspects of advancement of technology support for communication; enhancement of sensory modality, multi-modality and personal management of information; modular, integrated, devices for restoration and enhancement of motor ability; assistive technology addressing general abilities such as decision making, problem solving, learning, personal organisation and management of daily activities.

Results and Impact

The main expected benefit will be an increase in the independence of elderly and disabled people, along with enhancements of quality of life from :

- Improvements to assessment and training of elderly and disabled people through the use of advanced technology.
- Integrated modular approach to enhanced communication technology across a range of tasks allowing increased autonomy and improved participation and opportunities in employment, education, and society.
- Decreased need for direct assistance and all forms of indirect support for elderly and disabled people.
- Increased personal mobility and physical independence.
- Cost-effective delivery of support to people with mental impairment, as well as increased effectiveness of service organisations.

Sub-areas

3.5.1 Advanced Solutions for Ability Assessment and Training (Tasks 500-502)

Overview of the area

This sub-area addresses the need both to ensure proper assessment of the abilities and support needs of people, and also the specification and delivery of training. This includes assessment and training (A&T) for people having motor, sensory, cognitive or communication dysfunctions, or any combination of these.

It is necessary to distinguish between clinical or formal assessment of quantifiable parameters of specific functions, and the assessment of ability to deal with aspects of daily life in a satisfactory manner. The latter includes consideration of, but is not restricted to, the former. Developing a clear

profile of the individual showing what they can achieve, and what ability they can make use of, is necessary for the selection and configuration of support aids, and for the design of training and remedial actions.

Applicable technology includes:

- Systems providing assessment of level and scope of ability.
- Distribution of, and access to, assessment and training expertise through the use of telematics.
- Systems allowing contextual assessment; at home or in the workplace.
- Systems supporting the planning and management of personal maintenance regimes.

Objective

Develop technology solutions supporting the assessment of the ability and the skills training of persons with motor, sensory, communication, and cognitive disability.

Issues

Ability must be clearly defined to allow specification and supply of suitable technology and services to elderly and disabled people.

Effective systems must:

- enable the selection and delivery of services and equipment which more appropriately meets the needs of elderly and disabled people.
- reduce waste of treatment resources in an area which is rapidly expanding in Europe.

Effective assessment technology must improve the selection and delivery of services and equipment so as to allow elderly and disabled people to increase and prolong independence.

Key issues to be addressed by the work include:

- Harmonisation of assessment and training approaches to ensure marketability and uptake of assessment and training systems.
- Enhancing assessment and training technologies and techniques to better address the needs and preferences of elderly people.
- Making systems suitable for assessment in real world contexts.
- Sharing assessment and training expertise, and developing infrastructure (share and build).

- Environments for investigation and exploration of functional ability, especially by children.
- Developing profiles of people in terms of what they can achieve, to identify need for training and technology in a personal context.
- Use of sensor technology and imaging techniques for the assessment and training of speech production.

Scope

The work addresses the need for assessment and training tools, covering identified needs for tools support, general applicability of A&T methods, and the acceptability of candidate solutions to A&T professionals and their clients.

The development of common approaches to A&T must be addressed, and consensus sought within the programme and externally. Systems should be capable of application in domestic, social and community settings to support contextual assessment.

The scope of A&T systems can address any and all forms of assessment and training applicable within the member states. Whilst assessment should beneficially exploit the framework of Impairment, Disability and Handicap, as identified by the World Health Organisation, the primary target of A&T systems is the clear definition of ability, support need, and solutions.

Results and impact

The results will include improvements to assessment and training of elderly and disabled people through the use of advanced technology. A clear definition of ability and impairment will allow minimisation of handicap through improved specification of training, and selection and delivery of appropriate rehabilitation technology. The major expected impact is therefore an increase in the independence of elderly and disabled people. In addition, commonality of approach will reduce fragmentation in this market.

3.5.2 Alternative and Augmentative Communication (AAC) (Tasks: 503-504)

Overview of the sub-area

This area addresses the specific communication needs of people with speech and communication disabilities. The term 'AAC' here is used in the broad sense and refers to enhancement of communication functions to overcome a wide range of impairments since it can provide either alternative (substitute) channels (temporary or long term) for interpersonal and written communication, or systems for augmenting existing speech and writing, including the use of manual signs, symbol systems, traditional orthography, etc.

Communication difficulties may result from motor, sensory, cognitive, linguistic or multiple impairments, and can be either congenital or acquired.

This area also includes dyslexia from the perspective of communication difficulties (reading and written communication).

AAC systems are not necessarily technology based. They may be communication boards composed of letters, words, symbols or pictures which the user indicates to the communication recipient. However, only advanced technology has the potential to integrate systems and provide user adapted/adaptable output.

Projects must be driven by user needs and concerned with improving communication function in real life environments, so enhancing the quality of life of communication impaired people.

Objective

To develop, adapt and integrate, user-driven technologies facilitating interpersonal communication of all kinds, ranging from face-to-face conversation to communication at a distance.

Issues

Providing user-driven communication is a general technological goal which is even more difficult to achieve where the user has communication disability. A range of distinct but interdependent issues are identified :

- there is a need for continuing research into enhancing the real time communication speed of people using communication aids.
- there is a need to develop communication aids to allow the use of augmentative and alternative communication within a range of situations and tasks (access to environmental control, mobility, learning, work, creative and artistic expression, pleasure, social interaction . . through the communication aid).
- there is a need to fully exploit mainstream technology for AAC purposes, since many dedicated or special-purpose devices lack flexibility and growth potential (modular approach).
- miniaturisation and portability remain issues, especially for those people who are ambulatory but have severe communication impairment and need aided communication
- the psychological impact of technology on elderly people should be assessed, and their attitudes toward the use of communication devices explored so that appropriate solutions can be developed.
- there is a need to use communication aids to help in the development of language, that is, communication aids which are appropriate for very young children and which allow for learning through use in natural environments (learning through interaction).
- the integration of alternative and augmentative communication systems (total communication approach) should be possible,

bringing together several communication channels (e.g. manual signs, symbol systems, gesture, vocalisation, etc).

- there is a need for adaptation of existing technology solutions so that they can be appropriate in different countries, cultures and languages.
- the possibilities for translation of manual sign language into text and speech (and vice versa) should be explored.
- there is a need to address user comfort in terms of ease of use, speed of communication, quality of performance, effect on self esteem, etc.
- there is a need to include coverage of retraining of language skills.

Scope

This work area addresses all aspects of technology support for communication, and includes improvement to contemporary approaches, as well as the exploitation of new technology opportunities. For example, maturing technologies, such as language technology, generally focus on mainstream research issues. It is therefore necessary to ensure an effective transfer and exploitation of emerging technical successes for application to the needs of people with communication disabilities.

Further scope is offered, for example, by flexible speech output technology which, while still in its infancy, offers opportunities for development of communication aids incorporating control of speaking styles, voices, attitudes and emotions. In addition, technical advances promise opportunity for speaker adaptivity using learning and adaptive technologies.

Communication assistance, such as sign-to-text transformations using modern picture analysis and synthesis techniques, also offer new challenges for exploitation of rapidly maturing research developments in other areas. There is even scope for extending speech recognition technology to cope with dysarthric speech.

Results and impact

The work in this area will ultimately deliver :

- An integrated modular approach to AAC enabling an effective European market through interchange of products.
- Integration of AAC across a range of situations and tasks allowing increased levels of autonomy to people with a communication impairment.
- Improved quality of life and participation through improved communication.

- Opportunities for employment, learning, and social interaction through linking of the environment with the user's language system.

3.5.3 Compensation by Substitution or Enhancement of Sensory Function (Tasks: 505-506)

Overview of the sub-area

This area addresses the development of technology and methods for supporting disabled and elderly people with sensory impairment, especially hearing, vision or a combination of these. Enhancement addresses the various technology strategies for compensation including amplification of sensory stimuli or their recoding (within the same modality). Substitution addresses the scope for technology solutions whereby the sensory input is achieved by modality transformation (for example, sight to sound).

Objectives

Develop and adapt technologies allowing participation of sensory impaired people in all areas of life, encouraging and enabling independence and improved communication, and allowing effective and safe interactions with the natural environment.

Issues

The identified issues in this area suggest that :

- technology solutions should seek to make the best use of existing sensory capability where possible (ability exploitation).
- solutions must ensure portability of technology so as to enhance independence, and to reduce obtrusion.
- technology solutions must be fit for the general market, including all likely instances of usage. They must therefore be ergonomic, safe to use, integrated with environmental considerations, and above all, be aesthetically pleasing so as to encourage user acceptance and uptake.
- the functionality offered must closely match the users' requirements, and so any development activity must be user driven.

Scope

Knowledge from the science research base, when combined with new developments in telematics, offers opportunities for technical solutions to the problems of sensory impairments. Opportunities include :

- Sensory MultiModality
- Dealing with different tasks and environmental conditions through the flexible use of sensory modalities in a non-stereotypical manner. This requires the personal management of information in different

representational forms (e.g. text/speech) for the enablement of different acquisition strategies (e.g. vision/hearing/touch).

- Intelligent transformations considering cognitive differences.
- Recoding strategies where this is the optimal approach for overcoming disability in a given situation / context (e.g. programmable hearing aid) including adaptivity (both to sensory and cognitive capabilities).
- Investigation, implementation and evaluation of recoding schemes.
- Multimodal presentations including touch, speech, vision, sound, . .
- Lip-reading enhancement including speech-to-feature-to-text transformations.
- Survey of contemporary display technology to assess utility and suitability of new approaches, along with assessment of adaptability.

Results and impact

Compensation for sensory impairment by the use of telematics solutions is expected to decrease the need for direct assistance and all forms of indirect support. It is expected that there will be long term advantages for all (e.g. face synthesis in noisy conditions to augment acoustic speech information) and a lowering of cost through mass market access by common technology solutions. An additional benefit from an expanded multilingual market is the increased likelihood of, and enhanced access to, a global market for products enabling 'sensory compensation and enhancement' through telematics. At the individual level, it is expected that benefits will accrue in terms of increased independence, enhanced productivity, and a combinatorial effect upon general quality of life from improved personal, social, educational and professional scope.

3.5.4 Restoration and Enhancement of Motor Ability (Tasks 507 - 509)

Overview of the area

Motor ability includes all of the skills required for the performance of activities in everyday life, in particular, the abilities required for autonomy (e.g. walking limited distance, negotiating stairs, maintaining balance in the presence of obstacles, washing, dressing, cooking, eating, personal hygiene, control of equipment such as switches, telephone, etc) and for performing some kind of productive work (for instance manipulating light tools, using keyboards, assembling mechanically simple devices) and leisure activities.

It is important both to reduce and possibly delay the normal degeneration of motor ability in elderly people, not only to allow the retention of autonomy and independence, but also to greatly reduce social load and to improve the quality of life of the individual.

For people with temporary disability through motor impairment it is important to reduce the time for rehabilitation and also the dependence on direct or indirect support. For those people who have a permanent or long-term disability through motor impairment, it is important to optimise the exploitation of residual ability to improve the quality of life and to reduce the costs of care.

Reduced motor function may have congenital causes or may result from disease, accident or normal degeneration of the neuro-motor system. Several stages in the rehabilitation process can be distinguished:

1. Modification of the dysfunctions of severe disorder
2. Training of muscle performance (mobility range, force, endurance)
3. Enhancement of voluntary muscle contraction and coordination of muscle activation
4. Maintenance of motor function after the rehabilitation phase

Each of these stages can be supported by using the proper technology in order to assess and improve motor functions of isolated joint or global human movement.

Objective

To restore or enhance motor function underlying motor ability through appropriate technologies.

Issues

For success in this area of work it is necessary :

- to develop a common approach to the assessment of motor ability.
- to define common procedures for the planning of rehabilitation.
- to encourage research on simulation and modelling of motor functions for rehabilitation applications.
- to develop sound design criteria for computerised assistive devices, such as neuroprostheses, for recovery and enhancement of motor ability.
- to agree functionally determined standards for acceptance of devices.
- to develop an information and communication infrastructure supporting interaction between users and manufacturers via appropriate national authorities.
- to develop information systems supporting user selection, fitting, and maintenance of devices appropriate to their needs.

The development and implementation of telematics solutions in this area must address technical issues concerning microelectronics (sensors, stimulators, actuators, etc), advanced mechanics (modular design of devices, advanced customising technologies, personalised anatomical modelling of implants, etc), maintenance technologies, and advances in ICT (user interfaces, knowledge based systems, neural networks, etc)

User needs are currently only poorly met. There is a requirement to shift emphasis from impairment compensation to disability compensation in order to more properly address the requirement for enhancement of ability in the context of usage. In addition, the acceptability of devices is paramount, and the aesthetic appeal, portability, and user friendliness are identified as primary determinants of likely market success in addition to efficiency and cost.

Scope

In addition to the very broad range of issues identified, the scope of work must address the need to build on the advances of microsystems technology to develop modular, integrated devices for restoration and enhancement of motor ability. Developments are required in the domain of computer aided prosthesis (CAP) in which computer facilities provide a component of the prosthesis as, for example in neural prostheses using Functional Electrical Stimulation. Exploitation of networking facilities available or under development will allow the specific exchange of information and expertise necessary to harmonise and develop a common infrastructure supporting developments in this area. Promotion of active involvement of all interested parties in all phases of technology development from definition of design specifications to the implementation, assessment, and maintenance policies and procedures is deemed necessary.

Results and impact

It is expected that the results of work in this area will increase the personal motor function to enhance personal mobility and communication. The results will also enable cost reduction for motor rehabilitation through standardisation of approach and distribution through the wider market, even to a global level. The improvement of efficiency of motor rehabilitation products will enhance the quality of life of elderly and disabled citizens. It is envisaged that the development of uniform design tools for devices and systems, along with common evaluation criteria, will lead to a standardisation of approach ensuring both marketability and goodness of fit of rehabilitation technology products in this area.

3.5.5 Technology Support for Enhancement of Mental Abilities (Tasks 510-511)

Overview of the sub-area

Comparatively little work has addressed the problems of individuals who have impaired mental ability. Mental impairment includes impairment of intellect, memory, perception, and the organisation and control of activity. User groups include people with learning disability or mental handicap;

survivors of stroke, head injury, neurological disease, brain damage from other causes; Alzheimer's sufferers and those whose disability is a result of ageing.

Objectives

To develop, apply and demonstrate the use of technology for the enhancement of mental ability.

Issues

The area of technology development to assist the enhancement of mental ability for those with mental impairment is a neglected area for a variety of reasons:

- Limited expertise in member states (needs pan-European initiative)
- Marginalised and low status groups (requires empowerment through technology)
- Solutions are not obvious (requires more transfer from basic research and interdisciplinary cooperation)

Scope

It is envisaged that a broad range of activities which are mental-ability dependant can be enhanced by the application of rehabilitation technology. These include :

- decision making
- problem solving
- learning (especially learning to learn)
- personal organisation and management of daily activities
- data/knowledge/sensory integration

For people with mental impairment there are a variety of requirements for assistance in all areas of life. The goals of promoting independence and self esteem offer opportunities for the development and adaptation of advanced technologies for personal support which are user adapted and under user control where possible.

Results and Impact

The results of work in this sub-area will demonstrate ways in which people with mental impairment can be assisted by telematics applications to enhance specific competencies and abilities. The results will enable cost-effective delivery of support to people with mental impairment, as well as increased effectiveness of service organisations.

4. SUPPORT ACTIONS SPECIFIC TO TELEMATICS FOR DISABLED AND ELDERLY PEOPLE

The RTD tasks in this sector will be accompanied by a set of specific measures tailored to the assistive technology domain, supplementing those carried out at the Telematics Applications programme level. These measures can be associated to a specific task or may add value and impact to a group of projects in a particular subsector or across the assistive technology area as a whole.

General Objectives

- To raise the level of knowledge and awareness across the the fragmented industries and markets in the assistive technology field.
- To develop and support new standards.
- To get users involved in developments and validation.
- To facilitate the interaction between sector actors, especially involving SMEs.
- To develop measures of cost effectiveness and cost utility of assistive technology.

Overview

The horizontal activities and accompanying measures complement the work in the technical areas specified in this sub programme.

The work in horizontal areas during the Fourth Framework period will build on the foundation of results from horizontal activities in the TIDE pilot and bridge phases.

The key focus is on the problems and needs of disabled and elderly people and not on the technologies.

The principles on which this work will be based include:

Design for all - Quality of life - Real user involvement

This work is divided into four areas:

Education, information and awareness

Methodologies, innovation strategies and future perspectives

Standardization

Market development and technology

4.1. Area H.1 Education, Information, and Awareness

Objective

To raise the level of knowledge and awareness of assistive technologies within Europe.

Overview

Horizontal activities in the fields of education, information and awareness on a European scale adds value by improving the use of technical developments and devices, so reducing hindrances to using technology products and the divisions between developers and users.

There is also a need for better knowledge of how rehabilitation technology products and services can improve the users quality of life (e.g in employment, education, daily living)

This requires appropriate and up to date information and educational actions.

Sub-area

H.1.1. Education

Objectives

To stimulate the development of educational programmes and materials.

To promote availability and adaptation of existing educational materials appropriate to different European cultures for professionals, disabled and elderly people and their carers.

Scope

Educational actions at the European level can develop competence in users of rehabilitation technology, can ensure widespread availability of existing educational materials and programmes, and can equip users to gain maximum benefit from assistive technology products.

Actions should be targeted at:

- Professionals who work directly with end-users (e.g. therapists, rehabilitation engineers, etc, including developers of assistive technology devices), and who need rehabilitation technology information.
- End-users and carers who must have appropriate information, instruction and training to make the best use of assistive technology products.
- Professionals who do not work directly with end-users, but can benefit from these kinds of action in their professions (e.g. architects, industrial designers).

Approach

Survey existing education schemes and materials, collecting examples of good practice.

Set up practical trans-national projects exchanging information and experience.

Carry out research on requirements for training programs, taking into account various professional and user groups, the different technologies, and their applications.

Identify ways of using new educational techniques and pedagogical approaches.

Results expected

Educational programmes and material.

Better methods of introducing technology to the end user.

A network for exchange of information and experience with methods and materials.

H.1.2 Assistive Technology Awareness

Objectives

To disseminate information on rehabilitation technology RTD to decision makers, sector actors, and end users through focused workshops etc.

To provide information to professionals about new research and possible or existing implementations and new opportunities for users in relation to these projects.

To provide information to end users on complementarity between new devices and existing services dedicated to the satisfaction of specific needs.

Scope

Political decision makers must satisfy social needs economically, professionals want effectiveness at work, and users want better quality of life. At the European level there is a need for knowledge about the possible contribution that assistive technology can make to improving the users quality of life. There is also a need for information on new devices.

Approach

Implement an effective programme for the dissemination of information.

Create opportunities for countries to review and compare their arrangements for information dissemination about assistive technologies.

Promote information campaigns.

Arrange liaisons with Handynet, Helios, and other assistive technology research actions.

Results expected

Unnecessary duplication of research and assistive technology products will be avoided.

The knowledge of professionals, particularly professionals not involved in assistive technology activities, about research and development results in these fields will be improved and regularly updated.

4.2. Area H.2 Methodologies, Innovation Strategies and Future Perspectives

Objective

To provide methods to fully involve end-users in the process of bringing innovative assistive technologies to the market.

Overview

TIDE projects must provide a methodological approach, centred on the needs of elderly and disabled people, to the design of products and assistive technologies.

Appropriate technological systems and products can play an important part in enabling disabled and elderly people to enhance their independence and to participate actively in society, taking into account the heterogeneous nature of these groups. Engineers, ergonomists and industrial designers often fail to construct the supporting environment for a comfortable and autonomous daily life because they lack a knowledge of the needs, preferences and characteristics of these consumers. This situation is unsatisfactory for both consumers and producers, since products are developed on a trial and error basis, which implies an unnecessary waste of effort and materials. The lack of knowledge of cultural and social differences between different user markets also means that the expansion of the single European market is hampered.

Assistive technologies are frequently developed without analysing how the technology should be used by the end user. Methods and processes for introducing new technology are often critical and need to be analysed thoroughly.

The lack of knowledge of the needs of elderly and disabled consumers needs to be complemented by the provision of an adequate environment in our society. A holistic approach needs to be adopted, with inputs from users and scientists, care workers, engineers, and designers.

There is a clear need for technological developments to be steered in directions which satisfy user needs. Existing technologies must be adapted for use by the elderly, and specific technical solutions need to be sought for the particular problems of these users. Both incremental innovation and 'cutting edge' technologies are needed.

At present there exists a large amount of knowledge about assistive technologies, but this is not always available in a format that can be readily used by the various sector actors. The available data needs to be transformed and restructured.

Sub-areas

H.2.1 Ethical Methods for User Involvement

Objectives

To actively involve disabled and elderly people in the whole process of the design of assistive technology products and services.

To provide methods for involving end-users of assistive technology and their user organisations throughout the process of developing technical solutions, ensuring processes to overcome the special ethical problems that can result when working with these users.

To address the emerging needs of particular user groups.

To ensure balance in the RTD programme's coverage of different user groups.

Scope

Older people and those who are disabled have to be actively involved in the whole process of the design of assistive technology products. The design process is not restricted to technical development and design.

A design process has many aspects, including:

- assessment of needs
- additional research to fill knowledge gaps
- technical design and development
- prototype testing and evaluation
- documentation, plans for service and maintenance
- market introduction, evaluation, and feedback distribution and upgrading

Methods must be developed to create active user involvement during all these steps.

Researchers need to understand the requirements of users and the changes in their needs that arise. For various reasons there has been less research and technical development activity centred around people with mental disabilities and elderly people. These user groups include people with learning difficulties or mental handicap, people with cognitive and neurological impairments, people with dyslexia, and people who, due to ageing, encounter difficulties in daily living. In market terms this means that some of the largest potential user groups have received the least attention, as a result of which their special needs and preferences are not known. Pro-active measures are required to stimulate research interest, identify user needs, and accelerate development.

Approach

Identify and develop methods for active and ethical user involvement.

Set up a sector ethics committee to monitor and advise on the involvement of users and in particular to consider ethical issues in testing the solutions and technology with users.

Create experimental environments that permit interaction between users and creators at all stages.

Develop methodologies to maximise real user involvement.

Establish protocols for working with users in an ethically sound manner.

Identify expertise in the undersubscribed and underdeveloped fields, stimulate interest and accelerate assistive technology research and development.

Ensure that there are sufficient project evaluators included who have practical expertise in the undersubscribed fields and include appropriate user group representatives.

Consider adjusting the current selection criteria for evaluators in order to achieve balanced coverage of these user groups.

Establish studies to identify user needs, investigate the current state of research in these fields, and explain the reasons for the apparent lag in technology development.

Set up workshops to bring the needs of these user groups to the attention of those who might wish to suggest or bid for future projects.

Results expected

Disabled and elderly people will become fully involved in all phases of the design and development of assistive technology products and services.

Products will be developed that match the real needs of users.

The emerging needs of user groups who are not currently targetted with technological support will be brought to the attention of those in a position to develop solutions, and RTD results will reflect the needs of users.

H.2.2. Methods for Validation

Objectives

To provide methods for implementation and validation of assistive technology solutions to ensure that the end user gains the maximum benefits.

Scope

Proper use of rehabilitation technology is dependent upon provision of processes and methodologies in the various phases. The lack of such processes and methodologies results in users not making use of the rehabilitation technology provided. The reasons for failure include:

Lack of understanding of the close interaction between the rehabilitation technology and the user.

Problems relating to self image and self esteem - stigmatisation.

The lack of proper instruction and training.

Inappropriate product specifications.

Failure to involve key people in the individual's environment.

The professional advisor not having appropriate information and skills.

The interaction of service provider, methods, technologies and distinct user groups determines success or failure. Each rehabilitation technology must consider the provision processes and methods. Some may be generally applicable, whilst others are solution specific.

Approach

Collect examples of good practice in the area of validation and implementation of assistive technology solutions.

Initiate and monitor case studies to develop solution specific processes and methods for validation and implementation of assistive technology solutions.

Organise special topic workshops for professionals and users to create awareness, exchange experiences and identify needs for further developments.

Results expected

Increased probability of usage of rehabilitation technology solutions by the target client group.

Improved feedback to researchers and developers.

A larger market for assistive technology products.

H.2.3. Future Perspectives in Assistive Technologies

Objectives

To guide Research Technology Development in assistive technologies in the medium and long term

To encourage innovation in assistive technology solutions.

To strengthen the competitiveness of European producers of assistive technologies by encouraging innovation.

To promote the development of a successful European industry that produces technology responsive to the everyday needs of elderly and disabled users.

Overview

Individuals whose autonomy is affected by disability can be assisted by technology, but they are also vulnerable to changes in the social and physical environment which can be brought about by the application of technology. Research and technology development is a key activity with the potential to link users, the researchers, manufacturers, distributors, service providers, and decision makers. Because of the imbalances between research and development effort and the scale of changes in society, further action will certainly be needed in this area to follow the Fourth Framework.

Scope

Changes in demography, policy, civil rights empowerment of disabled and elderly people, economics, current trends and employment patterns will call for activities in the assistive technology research and development field at the European Level to continue and increase. The movement towards the information society will make links between social sciences and research and technology development increasingly important.

The main areas of activity must be the interfaces between

the user and research;

the user and industry

research and industry

the different actors in assistive technologies

member states and the EU;

EU and other parts of the world

Information Technology and telecommunications developments and social policy.

An innovative approach to the application of technology to the needs of disabled and elderly people is required. This involves:

- application of new technologies to problems usually tackled by traditional technologies.
- experiments to examine emerging or existing technologies and their scope for application to rehabilitation technology problems.

- application of existing consolidated technologies to new rehabilitation technology problems.

An application is considered innovative if it resolves a new assistive technology problem or if it resolves an assistive technology problem in a better way, whether from a social, economic, or technical point of view. Feedback on innovation strategies will be obtained and fed forward, and views from professional users, end-users and from industry will be sought and utilised.

Problems to be addressed include the identification of emerging technologies which can be reasonably applied to assistive technology problems, and the application of consolidated existing technologies to assistive technology problems and areas which have not yet been considered. In parallel, it will be important to identify new (assistive technology) actors such as technical experts and professionals.

Approach

Select and develop methods for measuring and assessing market forces, changes in policy frameworks, and those factors which prove critical to the success of products and services needed by elderly and disabled users. Scenario studies and forecasting techniques should be used to look at trends and inform EU strategy.

Analyse consequences for disabled and elderly people of key research projects and suggest draft recommendations for European legislation, which will ensure that the needs of elderly and disabled people are always taken into account when European actions are being planned.

Compile 'design for all' guides by product testing and consumer feedback.

Arrange workshops on trends and shifts in the living and working environment which have implications for the assistive technology market.

Results expected

Follow up action will take place in a future Framework Programme.

Recommendations for European legislation will be drafted which will ensure that the needs of elderly and disabled people are always taken into account when European actions are being planned.

Assessment of projects and their achievements will be improved, leading to more efficient use being made of research funding.

The assistive technology industry will become stronger and more competitive.

New applications of existing technology and new products for specialist purposes will appear.

Disabled and elderly people will be enabled to make greater use of Information Technology and telecommunications.

4.3 Area H.3 Standardisation

Objective

To ensure that assistive technology and other products are designed to appropriate standards.

Overview

Standardisation is a very powerful tool

- for carving out the single European market
- for ensuring compatibility between different products and systems

Standardisation work requires a special expertise. In general, professionals dealing with assistive technologies do not have this expertise. This means that standardisation aspects are often neglected or badly handled. For the purpose of creating a single European market the EU have issued directives strongly influencing the way products, systems and services are produced. These framework directives have resulted in extensive standardisation work, some of which is complete, but much remains to be done.

Most of the people participating in general standardisation work have no knowledge of the needs of elderly and disabled people, and if standardisation experts can be informed of these needs it will influence a wide range of standards, to the benefit of elderly and disabled people. Including this input in such standards will prove a powerful tool for making the physical environment ,transportation, services and products accessible to these user groups. In this way, standardisation will contribute towards the major aim of making a society for all.

Involving the expertise of the users in formulating the standards will ensure that the standards truly reflect their needs.

Sub-areas

H. 3.1 Facilitating the Standardisation Process

Objectives:

To ensure that potential standardisation aspects of all assistive technology research and development projects and studies are handled effectively.

To provide a service and a resource which will be offered to other TIDE project groups in order to give guidance and assist them to ensure that all standardisation aspects of the projects and compatibility aspects are handled effectively.

Scope

Standardisation work needs a special expertise and experience as well as knowledge of the European Standardisation bodies (CEN, CENELEC, ETSI) and their working methods. Many of the consortia undertaking TIDE projects will not have this knowledge, and even at national level very few will have the appropriate contacts

and experience. It is important for the commercialisation of a product that standardisation issues are addressed from the very beginning of the project.

Approach

Establish a network, in co-operation with appropriate European standardisation bodies, containing a team of experts experienced in the standardisation field who can assist the TIDE projects, providing all the contacts and experience necessary to overcome standardisation problems.

Ensure that existing standards are utilised whenever possible.

Provide input to standardisation bodies about the results of TIDE projects which may be relevant to the ongoing standardisation work.

Establish common interest groups to agree on common platforms.

Results expected

TIDE projects will incorporate standardisation aspects in their work and ensure that products and systems are developed in accordance with existing standards and de-facto standards.

A professional bridge will be established between the standardisation bodies and the research and technology development activities in TIDE to ensure that the newest results from this area influence the standardisation groups.

Equipment compatibility will be enhanced.

H 3.2 Including Elderly and Disabled People in the Standardisation Process

Objectives

To ensure that all relevant standardisation bodies and activities take account of the requirements of disabled and elderly people.

To provide inputs to appropriate standardisation bodies (CEN, CENELEC, ETSI) to explain the needs of elderly and disabled people, so as to ensure that emerging standards take account of their needs .

Scope

The creation of the single European market is resulting in a large programme of standardisation. At all levels of the standardisation hierarchy, right down to the working groups, there is almost no knowledge of the needs of elderly and disabled people.

The integration possibilities for elderly and disabled people will depend to a high degree on how accessible general products and services are to them. For that reason, it is of vital importance that the needs of disabled and elderly people are taken account of by all who are involved in standardisation work, and it will be necessary to ensure that standardisation bodies are kept fully aware of the needs of these groups.

Approach

Building on the results of previous TIDE horizontal activity programmes, identify standardisation areas which are relevant to the integration of elderly and disabled people.

Prepare a general information package, including examples, and present this to standardisation bodies in various different forms, such as workshops and conferences, as well as in written form.

Provide standardisation bodies and working groups with expertise and existing detailed knowledge about the requirements of elderly and disabled people that are relevant to the standards being discussed.

Identify areas where there is a need for detailed knowledge of the needs of elderly and disabled people and undertake activities which could provide this knowledge.

Initiate the production of horizontal standards within different standardisation areas which describe the relevant requirements of elderly and disabled people.

Organise activities to promote user involvement in standardisation work.

Results expected

Existing products and services will fulfil the needs of elderly and disabled people more satisfactorily, and thus promote the integration of these groups of citizens.

Standardisation areas which would benefit from further activities incorporating the needs of elderly and disabled people will be identified.

An important contribution towards the creation of a society for all.

4.4. Area H.4 Market Development and Technology Transfer

Objective

To encourage the development of the market in rehabilitation technology products and services and the transfer of research results into products and services on the market.

Overview

The market for rehabilitation technology is underdeveloped in size and coverage. A number of reasons why the opportunities are not taken up by the relevant actors can be identified.

The industry producing specialist technology is fragmented and the producers of consumer technology are not aware of the needs and preferences of elderly and disabled users.

User groups are diverse, not well defined, and little is known about their requirements, preferences, or purchasing power. The scope for technology applications is not identified.

Decision makers cannot clearly determine the gains and costs of the application of rehabilitation technology.

The cultural and national differences within the EU hinder market development.

Basic information and knowledge is needed to guide and steer the directions of work in this field, to set priorities and make decisions, to establish programmes and actions to meet the user needs and market demands.

The target groups for such information include: users, professionals, researchers, decision makers, producers, and financiers.

Sub-areas

H. 4.1 Assistive Technology Market Data and Diffusion

Objectives

To increase the availability of market data for assistive technology products and 'design for all' products.

To transform research results into available assistive technology products and services which satisfy users' needs.

Scope

In addition to the technology and market watch activity carried out at the level of the Telematics Applications programme there is a further need to develop structures and methods to analyse and collect data at the subsector levels, due to the extremely fragmented nature of the assistive technology market, and so to support the

emergence of a coherent internal market and sector. There is a need for data that are not available at present, such as:

- numbers of target populations
- needs, preferences and requirements of users
- numbers of devices now sold
- purchasing power
- third party payers
- legislation
- service delivery systems

TIDE horizontal studies have gathered some of this information, such as that on legislation and service delivery systems, but there is a need for much more relevant information.

Technology transfer is important in order to transform the results of research into working prototypes or designs and then into innovative assistive technology products. Market innovation is the end result of the successful transformation of working prototypes into new assistive technology products. This aim can be achieved more easily if the problem is tackled at a European level. Assistive technology research results can be exploited by means of diffusion initiatives such as workshops and exhibitions and the availability of research dissemination networks like VALUE's relay centres. Intermediaries between researchers and people working in the assistive technology market are also important.

The development of the assistive technology market depends upon the timely appearance of innovative assistive technology products. In order to achieve this significant goal, good co-ordination between technical researchers, industrial designers and users is fundamental. Characteristics of the assistive technology working prototypes have to be carefully described before trials with users are undertaken. After experiments with prototypes have been carried out the modifications required to transform prototypes into products have also to be clearly defined.

Approach

Collect, analyse, and present relevant data on the market for assistive technology products and services.

Make this data available to all those who are concerned with this market, and to manufacturers who might be persuaded that it could be worthwhile and profitable for them to enter the assistive technologies market.

Identify major problems in the technology transfer process which are specific to this area.

Disseminate information gained from analysis of successful examples of technology transfer.

Results expected

Better information will be available to manufacturers, and distributors to facilitate entrance into new markets. Research and development teams and user organisations will also benefit.

A greater number of usable products will become available to professional and end users.

Increasing demand for assistive technology products will induce manufacturers to produce even more innovative products.

H.4.2 Cost Effectiveness and Cost Utility Analysis

Objectives

To measure the impact of assistive technologies on the quality of life of disabled and elderly people, and to measure the 'value for money' which society receives from the deployment of assistive technologies.

Scope

There is a need for more knowledge about the effects of assistive technology devices on different socio-economic and economic parameters and on the quality of life of individuals. TIDE horizontal activities presented a comprehensive study of methods now used, their advantages and disadvantages, but highlighted the need for further studies and methodology development.

In several areas, in close connection with existing services and policies, assistive technology can enable people with disabilities and elderly people to live more independently and promote their participation in and contribution to the life of the community. Technology can, however, also increase social isolation and exclusion.

Approach

A holistic approach needs to be developed in order to take into account the opportunities to strengthen the integration of disabled and elderly users in developing the use of assistive devices.

Undertake cost-effectiveness studies and cost-utility evaluations using existing methods and further refine these methods.

Three or four countries should be included in these analyses in order to contribute to comparisons of different situations and to the identification of solutions in relation to the quality of life of the users and value for money.

Results expected

More reliable information to decision makers on social and economic advantages and drawbacks of the use of rehabilitation technology and the value for money which these provide in several areas, such as education, employment and independent living at home.

5. RTD Tasks

100-511

Task 100 Accessing Current and Emerging Interpersonal Telecommunications

Background

Disabled and elderly people experience problems in using current telecommunications services. Lack of concern for the requirements of these user groups creates problems in using telephones, faxes, audiotext, and videotext services. Simple adaptation and minor design modifications can often provide solutions, but they require a clear understanding of the requirements and preferences of the users, and careful design

New telecommunications technologies and equipments are now emerging in the market which are stimulating the introduction of many new services based upon intelligent network facilities, the data transmission and integration capabilities of GSM, the UPT, the Class Services (e.g. answering services) and the new multimedia technologies. Whilst new opportunities are created for some user groups they can impose new barriers to others.

The demonstration of well designed solutions, integrated in real network environments, could have a major impact on the evolution of these new technologies and equipments.

Objectives

To improve usability and accessibility of current and emerging services and equipment for interpersonal telecommunications by disabled and elderly people.

Technical Approach

This task must be driven by the consideration of human factors related to the requirements and preferences of different user groups, to the current and emerging telecommunications technology and to the characteristics of equipments and services. Comprehensive and systematic design guidelines have to be established, submitting inputs to the relevant standards bodies, to the industries and to the telecommunications operators.

Improved interpersonal telecommunications equipments and services must be designed, implemented and integrated. They must be demonstrated and evaluated with user groups and in real telecommunications networks. Projects should take into account new possibilities provided by the intelligent network customer control facilities. Where general solutions cannot be found or are not commercially viable, the adaptation of equipments and services should be considered

Key Results and Milestones

- A comprehensive set of user requirements related to different user groups
- Systematic design guidelines for industries and telecommunications operators
- Implementation, demonstration and evaluation of improved and integrated interpersonal telecommunications equipments and services in real network environments.

Task 101 Access to Information and Other Resources

Background

Disabled and elderly persons must be able to access and process information in any area of life using the available IT systems. New paradigms and technologies have been developed recently and are emerging, such as multi-media, pen based computing, 3-D interfaces, smart cards, portable computer-based devices (for example PDA's), interactive TV, etc. These new technologies will have a major diffusion and impact on the way information will be used in the future. Disabled and elderly people must be given access to these technologies; furthermore, these technologies should be harnessed for their special requirements and needs. These developments concern many day to day needs, for example in the areas of the workplace and of individual professional services as well as social and cultural and leisure activities.

The movement of ICT to digitalisation of information and multi-media integration creates the opportunity for the development of new interactive services for professionals and the general public. These evolutions and services provide a good opportunity to improve social and professional integration of disabled and elderly people, but specific adaptations must be developed, and services open to disabled and elderly people must be designed and tested.

Objectives

To improve the accessibility and usability of current and emerging information sources, and equipment for access to them.

Technical Approach

The work will concentrate on current and emerging developments in information technology, such as multi-media, pen based computing, 3-D interfaces, smart cards, portable computer-based devices (for example PDA's), interactive TV, etc. It will examine how the many needs of disabled and elderly people may be addressed while maintaining and even enhancing the usability and accessibility to these devices and information sources for the general public. Particular attention must be paid to the study of potential barriers for different user groups, their requirements, an identification of possible solutions and the implementation of prototypes.

Key Results and Milestones

- Publication of a comprehensive analysis of user needs and preferences and technological options for access to current and emerging information sources and applications by elderly and disabled users.
- Implementation and demonstration of access to current and emerging information sources, equipments and applications, which incorporate the needs and requirements of disabled and elderly people.

Task 102 Computer Supported Group Activities

Background

Recent technological achievements have led to the production of commercially available emerging software systems enabling computer-based co-operation. However, accessibility by disabled user groups is not facilitated. It is important that this technology is also extended to new areas to provide new opportunities for disabled and elderly people. It should address at the same time different user groups with diverse characteristics, abilities and preferences. The current technological move from standalone single-user interactive applications to advanced multi-user interactive applications, especially with the wide spread of networked systems and telematic services providing multimedia information, provides an opportunity to develop augmented environments which support the socio-economic integration of disabled and elderly people.

Objectives

To improve the accessibility and usability of computer supported group activities and to consider new uses of this technology of particular value to disabled and elderly people.

Technical approach

The flow of information between participants in computer mediated group activities needs be analysed with respect to various perceptual, cognitive, sensor and social criteria, resulting in quantitative and qualitative specification of user requirements and system functionality. For instance new interaction techniques for presenting common information in different ways to participants with different abilities and requirements. In order to reach the above objectives it is necessary to:

- Provide augmented environments for disabled and elderly people enabling accessibility of computer-supported group activities.
- Develop technological solutions for enhancing existing technology in order to support different target user groups, including disabled and elderly people.
- Develop prototype innovative co-operative interactive applications for all, which demonstrate collaboration through appropriate novel interaction methods and techniques and integrate disabled and elderly people in new ways.

Key results and milestones

- Publication of a comprehensive analysis and technical development guidelines for current and emerging groupware technologies with respect to the usability of systems by disabled and elderly people.
- Implementation and demonstration of systems which integrate disabled and elderly people into computer-supported group activities.
- Publication of user evaluations, experience and examples of good practice

Task 103 Support Systems for Multi-modal User Interaction

Background

The availability of different interactive channels during user-computer interaction is critical for disabled and elderly people. The use of advanced interaction methods, such as non-speech audio, speech, graphical output, tactile output, force feedback and gestures could provide the only viable means of access to and manipulation of information for certain users.

Developing User Interfaces which combine such methods is a difficult task, particularly since there are no well established methods and tools to support the definition, design and implementation of such interfaces

Objectives

To develop systematic approaches and demonstrate prototype User Interfaces facilitating multi-modal user interaction by different user categories.

Technical approach

The use of different media and modalities is critical in addressing diverse user requirements and preferences as is the integration of alternative peripheral devices and new interaction techniques. A multi-modal User Interface should enable the completion of a particular user-task in several different ways. For example, an disabled user could delete a file by either sketching an 'X' using his/her fingers over the object representing the file displayed on a touch sensitive screen; alternatively, he/she could focus on this specific object via an eye-gaze system and then perform a simple gesture using a data glove to indicate the intention to delete that file.

New approaches to the development of multi-modal User Interfaces should enable a more flexible combination of interaction methods and easier configuration of the interaction. Appropriate enhancement of existing software engineering methods for building multi-modal interfaces is required and new augmented development techniques which need to be constructed to enable accessibility by disabled and elderly people. Also, development of new multi-modal interaction techniques is required which are targeted to the specific needs of disabled and elderly people; innovative input/output devices may need to be considered.

Key results and milestones

- Publication of a comprehensive analysis and assessment of user needs and analysis of the usability of multi modal interactive systems by disabled and elderly people.
- Implementation and demonstration and evaluation of innovative multi-modal interaction techniques accessible by disabled and elderly people.
- Implementation and demonstration of development systems for multi-modal User Interfaces accessible by disabled and elderly people.

Task 104 Intelligent and Adaptive User Interfaces

Background

Recently, the notions of intelligent and adaptive user interfaces have been developed in response to the need for enhancing the accessibility of software products in the professional, domestic, education and leisure related domains. The design of such interactive applications is, however, becoming more complex and assistance in the form of well defined methods and powerful tools are required by designers.

Adaptability of interfaces to user needs can range from simple automatic reconfigurations at the physical level to more intelligent adaptations of the dialogue. New metaphors are required or existing metaphors may need to be revised. For instance, a new metaphor for interaction encompassing intelligent interactive entities may be developed, in order to meet the specific needs of cognitively impaired users, while the conventional desk-top could be transformed to an intelligent one meeting the specific needs of motor impaired users.

Objectives

To develop systematic approaches and demonstrate prototype intelligent User Interfaces which are adaptive to individual user requirements.

Technical Approach

Recent investigations have attempted to rationalise the User Interface design in the construction of interactive systems, including the use of 'intelligent agents', but the majority of these research efforts have not addressed the requirements of disabled and elderly users. Moreover, each distinctive approach proposes its own design steps and makes its own definition of the features and properties of the terms 'intelligent' and 'adaptive' User Interfaces. Work in this task should extend the scope and range of issues covered in existing approaches and methodologies by involving non-computer specialists (such as cognitive psychologists and other human factors experts) to (i) analyse user requirements with respect to existing and emerging User Interface Software Technology, (ii) define new metaphors (where necessary) and new interaction techniques which serve these requirements and (iii) evaluate and test the usability, effectiveness and efficiency of the new interfaces.

Key results and Milestones

- Development of new metaphors of interaction based on the notion of an intelligent interactive system.
- Specification of criteria for selecting and integrating appropriate interaction techniques for user-centred interface design.
- Models of the design process for User Interfaces for all.
- Demonstration and evaluation of prototype intelligent and user-adaptive Interfaces for all.

Task 105 Dialogue Control Structures and Flexible Interaction Techniques

Background

Current user interfaces often create barriers to disabled and elderly people by making assumptions about motor, sensor and mental abilities of users (e.g. fine movements, colour discrimination, short term memory, etc.). The dialogue structure, the control techniques, the presentation of commands and feedback are often dictated by 'technological' and 'aesthetic' criteria rather than consideration of relevant human abilities

There is a need for more general knowledge about human functioning of disabled and elderly people in relation to technology, and for a methodical definition of their requirements, preferences and expectations leading to a more systematic approach in the dialogue design and testing procedures and supported by adequate assessment data and tools

Objectives

To develop systematic approaches and demonstrate prototype dialogue control structures which facilitate the definition of flexible interaction techniques to meet the needs of different user categories.

Technical Approach

The techniques of human factors, ergonomics and psychology must be integrated with hardware and software engineering skills. Configurable and adaptive dialogue control structures should be designed and tested for usability with systematic procedures, supported by adequate tools. Wherever possible, the improvement of existing user interfaces should be demonstrated and evaluated with a range of different users.

The dialogue structure should be adaptable to possibly changing user abilities, hiding the complexity of the underlying functions, and catering for different requirements, preference and expectations of different user category. User procedures should be easy to learn and facilitate the cognitive transfer of a user experience in similar environment. Presentation and nesting of commands and feedback actions should be tailorable to different motor, sensor and cognitive abilities. Help and error control procedures should be tailorable to user needs.

Key Results and Milestones

- The publication of a comprehensive set of user requirements related to different user groups.
- The publication of systematic design and testing guidelines, and support tools for dialogue designers.
- Development, demonstration and evaluation of adaptive dialogue control structures in improved or new user interfaces, applied in real environments.

Task 106 Methods and Tools for user-centred design of user interfaces for all

Background

Designing user interfaces for access by all requires careful attention to user requirements. Requirements information is typically difficult to access, and the effective communication of such knowledge to developers and the experts who may conduct the user evaluations can be a critical aspect of the design life cycle. Support tools for user centred are common and have been developed in many programmes yet do not specifically address 'design for all'. It is unlikely that a single project could support all projects in this regard, and support is needed for systematic specification of user requirements and preferences, for user interface design and dialogue specification, and evaluation in all projects.

Objectives

To select or develop and demonstrate methods and tools which support definition of user requirements, design, prototyping and evaluation of user interfaces accessible by different user categories of elderly and disabled people.

Technical approach

Work in this area addresses the entire user interface development life-cycle, and should promote iterative design of interfaces accessible to all and support strong user involvement. The tools should support:

- the elicitation and systematic specification of end user requirements and preferences with respect to the user interface design issues (e.g. preferences over devices, modalities, type of interaction, etc.);
- rapid prototyping of user interfaces for all by use of tools and methods which facilitate translation of user requirements and preferences into design;
- early and continuing evaluation and testing of evolving prototype designs.

Key results and milestones

- Selection or development of methods and tools facilitating the elicitation and systematic specification of user requirements and preferences regarding user interfaces accessible to all.
- Selection or development of methods and tools providing assistance for user centred interface design and dialogue specification.
- Selection or development of methods and tools facilitating rapid prototyping.
- Selection or development of methods and tools facilitating testing and evaluation of user interfaces.

Task 107 Innovative I/O devices for access to ICT Systems, Services and Networks

Background

The rapid development of ICT systems, services and networks creates new opportunities serving practical needs of disabled and elderly people in areas of life, such as social contacts, work, education and leisure. Moreover new systems and services are being introduced and their access and usability has to be geared to disabled and elderly people (e.g. cable TV, interactive video communication, mobile and portable devices, multimedia services, etc.). Many disabled and elderly people cannot use these developments and techniques, or experience problems with them due to impairment of some physical, sensory or cognitive capabilities.

The aim of this task is to facilitate access to ICT systems, services and networks by disabled and elderly people by exploiting residual perceptual and motor functions. This requires the development and integration of new dedicated I/O devices and interaction techniques, compatible with mainstream technology. The potentially very rich set of capabilities and options generated by emerging technologies, provides the means for addressing many interaction needs of disabled and elderly people.

Objectives

To develop innovative input/output devices and techniques in the application of information and communication technology for disabled and elderly people.

Technical Approach

This task must be driven by careful consideration of user needs and preferences and by market considerations. The availability of technologies and devices in the time frame of the programme has to be considered. Priority has to be given to containing the cost, for allowing market acceptability and economic viability for the users.

Existing solutions and technologies have to be analysed, assessing the potential for their development and innovative use. The possibilities given by new technologies and devices have to be explored. The socio-economic impact and the achievable benefits of the proposed solutions have to be evaluated. Innovative integrated solutions have to be designed, developed and integrated with real systems, services and networks. The results should be evaluated in field trials with real users.

Key results and milestones

- Analysis and publication of user requirements, social and economic factors and technical feasibility of innovative I/O devices and interaction techniques
- Implementation, evaluation and demonstration of innovative I/O devices and techniques integrated with real systems, services and networks used by disabled and elderly people

Task 108 Relay Services and Mediation

Background

The development in the telecommunications area is expanding extremely quickly. It gives people the possibility of communicating in many ways and accessing many information services, databases, etc. These services are not, however, accessible to all. Some groups of disabled and elderly people are unable to achieve access, use or benefit from many services offered.

To give disabled and elderly people access to telecommunications services offered to the public it may be necessary to establish relay or mediation services. People with a hearing impairment (deafness and severe hearing losses) are unable to use the telephone service unless a relay service is established between ordinary telephones and text telephones. Also people with speech problems, mobility problems, visual problems etc., may benefit from relay services enabling them to communicate using ordinary telephones.

The most common relay service in operation today is between ordinary telephones and text telephones, yet the scope includes text, voice and videophones of many varieties.

Objective

To develop and demonstrate new relay and mediation services for interpersonal telecommunication and access to information and other services.

Technical Approach

Relay services may be based on operator intervention, may be completely automated in nature or based on a combination of both. The relay service can be national or trans-national, in the latter case, the issues of interoperation and of language should be addressed. Availability is also a significant user concern: services may only be of value if they are available on a 24 hour basis. Research needs to be undertaken in such areas as transferring speech to lip reading or signing via automatic relay centres.

It is expected that further development of the new ISDN service can substitute some relay services. Projects which further develop and demonstrate new ISDN based services should, therefore, be stimulated. Future relay services may be between ordinary telephones and videophones.

Key Results and Milestones

- Analysis and publication of user needs, social and economic factors and technical feasibility of relay and mediation services
- Production and field testing of specific relay and mediation services
- Formulation of plans for introduction and delivery of services.

Task 109 Information retrieval and transfer to Disabled and Elderly People

Background

Access to information can be facilitated for many disabled and elderly people by the use of electronic forms. Moreover, much information is only available in electronic form. Great efforts have been made to permit access by disabled users to pure text documents but more effort is required to allow fast and effective access to multimedia information.

New channels are being developed and used to distribute information in all aspects of social and economic life, such as land based, cable and satellite TV, interactive CD and TV, CD-ROM, the public switching networks and the mobile networks, etc. These developments represent both an opportunity and a potential difficulty for different groups of disabled and elderly users.

Objectives

To develop and demonstrate new special applications and services for the distribution of information to elderly and disabled people

Technical Approach

A wide ranging review and analysis of technological, market and standardisation issues, as well as human factors and social implications is required in this task. Legal, copyright and regulatory aspects have to be taken into account. The pan-European dimension must be considered carefully

Effective retrieval and presentation techniques for multimedia document have to be developed. Means for presenting the information with different media and formats have to be defined and implemented in order to adapt to different user abilities. Navigation systems that take into account different cognitive abilities have to be developed. Intelligent agents could represent a significant tool, providing the capability for users to delegate tasks and responsibilities to software functions that are capable of adapting to and predicting their needs.

Prototype services for information delivery to different user groups have to be developed and demonstrated. The possibilities given by new technologies, networks and devices for information delivery (e.g. portable and mobile equipments, high speed digital networks, interactive TV, etc.) have to be taken into account.

Key Results and Milestones

- Publication and dissemination of requirements, technology options, and proposals for standards and regulations at the pan-European level
- Demonstration and evaluation of applications and services for information delivery to disabled and elderly people in Europe.

Task 200 Integrated Systems And Services

Background

During the TIDE bridging phase prototype integrated systems have been developed where the components are technically and/or functionally interconnected by some means so that:

- a control interface can be used to control two or more components,
- a component can be controlled by one or more control interfaces

Objectives

To develop and validate integrated systems and services to support activities of daily living which combine Information Technology, Home systems and Telecommunications.

Technical Approach

Study how technology should be introduced in the home, based on user needs and preferences and how future enlargements of the system should be taken into account.

Define an overall architecture for the integrated system.

Further develop and integrate by a suitable home bus or subscriber premises network systems for

- home security control,
- environmental control (home devices, TV,..)
- communication control (telephone, data terminals, ..)

Develop tools needed for integration of new components to the system.

Evaluate the integrated systems in pilots.

Key results and milestones

Report on how to introduce new technology in a home and how to make reservations for further enlargements.

Inputs to the 'Common Specifications' activity.

Evaluation of the usability of the integrated system.

Task 201 Integrated Tele-Services

Background

Use of telecommunications services are often a prerequisite for persons relying on support for coping with the activities of daily living. Alarm telephone services and home services are available in most countries. The services will be further upgraded by efficient use of new telecommunication services.

Objectives

To integrate different tele-services to support the activities of daily living.

Technical Approach

To evaluate opportunities offered by new tele-services (like videotex, electronic mail, videotelephony, multimedia services,..) for supporting activities of daily living (like information or communication services, reminder services, ordering of merchandises or services, security services)

Develop an integrated conceptual model for the user interface.

Prototype the telematic support system and the MMI for the integration of services.

Evaluate the integrated system in a real life pilot

Key results and milestones

An evaluated system for supporting activities of daily living.

Inputs to the Common Interest Group activities

Task 202 Man-Machine Control Interfaces for Integrated Systems

Background

Other tasks address integrated systems including control MMI's. However, many homes have systems and appliances installed with their own control devices. Each of these devices may or may not assist people in effectively controlling their environment. There may be no commonality in the representation of functions or even difficulty identifying which device controls which system/appliance. This task addresses the need to integrate a number of systems through a common interface to ease control and increase functionality.

Objectives

To develop appropriate control MMIs, which take account of cognitive overload and consider the user's abilities and changing needs.

Technical Approach

Identification of user needs and requirements with regard to the need for a single, multi-functional device (or segmented suite of MMIs) and the degree of intelligence required in an MMI to simplify use through decision support systems, prompts, reminders and/or flexibility and adaptability to meet changing needs of a particular user or user group.

Involvement of users and addressing issues of aesthetics and acceptability.

Establishing multi-disciplinary teams involving manufacturers, engineers, ergonomists (cognitive and physical) and users (including their representatives where appropriate).

Applying appropriate software and hardware to provide tailor-made or flexible/adaptable solutions to the problems of controlling a variety of disparate systems and appliances.

Development and evaluation of prototypes and inputs to Common Interest Groups

Key results and milestones

A survey of common groupings of systems/appliances already installed in the homes of disabled and older people, and of the problems encountered with current control devices.

The identification of solutions to issues of; incompatibility, different and changing user needs, limited user ability and the possibility of adapting currently available control devices.

Specification of requirements of users, groups and customers (if different from the users) plus technical and architectural issues, protocols and agreement of pragmatic standards.

Development of prototypes for real world field trials and ergonomic tests and for assessing user/customer acceptance.

Task 203 Integration of Devices

Background

There is increasing interest in the smart home concept, within which there are integrated devices which promote independent living. So, the definition of appropriate elements for smart homes and environments which facilitate self-support and hence independent living is an essential goal. This could include integrated alarm system in the home and in sheltered homes, including sensors for passive security.

Specialised systems, which include sensors and actuators, can increase self management capacities and meet the security needs of the increasing numbers of older and disabled people living alone and can also facilitate the work of their care providers.

Objectives

To integrate devices, including sensors and actuators, within systems for daily living.

Technical Approach

Work in this task should be directly related to work being carried out in task 201, and should include:

Identification of user and market requirements.

Identification of technical solutions and common specifications to be implemented.

Identification of existing standards and regulatory issues.

Development and adaptation of enabling technology, with design of prototypes and models.

Technology verification using field trials and usage scenarios.

Key results and milestones

Evaluation of the requirements and needs for independent living at home for different groups of older and disabled people.

Identification and evaluation of market segments.

The development of models and prototypes (new sensors, special devices and user-friendly software) for integrated devices and the evaluation of their functionality and usability for the target population of users, including field trials.

Task 204 Systems for Maintenance of Health

Background

Basic components for health monitoring and the required care systems are already available. Components for home measurements of important physiological parameters such as heart rate, blood pressure, glucose, temperature, etc. are also available.

Integration of these components for daily living support, validation by carers and integration with user-friendly software for users are key issues for development.

Open questions remain concerning treatments and conditions for which the application of home based or remote technology is suitable. Factors affecting this question include legal and ethical aspects and the issues of data protection and security and reliability of data.

Objectives

To develop systems which aid older and disabled people in maintaining their health and in obtaining advice for self treatment.

Technical Approach

Work in this task should be directly related to work being carried out in task 202, and should include:

Development of a systematic approach to the support of older and disabled people.

Development of technical solutions for health monitoring and supporting older and disabled people, including development of devices for carers and software support and taking into account the requirements of health care or support services.

Development of technical solutions to enable older and disabled people to obtain advice about self treatment in order to maintain their health.

Development of technical solutions to enable the remote control of delivery of medication and provide appropriate feedback.

Key results and milestones

Evaluation of the possibilities offered by the new technology for remote care and health monitoring.

The development of new devices and systems for sheltered and home measurement of physiological parameters that can be used to monitor health status.

The development of integrated systems for self maintenance of health and remote medication delivery.

The integration of these devices in systems for testing in real environments.

Inputs to the Common Interest Group activities

Task 205 Training Systems for Daily Living

Background

Training for older and disabled people must be based on research into how they can learn new skills and to what degree these are transferable (to what extent training in a particular skill, allows the more rapid acquisition of similar skills). Work must address selection of methods to train intellectually impaired individuals in their interaction with technologies (e.g. computers and communications systems); identification of the ergonomics of home appliances; definition of training and support needs based on personal profiles; mapping support needs to solutions. (Related Tasks, 500 - 502). Projects should address problem areas such as house-and-home management (e.g. kitchen management, using domestic appliances, planning etc); use of telecommunications (e.g. video telephones); use of information technologies in the home, at work or socially (e.g. banking, libraries, teleshopping, automatic ticket machines, teletext systems). Prototypes must serve real needs and have potential for exploitation in the long term, while authoring systems must support development of multimedia learning tools which facilitate learning skills needed to interact with technology. Solutions shall be based on a thorough analysis of impairments, learning difficulties and the experience of using technology.

Objectives

To develop and validate tools to support training of older and disabled people in daily living skills.

Technical Approach

Identify impairment and experience profiles of target groups of older and disabled people.

Identify the requirements for training of living skills and technology (includes carers).

Survey existing technology based training aids, and relate training and support needs to the technological solutions.

Identify, specify, demonstrate and evaluate technology based training and support systems.

Key results and milestones

Specification of the training and support requirements of target groups.

Identification of how well these are met by existing technological solutions.

Specification of new technological solutions in the form of common specifications.

The provision of authoring tools for technology based training materials.

Advanced prototypes in terms of software and hardware which can demonstrate the application of technology to specific problem areas.

Task 206 Systems for Free Movements of People

Background

Systems exist for the precise positioning in the environment and these systems have been linked to geographical and other information systems. However, these systems, with appropriate modification, might be of benefit to older and disabled persons.

Objectives

To develop systems that enable people to move freely and safely into and around the EU external environment.

Technical Approach

Assessment of information needed for independent travel, and the optimum way of displaying this information to older and disabled persons. There may need to be an user-adaptable interface with the facility for the user to interact with the database.

Development of prototype systems for route planning and for mobile use. Economic constraints may necessitate utilising an existing infrastructure but with modified input and output modalities to suit the disabled or older user.

Development of training procedures.

Evaluation with a cross-section of potential users.

Assessment of the potential market for such systems.

Development of appropriate common specifications for transmission and coding of signals used by the system, including aspects such as data security and maintenance of privacy

Key results and milestones

User requirements specification.

Common specifications relating to coding and transmission of signals.

Demonstration of working prototype systems.

Task 207 Services for Communication

Background

There is increasing interest in the integration of technologies in order to provide services that allow communication with people and services external to the home including vocational, educational, leisure and cultural activities. Such services are moving from an experimental phase to a stage where they promise to be extremely useful in that they can provide facilities which are of major importance for the creation of conditions of self support and independence for older and disabled people, and then to permit them to participate in a lot of activities from a remote location

It is essential to facilitate accessibility for such people to the wider life of society. Specialised services can improve their autonomy and avoid the consequences of frustrating social isolation.

Objectives

To develop services that allow communication with people and services external to their home, including vocational, educational, leisure and cultural activities.

Technical Approach

Work in this task area should be directly related to work being carried in the tasks 201 and 202.

Identification of user needs and requirements as to the functional and technical characteristics of potential solutions:

Analysis of services that can be delivered at a distance.

Identification of kinds of activities appropriate for people with one or more handicaps and of the environments in which such activities are carried out.

Key results and milestones

Evaluation of user requirements through the identification of specific impairment groups of people and evaluation of their problems to communicate with external environments.

Evaluation of support services and their acceptance by users.

A survey of available solutions.

Design guide-lines for the development and adaptation of services using integration technologies and facilitating communication between older and disabled people and services external to their home.

Inputs to the Common Interest Group activities

Task 208 Requirements of Users for Emerging Systems and Services

Background

New equipment, computational techniques, systems and adaptations to equipment occur all the time. Each change must be studied to identify its potential impact on the needs and wishes of older and disabled people. Can they access the equipment? Does it need adaptation to be suitable for older and disabled people? Can it solve specific problems of older and disabled people either alone or with further adaptation?

Objectives

To isolate the specific requirements for older and disabled people for emerging systems, services and underlying infrastructures.

Technical Approach

Identify items of equipment or techniques for study and establish their suitability for meeting the needs of older and disabled people.

Consider the systems/interfaces required to enable older and disabled people to access and utilise such equipment, bearing in mind that they are not a homogeneous group.

Experiment with interface devices and report on their benefits and limitations

Describe how devices or techniques can assist, giving an indication of possible market volume and costs.

Key results and milestones

Specify equipment required to enable older and disabled people to access and use emerging systems together with information about costs and marketability.

Identify emerging technologies and specify any problems encountered by older and disabled people in making use of them.

Develop trial interfaces where necessary, validate them and consider the future market.

Inputs to the Common Interest Group activities

Task 209 Tools to Support Training to promote involvement in Society

Background

This task complements all other tasks in this sub-area. The sheer effort involved in personal survival and obtaining a reasonable quality of life without placing an undue burden on family and friends has meant that many older and disabled people have limited their expectations about participating fully in society. Furthermore, their disability may make involvement more difficult and require them to learn how to participate on an equal basis with others.

Objectives

To develop and validate tools which support the training of older and disabled people to increase their involvement in society.

Technical Approach

Isolate extent of involvement in society and requirements for technological assistance of the chosen target user group. This will include an analysis of the cause of isolation or involvement and the action required to improve the situation.

Develop training systems that address both attitudes and practical techniques for improving involvement in society. The systems should be constructed using the media and presentation that are appropriate for the target user group.

Evaluate the systems in training situations.

Key results and milestones

A set of user requirements appropriate to the target user group

A system developed to assist in a training scheme

An evaluation report on the effectiveness of the technology and an improved system.

Task 210 Systems Providing Access

Background

The inclusion of elderly and disabled people in vocational, educational, leisure and cultural environments has had limited success. Disabled people find it difficult to integrate into the economy and into society. Their rehabilitation and integration into the external environment is currently very costly and results are often not optimal due to the inaccessibility of the environment external to the home (workplace, leisure place etc.) and this contributes substantially to what is perceived as the nature or extent of a disability. Rehabilitation effort should therefore assist people in accessing the environment by optimising the external environment to suit the specific needs of the users (includes workplace).

Work should concentrate on the development of devices and their integration into external environments, and designers should pay attention to flexibility of devices such as multimedia terminals for different user groups, modular human-machine interfaces to meet the needs of people with different kinds of disability, and information presentation geared to different disabled people (especially those with sensory and cognitive impairments). Work in this task may solve the problem of isolation which other rehabilitation technologies may provide (by supplying to disabled or older people sophisticated communication facilities and by enabling them to work in a remote environment).

Objectives

To develop and validate systems that provide accessible and adaptable environments, including vocational, educational, leisure and cultural.

Technical Approach

Identification of the requirements and environments of the target user groups relative to different activities (work, leisure etc.) that can be carried out in the local external environment, together with market requirements.

Identification of existing appropriate technical standards, legislation and regulatory issues.

Survey of existing technology that aid older and disabled people in these types of activities.

Development of operational scenarios along with prototyping and modelling

Demonstration and validation of the integrated systems through field trials.

Key results and milestones

Evaluation of user requirements

Analysis of market and evaluation of market requirements

Validation of the integrated systems

Inputs to the Common Interest Group activities

Task 211 Common Interest Groups

Background

The formulation of common specifications enable the integration of devices such as Home Bus Systems, Communications Systems, MMI, Applications and Services, and Work-Stations to meet the differing needs of this group.

The standards process is being overtaken by Common Interest Groups which formulate common specifications which become de facto standards (e.g. MPEG, ATM Forum), thus allowing products to reach the market before the standardisation process is completed. CIGs consist of an open alliance of producers and customers. The common specification is a loose agreement allowing products to be designed to meet customers' needs.

Objectives

To form common interest groups to develop and validate common specifications, standards and principles for systems integration considering user requirements and the set of relevant technologies.

Technical Approach

To form a CIG which includes both large and small companies, research institutions and major customers.

To identify the key areas in which it is necessary to have common interfaces.

To formulate draft specifications and progress their agreement with all members of the CIG.

To adapt devices, etc., and build integrated systems which use current technology with consideration of security, privacy, confidentiality and user identification.

To build test sites which will involve customers and users in verification of the interfaces.

To produce the common specifications

Key results and milestones

Formation of CIG

A comprehensive set of validated common specifications covering the interfaces of the component parts of integrated systems.

A test-bed for validating the specifications and for validating future new components.

A report on how to join the CIG.

Task 212 Modelling & Simulation Tools

Background

Older and disabled people generally need assistance from more than one system. As an example, a single person living in a smart home may rely on control of the environment as well as on connection to an alarm network. Up to now, there is no technological assistance in combining these different and heterogeneous systems into one system and in predicting its performance. This task calls for tools which model and simulate the overall system. Special attention has to be paid to the interface with the user as well as the carer to gain the acceptance of both.

Another topic to be addressed is the variability of component requirements, which have to be met by the global system. This results from the differing user and carer needs and from special requirements due to different structures in the member states.

During the process of system specification, issues like safety, privacy and usability have to be analysed.

Objectives

To adapt modelling and simulation tools which allow rapid prototyping and emulation of integrated systems and environments, according to user requirements, for demonstration to prospective users.

Technical Approach

Review of components to be included and specifications of the interfaces needed.

Definition of an open architecture based on a component concept.

Identification of components which have to be specified by user and carer needs

Adaptation of existing modelling and simulation tools and/or development of new ones.

Verification by trials with some existing integrated systems

Demonstrations of rapid prototyping capability with user and carer assessment.

Key results and milestones

Rapid prototyping allows feedback from prospective customers and users in an early stage of system specification

Validation procedures can be defined at the start of implementing system

Evaluation of usability and safety aspects can be done on the system level.

Contributions to relevant common specifications.

Task 213 Human Contact and Isolation

Background

A major concern of rehabilitation professionals in using assistive technology for the provision of remote services is the possible further isolation of the user from involvement in society.

There is very little certainty that research in the field of loneliness is necessarily relevant to use of remote services.

Objectives

To explore the issues of isolation and human contact that underline the provision of remote services for involving people in society.

Technical Approach

To established a baseline of literature in this area.

To formulate metrics for measuring appropriate aspects of human contact.

To conduct experiments using a set of existing remote services.

To analyse the results and identify the key areas that require attention to prevent isolation.

Key results and milestones

A comprehensive set of references to the field of psychology of loneliness and technology.

Guidelines for implementing remote services to avoid increasing isolation.

Task 214 Bridges & Gateways to Existing Systems

Background

Society is becoming more mobile with people moving between countries for study, employment, leisure and retirement. A community-wide market for products is likely to benefit older and disabled people, many of whom require highly specialised systems. Thus there is a need to ensure that new products are compatible across the Community.

Objectives

To explore the incompatibilities between systems in the member states and to develop bridges and gateways between the systems at the device and infrastructure levels.

Technical Approach

Identify specific systems for study

Design apparatus that will provide access between different systems

Test the effectiveness of the apparatus

Identify legal constraints

Report on potential market

Key results and milestones

Apparatus designed to enable users to access facilities across the European Community.

Identify current systems for study

Design apparatus linking systems

A validation report

Legal constraints imposed by the situation in the member states

A market report.

Contributions to relevant common specifications.

Task 300 Improving Access to Existing Databases and Knowledge-based Systems

Background

Databases and expert systems currently exist that deal with specific and general purpose information of interest to disabled and elderly people. It has, however, been shown that often the access to these information systems is much too complex for a number of elderly and disabled people and, that simpler systems, such as graphical user interfaces, are required. Also, that there is a lack of combined access to several databases with one single front-end application (e.g. holiday planning where you need lists of hotels, car renting, health care services, etc).

Objectives

To increase the benefits of existing databases and knowledge based systems by facilitating and improving their access. This will include the use of an integration policy permitting queries across several databases, and the definition of a standard set of database functions.

Technical Approach

- Identify query languages (e.g. SQL, ODBL), a dictionary of services concerning database use, and tools for flexible and user friendly access design (e.g. query integration).
- Apply software engineering methods for the designing and implementing steps, and apply "re-engineering methods" for converting existing databases to open systems.
- Supplement existing databases so that they become able to manage multimedia information and multi-level user functions that can be activated according to the requirements of a user's impairment.

Key results and milestones

- Guidelines for the optimisation of existing databases concerning interfacing and integration.
- Guidelines for re-engineering databases to open and standardised systems.
- A dictionary of identified services around databases.
- Demonstrations of pilot sites.

Task 301 Databases and Knowledge-base Systems for Service Support

Background

The quality of human service provision can be improved by the speed and flexibility of computerised database and expert systems technology. New applications, as well as the replacement of paper based systems, will be required to support the organisation of service delivery.

This task is directed at the effective use of database technology and knowledge based systems, does not address the development of the database technology itself. Typical applications are:

- Local registers of people at-risk.
- Neighbourhood directories.
- Service usage measurement.
- Monitoring service quality.

The major problems to be overcome in the task will centre around the maintenance of the database contents, maintaining client privacy, access control, and other organisational issues of the integration of a database as a vital component in the service delivery process.

Objectives

To integrate database technology and knowledge based systems into service delivery to provide gains in quality of service provided to the client.

Technical Approach

- Employ structured analysis and design techniques.
- Develop the usability engineering of the interfaces, and design consultation, to include all users of the system.
- Implement and evaluate service model/template and data modelling.

Key Results and Milestones

- Field trial of database in operation in service delivery.
- Database management and operation procedures.
- Clearly marked integration routes for databases into service delivery.
- Quantitative analysis of cost/benefits and qualitative analysis of stakeholder views.

Task 302 Virtual Teams (Groupware Applications)

Background

Multi-disciplinary teams delivering services to support clients can be geographically distributed. Groupware, also known as computer supported co-operative working, will enable the members of these teams to communicate and co-ordinate their activities. The team members may not need to physically meet each other, or the client, unless it is a necessary component of the service itself. Each member can contribute his or her skill into the work of the team by the use of public or private network services. Where no physical intervention is required with the client, it is possible to organise, maintain and deliver the service via a telecommunications network. Teams that make use of telecommunications technology to organise and maintain themselves, without the need for extensive personal contact, will have a virtual existence on a network. This will provide an opportunity for people with a mobility problem to participate as a team member to work in service provision.

Objectives

To provide ICT applications for the development of virtual teams on public networks that provide services to support autonomous living, and enable people with mobility restrictions active membership of these service provision teams.

Technical Approach

- Identify requirements through structured analysis, design and user consultation including people with mobility restrictions.
- Develop integrated multimedia applications using mobile and fixed network technology to provide team support.
- Evaluate system and components with the aid of iterative prototyping and field trials.

Key Results and Milestones

- Field trial results of technology performance and team experiences.
- Functional and process requirements for these applications.
- Performance benchmarks for this type of application.
- Cultural impacts resulting from introduction into service organisation.
- Training and personnel development requirements.

Task 303 Mobile Support in Service Provision

Background

Mobile services have the capability to mix data, graphics and speech and to be integrated into vehicle based information systems. Road transport informatics and personal traveller informatics can be deployed to support teams delivering services to a geographically distributed client base.

Mobile telephony and data network services will enable service providers to more efficiently deploy staff and equipment across a geographical area, to support to a wide range of clients. Fleet tracking and communications will enable the human and technical resources out on the road to be quickly re-routed or consulted in response to changing needs in the service environment.

Objectives

To develop ICT applications that provide flexibility in service delivery by enabling mobile staff to maintain contact with their core service organisation while working out in the field.

Technical Approach

- Identify requirements through structured analysis, design and user consultation.
- Develop integrated mobile network applications to support mobile service delivery for the support of autonomous living.
- Evaluate system and components with Iterative prototyping and field trials.

Key Results and Milestones

- Field trial results of technology performance and team experiences.
- Functional and process requirements for these applications.
- Performance benchmarks for this type of application.
- Cultural impacts resulting from introduction into service organisation.
- Training and personnel development requirements.

Task 304 Automation of Administrative Processes

Background

A lot of daily life procedures are not accessible for elderly and disabled people because of complex administrative operations (e.g. application, appointment, reimbursement forms), the need to visit different, geographically scattered office locations for document processing, and non transparent sequences of procedures that need to be carried out.

ICT could offer potentialities to facilitate and reduce these operations by providing easy to use services which are user-oriented and efficient. These applications should, however, respect verification, confidentiality and security criteria as well as rely on existing standards and architectures.

Objectives

To identify opportunities for using ICT for supporting the provision of intelligently linked services, allowing an improvement in the processing of complex administrative operations.

Technical Approach

- Introducing dynamic modelling methodologies, permitting to succeed in coherent and modular system design, that makes use of European technical standards e.g. EDI.
- Introducing ‘user models’ for enhancing feedback during a participative design process with users.
- Defining a European dictionary of services which can be implemented in a specific way on a national level.
- Introducing intelligent help functions for users and automatic ‘fill-in’ procedures.
- Introducing multi-media system design where needed, in accordance to a low cost policy.

Key Results and Milestones

- Report on opportunities for ICT in administrative services.
- A dictionary of services at a European level.
- Report on methodologies for service design and implementation.
- Survey on appropriate standards in the field of services.
- Demonstrations of pilot sites.

Task 305 ICT Support for the Management of Care Services

Background

Although the application of ICT to support the management of medical care services is becoming more widespread, the situation is not as well developed in the social care domain.

The management of social care services faces 2 key challenges:

1. To effectively co-ordinate the range of actors involved, including the various professional services, voluntary sector organisations and informal carers.
2. To provide services for individual clients in an integrated way, such as through case handling procedures, but with the focus on problem-centred approaches rather than labelling or categorising clients in terms of categories of disability or whatever.

Various ICT developments have a potential to contribute to improved effectiveness and efficiency of services in these areas. It will be necessary to select the appropriate elements and implement these in a way which is sensitive to the aspirations and rights of the elderly people and people with disabilities in receipt of care services.

Objectives

To identify opportunities for using ICT for supporting the management of care services.

Technical Approach

- Identify promising opportunities for the deployment of ICT in the management of social care (e.g. case handling tools, smart cards and other new ways of storing and accessing client information, budget management systems).
- Specify pilot applications.
- Implement and evaluate pilot applications.

Key Results and Milestones

- Report on opportunities for ICT in the management of care services.
- Guidelines on when and how to implement such systems, covering all aspects of the socio-technical system.
- Demonstrations of pilot systems.

Task 306 Social Support Services

Background

For most people, social support comes from their everyday contacts with their primary and casual social networks. For some people, however, social isolation can be a problem, either because of restricted social networks or physical barriers. Both elderly and disabled people can sometimes be especially vulnerable in this regard. ICT innovations offer the potential to reduce at least some of this isolation by providing access to support and contact in a flexible and efficient manner. Existing examples include telephone and video telephone re-assurance services, chat lines and computer conferencing services.

Objective

To identify new opportunities for using ICT in the management and provision of social support services and demonstrate and validate these.

Technical Approach

- Identify new opportunities for using ICT in the management and provision of social support services.
- Develop pilot services based on ICT.
- Implement and evaluate these pilot services.

Key Results and Milestones

- Report on opportunities and requirements for ICT in the management and provision of services providing social support for elderly and disabled people.
- Guidelines on when and how to implement such systems, covering all aspects of the socio-technical system.
- Demonstrations of pilot systems.

Task 307 Support Services for Activities of Daily Living (ADL)

Background

A significant proportion of elderly and disabled people experience some level of difficulty in completing various activities of daily living. Apart from the contributions of assistive devices and direct human assistance, ICT innovations also have a role to play in providing support. This is especially the case in situations where the activity in question involves some form of information exchange or transaction. Giving the client direct control over facilities he or she requires has the potential to improve flexibility and drive down costs. For example, teleshopping services may enable increased control to be passed to the client for selection and ordering, thus reducing the amount of care assistance required while increasing the autonomy of the client for this aspect of daily living. The opportunities for quality and efficiency improvements that new telematics services can provide in these and other areas (such as telelearning, telegames, teleworking etc.) needs to be identified and potential systems evaluated in realistic settings.

Objectives

To identify opportunities for using ICT in the provision and management of ADL support services and demonstrate and validate these.

Technical approach

- Identify opportunities for using ICT in the provision and management of ADL support services.
- Develop pilot services based on ICT.
- Implement and evaluate these pilot services.

Key Results and Milestones

- Report on opportunities and requirements for ICT in the management and organisation of services providing ADL for elderly and disabled people.
- Guidelines to identify situations where it is appropriate to use these systems and how they should be implemented. This will cover all aspects of the socio-technical system.
- Demonstrations of pilot systems.

Task 308 Care Services

Background

Independent living can be enhanced for a significant number of elderly and disabled people by providing various aspects of the care to the home. Services in the social area are of particular relevance here, as well as those aspects of medical care in the home which need to be delivered within the context of an integrated socio-medical approach. Access to information and training, monitoring and management of chronic conditions, and ongoing therapy provision can sometimes be provided in whole or in part via ICT. Services providing support for self-care also have an important role to play in this area. The focus of this task is on applications of ICT which support the overall process of delivering care services to the elderly or disabled person in the home. Existing examples include general health and fitness information and training services, life skills training, reminder systems for medication usage, remote delivery of physiotherapy training.

Objectives

To identify opportunities for using ICT in care services and demonstrate and validate these.

Technical approach

- Identify opportunities for using ICT in care services.
- Develop pilot services based on ICT.
- Implement and evaluate these pilot services.

Key Results and Milestones

- Report on opportunities and requirements for ICT in services providing care for elderly and disabled people.
- Guidelines on when and how to implement such systems, covering all aspects of the socio-technical system.
- Demonstrations of pilot systems.

Task 309 Security Services

Background

Security services are an important source of support for autonomous living for elderly and disabled people. Personal security inside and outside the home, environment management, and navigation and locating (by self and others) services are all relevant here. ICT services are already diffusing in some of these areas (e.g. Personal Response Systems) but new technical innovations are opening up much wider and more sophisticated solution opportunities. Existing examples include using passive sensors in alarm systems, video communications in security systems, telemonitoring of environment conditions like room temperature, and electronic localisation of lost individuals who are lost or disoriented.

Objectives

To identify opportunities for using ICT in security services and demonstrate and validate these.

Technical approach

- Identify opportunities for using ICT in security services.
- Develop pilot services based on ICT.
- Implement and evaluate these pilot services.

Key Results and Milestones

- Report on opportunities and requirements for ICT in services providing security for elderly and disabled people.
- Guidelines to identify situations where it is appropriate to use these systems and how they should be implemented. This will cover all aspects of the socio-technical system
- Demonstrations of pilot systems.

Task 310 Client-managed Care Packages

Background

Changes in models of the management of service provision are, in some cases, moving towards a situation where the client is resourced to obtain, organise and manage his or her own care provision. ICT has the potential to help a person with the task of organising and managing his or her own care package.

Basic IT facilities can assist with scheduling the time of care assistance to ensure adequate coverage. Simple accounting functions could be integrated with the time scheduling, to deal with cost and payment of the care assistance coverage being purchased. Simple database facilities could provide assistance in keeping track of the use of disposable items and provide reminders for reordering as well as supporting other functions such as telephone or e-mail directories.

Integration between the clients system, and those in use by care providers will enable quick identification of care service offerings and their availability. Where a supplier can meet the needs of a client, on-line ordering of the service could be employed. Benefits may be obtained here through improved flexibility or reorganisation to deal with changes in care assistant availability. This improved flexibility may enhance the quality of life of both the client and the care assistant by giving them greater discretion over their use of their own time.

Objectives

To identify and demonstrate the opportunities for using ICT in services to support client managed care packages.

Technical approach

- Identify opportunities for using ICT in client managed care packages.
- Develop pilot services based on ICT.
- Implement and evaluate these pilot services.

Key Results and Milestones

- Report on opportunities and requirements for ICT in services providing scheduling and management of a care service package by the client.
- Guidelines on when and how to implement such systems, covering all aspects of the socio-technical system.
- Demonstrations of pilot systems.

Task 311 Network Services

Background

There is an existing and growing number of extra facilities provided by network operators. They include services such as follow-me, second-calls, group conference talks, automatic answering service etc. However, these services are normally provided on a single mode basis, that is mostly by voice information through normal telephones with responses using the telephone keypad. This single mode basis does not take into account the use of other modes by special target publics, including disabled and elderly people. These persons are therefore to a large extent excluded from these services.

The cost of care service provision is increased by the lack of access that people with special needs have to these services. Specialist alternatives have to be developed or a care assistant mediate on behalf of the client with the network. By designing the service so that people with special needs can directly access it with existing terminal technology this barrier can be removed. These services need to include a 'design for all' approach to enable the support that they can provide to care provision to be realised.

Objective

To incorporate these available services into other modes of communication like text telephony, fax and picture communication.

Technical Approach

- Identify the different modes and which people will use them.
- Develop pilot products where services are operated in new modes.
- Implement and evaluate the pilot products.

Key results and Milestones

- Report outlining a procedure and technology to supply the facility in requested modes.
- Demonstration versions of special mode communications including the extra network services.

Task 312 Passive Networking and Limited Interactive Applications

Background

A number of services which require no or limited interaction are being provided through the telephone networks, mostly by non-network operators. These include information services such as telephone directory information, weather forecast, news, leisure information and tele-services such as tele-banking and tele-shopping.

Again, these services are being provided on a single mode basis only, therefore excluding all citizens not able to use this mode.

Objective

To develop methods and techniques to make information and service provision automatically transportable across multiple technological modes, including those specifically developed for elderly and disabled persons.

Technical Approach

- Identify the different modes/services and which people use them.
- Develop pilots that enable the transposition of applications between modes.
- Implement and evaluate pilots.

Key results and Milestones

- Methods that guarantee transportability of existing and emerging services.
- Pilot versions of technologies that automatically transport applications from one mode to another one.

Task 313 Active Interaction applications with a high level of control

Background

There is a rapidly increasing market for highly interactive services based on the telephone network. These services range from consultation services with doctors or lawyers to leisure-based services such as interactive entertainment using a combination of television and telephone services.

Currently, there are no measures taken to limit the exclusion of people not being able to use the current modes for participation.

Objective

To develop methods and techniques enabling the service providers to integrate interaction from people using special devices into their services, and ensure that consumer needs are recognised in the provision of new services.

Technical Approach

- Identify the different modes/services and which people use them.
- Develop pilots that enable the transposition from one mode to another.
- Implement and evaluate pilots.

Key results and Milestones

- Methods that guarantee transportability of existing and emerging services.
- Pilot versions of technologies that automatically or by means of interfaces transport applications from one mode to another mode.

Task 314 Information and Communication Technologies for improving the efficiency and effectiveness of relay and mediation services

Background

Services which support communication for people with disabilities, especially those with sensory, linguistic, or learning disabilities, are beginning to become more widespread. These range from more traditional modes of service delivery (such as a physically present sign language interpreter) to relay services for text telephone users. More recently emerging systems include the use of videotelephony for sign language relay services or for remote access to a sign language interpreter. Relevant developments are also emerging in other areas, both for people who are deaf and people with other communication difficulties. In the Rehabilitation Technology domain, developments in augmentative communication systems, multimodal information presentation and symbolic language systems are all potentially relevant. Also, developments in more mainstream voice recognition/voice synthesis, language engineering, and image analysis and generation can have great potential in this area.

There is a need to begin to integrate developments in these various areas of RTD and identify new opportunities for improving the efficiency and effectiveness of existing relay and mediation services. Efficiency benefits can be achieved through cost reductions. Effectiveness benefits can be achieved through providing an opportunity for better quality communications and for increased privacy for the communicating parties.

Objective

To identify opportunities for using ICT to improve the efficiency and effectiveness of relay and mediation services and demonstrate and validate these.

Technical Approach

- Identify opportunities for using ICT to improve the efficiency and effectiveness of relay and mediation services.
- Develop pilot services based on ICT.
- Implement and evaluate these pilot services.

Key Results and Milestones

- Report on opportunities and requirements for ICT to improve the efficiency and effectiveness of relay and mediation.
- Guidelines on when and how to implement such systems, covering all aspects of the socio-technical system.
- Demonstrations of pilot systems.

Task 400 Personal control for safe access to public transportation

Background

Access to public transport in urban and rural areas is an essential part of ensuring that the quality life of people with disabilities is improved and maintained. Most public transport infrastructures (including rail, bus, metro, plane and ships) are difficult, if not impossible, to use for those with a mobility handicap. There is an increasing need to improve access while ensuring operation is safe for both the user and the transport system. There is already a substantial technical investment in transport infrastructure across the EU and it is unrealistic to expect that this will be replaced in the short term purely to provide better facilities for those with special needs. However, there is opportunity to use technology to provide cost effective adaptations and modifications to infrastructure to offer additional functionality to cope with the requirements of users with special needs. Such needs could lead, for example, to intelligent controllers for ticket gates at railway stations which provide longer opening times, voice announcements on demand, automatic door settings for wheelchair users and autonomous safety systems related to user capability.

Objective

To provide improved access to public transportation infrastructure through the application of intelligent and safe control technology.

Technical approach

Requirements specification for infrastructure control and interface demonstrator(s).

Build and test the demonstrator(s) with a wide variety of types of users and a variety of sites under operational circumstances.

Modify design to reflect the results of user trials

Devise ways of onward development, implementation and onward exploitation.

Key results and milestones

Report on estimated market size and value of the proposed market.

Report on the requirement(s) and specification for demonstrator(s)

Provide a working demonstrator(s)

Report on user trials.

Revision of the requirements and specifications

Revised market size/value report and exploitation opportunity report

Technology migration and implementation strategy

Task 401 Public Area Trolleys and Mobile Platforms

Background

People find it difficult to move around in crowded places (eg airports, railway stations, shopping centres), especially people with disabilities and dysfunctions affecting mobility (eg damage to limbs; visual or hearing impairments; weakness; and mental confusion). People may be encumbered by luggage or shopping and may be anxious about the risk of missing their flight or whatever. A fairly common solution, at the moment, is to make pushed wheelchairs available but these require the assistance of someone to do the pushing - which reduces the independence of the person being pushed - and such wheelchairs seldom have adequate provision for bulky luggage or shopping. In some airports motorised vehicles like 'golf buggies' are supplied but these are not entirely suitable - many people cannot get on and off them easily nor are they given suitable postural support once on board.

There is a need to develop or adapt a variety of mobile platforms (semi-automatic, self-driven, or with a driver) to enable people to move easily in such crowded places. Ease of use is important. The focus should be on control technologies to improve existing mobile platforms and trolleys. Innovation must improve the navigation capabilities and ease of use for the occasional user drawing upon information from the public infrastructure.

Objectives

To provide new solutions and devices for people with restricted walking abilities to move in public areas.

Technical approach

Investigate current provisions and technological capabilities, compared with actual user needs and requirements.

Early prototyping with representative users, including elderly persons, should be used in order to focus on a design which is both effective as well as has the potential to be value-engineered into an affordable and widely available European solution.

Key results and milestones

Report on user needs and requirements.

Report on current provisions and technological options.

Early prototype or simulator.

Report on user trials with early prototype.

Revision of specifications and working demonstrator.

Report on user validation of demonstrator.

Recommendations for exploitation.

Task 402 Go Anywhere Wheelchairs

Background

Powered wheelchairs are available and in use in the EU, but mobility is still very restricted. Access to public transport is an issue, but the wheelchair itself must also be improved. The diversity of skills in the target population requires a powered wheelchair capable of being controlled by a variety of devices. The control must be very safe, easy to learn and to use for people with physical impairment and possible learning difficulties.

Microelectronics, along with new technologies such as robotics and AI bring opportunities for people with mental handicaps as well as those with severe physical disabilities. Needs for proper postural support (see T217), comfort and safety are all the greater when wheelchairs are to be used in more demanding surroundings.

The need to go anywhere current wheelchairs since changing from indoor to outdoor changes the requirement from manoeuvrability to track stability and coping with pavements (stairs are a special problem). New concepts in drives and intelligent controls, including sensory assistance, may meet these needs, but the complexity may require provision of e.g. 'hot line' help systems. This will play an important part in regular maintenance and prevention of breakdown affecting usage and safety.

It is not expected that a wheelchair will be produced which can go actually anywhere. This is an ideal concept which the project should work towards. The project should be realistic but ambitious.

Objective

To provide increased mobility for wheelchair users through the use of intelligent drives, actuators and controllers.

Technical approach

Identify the problems of users arising from the existing devices in tasks of daily living.

Identify the market potential for go anywhere wheelchairs.

Define the requirements for a demonstrator in a wide variety of environments and a variety of users, including improvements to controls and interfaces..

Iteratively build, test and evaluate a demonstrator version.

Key results and milestones

Report on user requirements

Report on functional and system requirements of the demonstrator

Working demonstrator and report on result of tests with the users

Report on a plan for dissemination, exploitation and further market activities.

Task 403 Assistance with the Transfer of People with a Mobility Handicap

Background

A difficulty experienced by people with a mobility impairment is the need to transfer between beds, seats, wheelchairs, personal hygiene facilities, etc. This need is frequently combined with the requirement for short-distance mobility within buildings, which may be residential homes, institutions, shopping centres, etc. The inability to make these transfers unaided results in seriously restricted independence for disabled people, while attempts at manual assistance account for high incidences of back-injury amongst carers.

An opportunity exists for a device, which may be user or carer operated, to assist in the collection, posture adjustment, carrying, temporary support (eg in showers), and transfer of people with reduced mobility. This may range from completely immobile hospital patients to low dependency users in shopping centres.

Objectives

To develop a transfer aid to assist in the collection, lifting, posture adjustment, transport and transfer of a disabled person within residential buildings.

Technical approach

Identify the user requirements for a transfer aid suitable for a wide range of disabled people in institutional or domestic situations.

Define control interfaces and strategies for operation by user and/or carer.

Produce technical specifications.

Review safety aspects and define safe working practices.

Build, test, and evaluate a demonstrator version.

Produce product specifications for an industrial version of the proven equipment.

Identify and recommend strategies for exploitation and further research.

Key results and milestones

Report on estimated market for the proposed equipment.

Report on the requirements and specifications for the proposed demonstrator.

Working demonstration system.

Report on user trials and revision of requirements and specifications.

Guidelines to the successful technical implementation of the specifications.

Recommendations for strategies for exploitation.

Task 404 Personal Device Controller and Control Technology

Background

Design of consumer goods often ignores the needs of elderly and disabled people. Conversely, the rehabilitation sector has been addressed by speciality manufacturers who do not sell or produce for the population in general, yet this market will eventually include the whole population as it ages and depends on technology more for the maintenance of function. Many devices are inherently complex, and control technology often fails to meet the needs of users and excludes them from the technical benefits. Furthermore, control technology is fixed to either a location or dedicated system and leaves the user tied to a single environment or without support when away from their usual location. People with disabilities have a need for independent control of domestic, leisure, living support or vocational devices (eg CD's, TV's, curtain closures, door devices, and other domestic appliances). A range of personal device controllers is required and may consist of a series of devices that the user needs to control individually or grouped through, say, home bus technology, and they may range in functionality from dumb inter-connectability through to intelligent sub-systems able to interrogate and self-configure to match the controlled devices to the users. They may range from stand alone, fully transportable devices to those which have their main functionality embedded in the mainstream consumer goods.

Objective

To develop an improved personal device controller and control technology with multi functional capabilities.

Technical Approach

Identify the users and the types of consumer goods that the devices will address.

Define the personal control device(s) to be prototyped.

Build and conduct user trials.

Revise and re-evaluate.

Key Results and Milestones

Report on the estimated market for the proposed equipment.

Report on the requirements and specifications for the proposed demonstrator.

Working demonstration system.

Report on the user trials, accuracy, reliability and safety..

Revision of requirements and specifications.

Guidelines for going from demonstrator to product.

Recommendations for strategies for exploitation (e.g. marketing and distribution).

Task 405 Control of Facilities in Public Environments

Background

There is a need for personal assistance systems for users of public transport and related facilities. These technologies will allow those with disabilities or dysfunctions to inform electronically the public facilities of their requirements and by which they will receive appropriate responses geared to their particular needs whilst at the same time ensuring their own safety (eg advice on access to rail platforms and the control of entrance gates).

The task is conceived in broad terms so as to encourage the proposer to suggest innovative solutions which are applicable across a wide range of applications or needs. However, particular regard should be given to the following: portability of technology; fail-safe procedures; and multi functional multi input/output methodology allowing use by all types of disability (eg using smart card technologies). Wherever possible, the technology should be understandable to the target users and population in general.

Objectives

To develop assistance and safety systems giving people on the move greater independence and control.

Technical Approach

Identify, with the target users, a list of facilities to be accessed and the users' requirements. An investigation into the types of facilities (eg pedestrian controlled crossings, barrier access) that need or can be controlled on a pan-European basis will need to be addressed at an early stage.

Define the systems to be prototyped.

Build and conduct user trials. Safety considerations are critically important.

Redesign and re-evaluate.

Key Results and Milestones

Report on the estimated market for the proposed equipment.

Report on the requirements and specifications for the proposed demonstrator.

Working demonstration system.

Report on the user trials, accuracy, reliability and safety.

Revision of requirements and specifications.

Guidelines for going from demonstrator to product.

Recommendations for strategies for exploitation (e.g. marketing and distribution).

Task 406 Dynamic Postural Support Systems

Background

People with restricted movement have problems maintaining stability, comfort and support when seated. Incorrect body support (eg in bed or in a chair) may cause health problems (eg tissue trauma and pressure sores). Good posture is also a basic precondition for performing various tasks at home or at work (eg stable seating while driving a wheelchair and correct support of body and arms for computer access). The need for postural support varies depending on the condition of the user and the task performed. People could be better supported by user initiated and operated control of a dynamic posture systems as part of their environment. The requirement for a dynamic system is twofold: to move the user into new positions; and to adjust movements made by the user or the environment (eg a wheelchair in transition from moving on the level to moving up the stairs). CAD/CAM could be an important tool for the basic design. The examination of the materials used in providing the support is of crucial importance for the prevention of tissue trauma and related conditions. The user should be able to control the postural support system (eg switch it 'on' or 'off') even if some intelligence is delegated to the system.

Objectives

To provide the user with self controlled dynamic postural support

Technical Approach

Survey design and manufacture of postural support systems (eg control technologies, CAD and materials). Analyse seating and support problems of selected target groups and specify postural requirements for daily activities. Produce technical specifications for dynamic posture, control interfaces and strategies.

Build, test, and evaluate a demonstrator version. Redesign and re-evaluate.

Develop necessary tools to facilitate customisation, documentation and user training. Produce product guidelines for an industrial version of the proven equipment. Identify and recommend strategies for exploitation and further research.

Key Results and Milestones

Report on state of the art in postural support systems.

Report on user requirements with respect to postural support of the target group and daily tasks considered.

Report on the requirements and specifications for the proposed demonstrator.

Working demonstrator, report on user trials, revision of requirements and specifications.

Guidelines to the successful technical implementation of the specifications.

Recommendations for strategies for exploitation.

Task 407 Increased Usability and Affordability of Existing Intelligent Manipulator Systems

Background

A number of intelligent manipulators and robots for rehabilitation have been successfully demonstrated. A few first models have been positively evaluated by the end users, and providers. However, market penetration is difficult, due to a combination of high prices, restricted user groups and limited functionality. Presently, three types of systems have evolved: wheelchair mounted manipulators; fixed robotic workstations; and mobile platforms equipped with a robot arm. Whereas mobile systems are primarily intended to work in an unstructured human environment, fixed workstations are designed for pre-programmed complex manipulations in a structured environment. All three concepts are tending to merge with the development of docking of mobile systems to fixed workplaces, world modelling, and direct user control for the workstation systems. Opportunities exist for improving the market potential by adapting the systems to wider groups of users by reducing cost, developing user interfaces adapted to the individual needs of new target groups, and extending the systems capabilities to a wider range of tasks.

Objectives

To enhance the usability and affordability of existing intelligent manipulators for rehabilitation.

Technical approach

Define user profiles, system functions and corresponding control interfaces which accommodate a wider population of users, including those with lesser disabilities, in vocational and domestic situations.

Specify demonstrator based on existing robotic systems and cost reduction aims.

Adapt, test, and evaluate a demonstrator version. Revise and re-evaluate.

Develop necessary software tools to facilitate customisation, documentation and user training. Produce product guidelines for an industrial version of the proven equipment. Identify and recommend strategies for exploitation and further research.

Key results and milestones

Report on estimated market for the proposed equipment.

Report on the requirements and specifications for the proposed demonstrator.

Working demonstration system.

Report on user trials and revision of requirements and specifications.

Guidelines to the successful technical implementation of the specifications.

Recommendations for strategies for exploitation.

Task 408 Navigational Support and Docking for Mobile Platforms and Manipulators

Background

To achieve better personal mobility, manipulation and carrying, various technical issues must be resolved. Navigation support and docking can aid interoperability of stationary and mobile systems and produce functional synergies. Mobile manipulator utility may be increased if they can dock to a structured workstation to acquire a reference frame. Techniques developed for workstation robots can be used, increasing execution speed of tasks. Under vocational conditions this may be important. In their primary role of mobile manipulator they continue to give the user a higher degree of autonomy when away from the workstation, thereby making the user more acceptable in a vocational environment.

In laboratories around the world techniques are evolving to make mobile platforms find their way safely even in environments they share with people. Transfer of technology for navigational support systems for powered wheelchairs exists today, but they do not match all user needs and many problems have to be solved to make them into viable products.

Objectives

To extend the use of mobile platforms and manipulators by developing safe navigation and docking systems.

Technical approach

Identify target group(s) of users, their perceived and real user needs, and a set of functions to be implemented to improve and extend the independence of the target group(s).

Define user profiles and corresponding control strategies and necessary interactions with other systems. Produce technical specifications including safety requirements.

Build, test, evaluate demonstrator, review safety aspects and define safe working practices.

Produce product guidelines for a redesigned and/or industrial version of the equipment.

Identify and recommend strategies for exploitation and further research.

Key results and milestones

Report on estimated market for the proposed equipment.

Report on the requirements and specifications for the proposed demonstrator.

Working demonstration system.

Report on user trials and revision of requirements and specifications.

Guidelines to the successful technical implementation of the specifications.

Recommendations for strategies for exploitation.

**Task 409 Domestic Assistance with Moving, Fetching and Carrying for
People with Low to Medium Dependency**

Background

Robots and manipulators aimed at people with high dependency usually involve a manipulative arm and hand, but people with low to medium dependency have different needs, such as help in rising, walking, climbing etc. Manipulation of objects may be possible once within reach. An key segment of this group are elderly people, and the combination of multiple impairments often seen in this group should be taken into account.

A market is emerging for new types of intelligent domestic devices (eg 'intelligent strollers and tea trolleys'). These require mobility, but not necessarily a robotic arm. In some cases they will be accompanied by the user, in others they will move autonomously to collect and deliver payloads such as trays of food, medicines or books. Successful implementation of such devices requires careful attention to the user's needs and environment. The issue of user friendliness is of particular importance in the context of elderly people. In addition, such functions as memory support and surveillance should be considered.

Objectives

To improve and extend the independence of people with low to medium dependency by developing intelligent systems to assist in a range of activities of daily living.

Technical Approach

Identify a set of functions to improve and extend the independence of elderly people in a range of activities of daily living in a domestic environment. Define user profiles and corresponding control interfaces and strategies.

Produce specifications for a demonstrator, taking account of other relevant technologies.

Build, test, and evaluate a demonstrator version. Revise and re-evaluate.

Produce product guidelines for an industrial version of the proven equipment. Review safety aspects and define safe working practices.

Identify and recommend strategies for exploitation and further research.

Key results and milestones

Report on estimated market for the proposed equipment.

Report on the requirements and specifications for the proposed demonstrator.

Working demonstration system.

Report on user trials and revision of requirements and specifications.

Guidelines to the successful technical implementation of the specifications.

Task 500 Systems for assessment and training of people with motor disability

Background

A wide variety of techniques and equipment for assessment and rehabilitation of motor function are available to support people who have disabilities due to stroke, spinal injury, amputation, nerve injury, cerebral palsy, multiple sclerosis, etc. Present assessment technologies are complex and tend to be usable only in clinical settings. Furthermore, approaches focus on disability rather than impairment assessment. There is a need to simplify systems, to make them usable in non-clinical settings, and to address impairment. Special attention to the development of new techniques and devices is needed, along with integration of these and existing systems using common approaches to ensure easy transfer and usage of expertise, methods and equipment.

Objective

To exploit telematics for the development of common approaches to assessment of people with motor disability .

Technical approach

Based on current knowledge of muscle function and movement coordination, prototype systems should be developed which allow the measurement of the functions of the neuro-motor system and which apply the observations in equipment for individually adapted programmes. This will require close interaction with users and/or administrators and/or social policy decision makers (public and private) to define the areas of motor function, and to define the criteria for training and expected outcome.

Service providers must be involved, and may benefit from networking and distributed information systems based on existing or planned infrastructures. Portability and inter-operability of platforms must be guaranteed, and must account for current standards including de facto standards

‘Interaction comfort’ must be assured (e.g. usability, speed, effectiveness), and the methods for education and motivation of the user's techniques must be defined.

Key results and milestones

- Harmonised methodologies of functional assessment
- Harmonised interpretation criteria
- Monitoring devices and training
- Availability of multimedia courseware

Task 501 Technology for the assessment, rehabilitation and training of people with communication disabilities

Background

Without proper initial and recurrent assessment of user abilities in the context of rehabilitation technology, the potential and achieved benefits from these technologies cannot be determined. There is a need to ensure a more precise match of technology to specific user needs so as to enable an effective uptake and use of devices and aids.

A multi-disciplinary approach is required to build on the knowledge and experience in this area. In particular, this task is concerned with the introduction of information technology tools and integrated approaches to support assessment and training. Opportunities exist for systems of this type to be operated autonomously or semi-autonomously by storing intermediate results. They can thereby ensure efficient utilisation of professional resources.

Objectives

This task aims to develop, demonstrate and evaluate methods, devices and systems to support the assessment, rehabilitation and training of people with communication disabilities (including spoken and non-spoken modes). The objectives include:

- Testing and assessment of impairment and residual / alternative capabilities
- Planning and supervision of rehabilitation programmes

Devices/approaches for adaptation of general purpose aids to specific user needs

In addressing these areas, the task must focus primarily on people with disabilities. However, support for professionals should be addressed as part of general system design

Technical approach

This task covers an area which is potentially very wide. A thorough review of current techniques, technologies and the contexts of their supply and use is required; technologies of particular relevance are interactive learning and teaching systems, and visualisation and user feedback techniques

Automated testing, monitoring and evaluation systems including complex pattern processing and recognition (for example in speech assessment and training)

Key results and milestones

- User requirement definition
- Publication of state of the art technology review and market evaluation
- Demonstration of prototype systems
- Evaluation of social acceptability and effectiveness of proposed systems

Task 502 Technology for the assessment and training of people with mental disability (learning difficulties, affective and cognitive impairment)

Background

There is a lack of comprehensive and systematic approaches to the application of information technology to meet assessment and training needs in this area, beyond individual initiatives. Despite the promise of technical advance, the issues of standards, marketing and user acceptability have not been addressed.

There is a need to address the harmonisation of approaches relating to system hardware, software environments, training methods and applications.

Objective

To identify clearly, the needs of the end-users including acceptability issues

- To characterise current good practice in the use of technology for the assessment and training of people with mental disability (learning difficulties, affective and cognitive impairment)
- To identify the needs for harmonisation in practice and technology
- To demonstrate and evaluate systems and applications aimed specifically at the assessment and training needs of people with mental disability

Technical approach

Survey current systems, methods and devices for functional and performance assessment applied to mental impairment (learning difficulties, affective and cognitive impairment). Examine user requirements for improved assessment and training related to end-user objectives.

Developments of prototype or demonstrator systems must take account of user support needs and the requirements of the carers as well as those of people with mental disability.

Key results and milestones

- Publication of reviews of needs, social impact assessment, and performance requirements
- Publication of reviews of market, viability analysis, implementation approach, along with proposal for pan-European application exploitation.
- Demonstration and review of prototype systems.
- Specification of evaluation methods.
- Testing and validation of results in realistic contexts.

Task 503 Interactive Personal Communication Systems (IPCS)

Background

People with communication impairment seek interactive personal communication at a rate approaching normal interpersonal communication. The reduced rate of existing Rehabilitation Technology systems is a barrier to providing effective alternative or augmentative systems in spite of current work on message acceleration (prediction, semantic compaction, abbreviation expansion, categorised lists, etc). Rate enhancement is a priority challenge for development.

Power and weight saving technologies need to be used in communication systems to reduce the conflict between portability, output clarity and power. The lack of powerful portable systems is a major problem for communication impaired ambulant individuals.

Integrated systems are still in their infancy. Work in this task area must address the integration of mobility, speaking, controlling one's environment, leisure and work within the individual's alternative and augmentative communication system. Communication with mainstream developers at the policy stage of R&D is essential.

Objectives

To deliver IPCS solutions addressing:

- Communication rate enhancement
- Adaptability to different personal environmental and conventional situations
- Integrated communication systems that are socially acceptable
- Quality of use in terms of effectiveness, ease and satisfaction in both use and configuration

Technical approach

- Analysis of user requirements incorporating user views at the outset
- Study of available solutions
- Selection of state of the art technology to develop pilots and demonstrators
- Validity approved with users in real-life situations and matching identified user views
- Publication of results and identification of routes to commercialisation

Key results and milestones

- Publication of analysis of user requirements and views
- Demonstration of pilot systems
- Development of plans for commercialisation and exploitation

Task 504 Personal Information and Communication Management Systems (PICMS)

Background

Advances in language technology offer potential for supportive devices (hardware and software) for people with communication impairments. Adaptive technologies should also be used in creating new systems.

There are many possibilities for transfer between the language modalities. At the same time, new advances in speech recognition technology should enable this task area to develop techniques for translation between all language modalities including dysarthric speech to text and/or socially acceptable and understandable speech.

Techniques for translation between languages, such as sign or symbol languages to text or speech, should also be considered in this task area.

Users of alternative and augmentative communication technology should feel comfortable with the facility to customise their own speaking styles and have control not only of language structure, but also of the expressive aspects of speech such as voices, emotions, and attitudes.

Objective

To ease and expand communication possibilities by using advances in language technology addressing transformation modalities, translation between language systems, and increase in expressive customised communication.

Technical approach

- Analysis of user requirements concerning the management, modalities and structure of personal information and communication systems.
- Identifying candidate solutions and expanding their scope to encompass all European languages (including non-spoken, sign and symbol systems).
- Creation and harmonisation of language notations where necessary.
- Demonstration of prototype systems.
- Evaluation and validation with real users.
- Cost benefit and viability analysis showing definition of future market.

Key results and milestones

- Pan-European definition of user requirements
- Demonstration and awareness actions.
- Market-exploitable specification for PICMS

Task 505 To improve and enable access to visual information

Background

The technology for capturing visual images, processing the data, and displaying the data in an enhanced visual image or other modalities (e.g. auditory and/or tactile) has advanced significantly in the last few years. At the same time, the price of the hardware components of such systems has reduced. However there is still a major lack of knowledge of the optimum strategies for displaying the information when the user can dynamically control the processing of the image.

Objectives

To develop and evaluate systems to assist visually disabled persons to access visual images in real time.

Technical approach

- Assessment of information needed for various application scenarios.
- Assessment of different ways of displaying information to a visually disabled user via speech, sound, residual vision, and tactile information.
- Development of a user-adaptable interface with the facility for the user to interact with the image processing module (where necessary).
- Development of prototype systems.
- Development of training procedures.
- Evaluation with a cross-section of potential users.
- Cost-benefit analysis.
- Assessment and definition of the potential market for such systems.
- Assurance of design for portability supporting everyday usage.

Key results and milestones

- User requirements specification.
- Demonstration of working prototype systems.
- Demonstration of training systems.
- Definition of future exploitation market (users, developers, distributors).

Task 506 To enhance or enable access to speech information and other acoustic events.

Background

The daily life of people with impaired hearing ability, even when they use conventional hearing aids, is constrained both by difficulties in speech communication, especially in commonplace conditions of noise, and by the inaccessibility of acoustic signals from their environment. These difficulties can be compounded by multiple disability, and by inadequate quality of speech output from telematic systems. Where hearing loss is profound or pre-lingual, speech production can also be affected.

Objective

To enhance or enable access to speech information and other acoustic events, including adaptive technologies, multi-modal sensory substitution, and methods of user training.

Technical approach

- Definition of needs of users in daily life and in the use of telematic systems.
- Selection of transformations or recordings which preserve the information required to support communication and match this to residual hearing or to alternative uni- or multi - sensory modalities.
- The effective use of newly available technologies, including the application of adaptive technologies to meet changing needs in different environments.
- Development and demonstration of prototypes
- Application of training methods where appropriate.
- Evaluations of effectiveness involving users and real-life situations, and assessment methodologies which can be applied and accepted in different European states.
- Analysis of commercial feasibility and requirements of service provision
- Attention to standardisation of interfaces

Key results and milestones

- Analysis of users requirements, technological and market potential.
- Demonstrations and field trials of user-oriented systems.
- Technology transfer and preparation for service provision.
- Liaison with mainstream developers at policy stage.

Task 507 Systems for supporting restoration and enhancement of motor ability

Background

Recent developments in the understanding of the functioning of the locomotor system identify new possibilities for restoring or increasing available function of the neuro-motor system. This knowledge can be used to understand the nature of the impairment and the resulting disability. Applications in both to hardware and software developments may improve the quality of motor function (e.g. increased muscle strength, reduced spasticity, improved muscle coordination, optimised range of motion, balance, etc.)

Objectives

To develop computer-based systems to train or restore motor function lost through disease or accident, and to increase the quality of available motor function, by using computer aided systems for sensing and control of voluntary movements

Technical approach

Work should include the development of systems integrating available measurement equipment and devices into improved systems for the rehabilitation of motor function:

- in making use of the available biosignals for the movement control of neuroprostheses, computer aided prostheses (CAP), etc.;
- by generating muscle force and movements of body segments by electrical stimulation of the muscle (FES);
- by developing ergonomically designed interfaces for the command and control of computer controlled motor function;
- by applying simulation models in to understand and predict mechanical factors (effort, load, range of movement, ...) in new situations (e.g. in the use of an assistive devices or their adaptation, etc.). Such models may also contribute to the definition of rehabilitation protocols and improve follow-up and support.
- by developing computer controlled devices for the training of motor function for persons with a motor disability (computerised rehabilitation equipment).

Key results and milestones

- computer aided prostheses and neuroprostheses;
- methods and devices for electrical stimulation, including functional electrical stimulation
- tools for simulation and modelling of motor function for rehabilitation purposes

Task 508 Systems for the planning of rehabilitation of motor function.

Background

A motor rehabilitation programme for an individual must account for the motor profile of the patient, and the various rehabilitation techniques and methods which exist in different centres. Links between centres in different countries can help harmonise and optimise procedures. Collecting data from clinical cases will allow analysis of a spectrum of cases, and exchange of information between centres and prosthetic shops or manufacturers may also improve efficiency by reducing the time to product for appropriate devices.

Simulations and kinematic models of motor function can improve prediction for a given pathology; can allow more exact fitting of devices to patients, taking account of individual parameters; and can avoid mistakes in the prognosis so increasing certainty and benefit.

For maintenance of elderly people at home, telesurvey systems allow monitoring, follow up after surgery, and improved preventive care in high risk population (e.g. femoral neck fracture) by the use of smart survey systems (contact also reduces social isolation).

Objective

To integrate information tools, available or under development, into telematic services to improve planning of motor function rehabilitation.

Technical approach

- definition of user technical and interface requirements
- specification of computerised tools in terms of functionality, usability, portability, reliability, and cost effectiveness
- interaction style selection (e.g. hypertext, multimedia, etc.)
- definition of devices, equipment and rehabilitation protocols based on input from users as well as from rehabilitation sector actors (i.e. device prescribers, providers and producers, and experts in rehabilitation technology)
- market analysis for maintenance of elderly and disabled people at home
- network infrastructure definition for interoperability and portability of platforms (including standards compliance)

Key results and milestones

- compatible tools
- harmonised rehabilitation programmes and simulation tools
- harmonised computerised assistive devices

Task 509 Information systems for design, fitting and maintenance of aids for restoration of motor function

Background

The division of the market along national lines, along with reliance on small enterprises and small-scale manufacture, promotes market fragmentation. Devices and components may be produced in small quantities, or for individuals, leading to poor definition of device specification, and specifications which do not conform to existing norms. Additionally, maintenance policies are often poorly specified by manufacturers. These features of the market indicate a lack of efficiency.

Information systems are needed to encourage and enable a common design framework and common approach to design fitting and maintenance of aids, and so to support market unification.

Objective

To develop information systems supporting aid manufacturers, including standards, norms, CAD software, and component specifications, along with customising and maintenance procedures.

Technical approach

- End user requirements specification
- Market and viability analysis
- General specifications of usability, functionality, portability of tools at pre-standard level by interested industrial parties.
- Development and testing of modules.
- Integration and testing at pan-European level.
- Evaluation of system with end-users

Key results and milestones

- User requirements definition
- Agreed procedures and specifications for design, fitting and maintenance of aids for restoration of motor ability.
- Software incorporating system demonstrator for evaluation.
- Evaluation of demonstrator by candidate end-users.

Task 510 Effective information systems for people with a learning disability

Background

Input devices such as concept keyboards, joysticks, and touch sensitive screens are employed to facilitate access to computer technology by people with a learning disability. However, it is of particular importance that this population is supported by information technology more fully, since IT promises much in terms of information retrieval, classification and association of interrelated facts, and assisted learning. The single greatest obstacle is that interactive software systems do not take account of the interaction and task support requirements of people with a learning disability.

Objective

To develop a strategy for combining state of the art technology devices and systems in a coherent structure which facilitates meaningful interaction with IT by persons with a learning disability.

Technical approach

Work should involve extensive cooperation with potential users to trial the effectiveness of a range of interactive mechanisms including devices, dialogues and interaction styles.

Attention should be given to:

- classes of learning disability and typical information and support related needs (e.g. reliance on recognition memory, concrete constructs/operations)
- task and information structures supporting user objectives
- formulation of queries by the user (assisted vs free dialogue)
- presentation of information to the user (style and management)
- investigation of all candidate I/O technologies and modalities
- design and testing of demonstrator information systems.

Key results and milestones

- definition of user groups and differentiation of user needs
- specification of tasks, information structures and user interface
- design and demonstration of interactive information systems showing user benefits from effective technology design
- consolidated report on future opportunities for different classes of people with learning disabilities

Task 511 Rehabilitation technology for people with mental impairment seeking independence in activities of ordinary living and employment.

Background

The current rehabilitation technology market is developing products to enable disabled people to avoid the need for continual supervisory care. However, the majority of adults with mental or cognitive disabilities are obliged to live under day or residential care to provide for their wellbeing, since there is little technical support. There is a great need for solutions which can minimise dependence, and so maximise autonomy and independence in domestic, social, educational and work settings.

Objective

To develop technology support solutions whose availability will significantly reduce the extent to which people with cognitive disabilities must depend on direct human supervisory care for the activities of ordinary living.

Technical approach

- Define the classes of people with disability and their support requirements.
- Specify the range of support offered by institutional care organisations.
- Model the support functions in a manner suited to system design (e.g. task models)
- Devise, elaborate and refine design concepts for incorporation in devices (e.g. prompting and reinforcement strategies).
- Develop and demonstrate technology systems supporting autonomy.
- Conduct market, cost benefit, and social impact studies.

Key results and milestones

- Definition of groups and support needs
- Definition of design concepts and demonstrators
- Evaluation of candidate design solutions in realistic task scenarios
- Specification of future market potential for technical solutions.