

# Gerontechnology assessment : opportunities and recommendations

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**GERONTECHNOLOGY ASSESSMENT**  
**opportunities and recommendations**

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Paper presented at the COST-A5 Workshop  
Technology Assessment of three Gerontechnologies  
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# **GERONTECHNOLOGY ASSESSMENT; OPPORTUNITIES AND RECOMMENDATIONS**

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## **Introduction**

There are substantial possibilities for product development and marketing for medical care and self-care in the home. However, the technology-push that created the living and working environment until now, did not take into account the preferences and the needs of the elderly consumers. If we want to anticipate the great social and demographic shifts in the very near future we have to switch to a client-pull approach.

It is for this reason that COST-A5 "Ageing and Technology" was set up in September 1991. The goal of COST-A5 is to define in which way the presently available and anticipated technology can sustain or hinder the active participation of the elderly in society, as autonomous or independent as possible.

In COST-A5 thirteen European countries participate. Until now four workshops were organized:

- Ageing and Technology, Helsinki, September 1991
- Mobility and the perceived needs of the elderly, Eindhoven, September 1992
- Intergenerational solidarity and impact of changes in family-structure on socio-economic status of the elderly, Brussels, November 1992
- Functional assessments of physical abilities in the elderly, Jyvaskyla, May 1993.

The Vienna workshop fits very well in this series since it's focus is on communication technologies and more specifically on the conditions for successful implementation of these.

The work in COST-A5 will continue with workshops in the United Kingdom on "Community care for the elderly people: Technology for living at home" (Dr. O. Stevenson, January 1994) and in Germany on "Social integration" (Dr. H. Mollenkopf, Berlin, May/June 1994).

Other forms of activity in COST-A5 are:

- Formation of networks
- Working groups on selected aspects of general topics
- Projects (support in fund raising)
- International programme development (postgraduate course and horizontal action on gerontechnology).

## **The concept of gerontechnology**

Gerontechnology includes the research and development of techniques and technological products, based on the knowledge of aging processes, aimed at the creation of a preferred living and working environment and adapted medical care for the elderly (Bouma & Graafmans, 1992).

In the discussions aimed at the establishment of the gerontechnology programme a number of questions were formulated:

- Which important changes of capacities are related to age
- Can these changes be minimized, postponed or even reversed
- Are changes in strategy a solution for matching human capacities to task demands
- What are the possible effects of interventions
- What is the role of technology?

These discussions resulted in a model now serving as a framework for programme development. This model fits the concept of the development of behavior as described by Lawton (1982). This model is used as orientation into the scientific disciplines which have a possible relation to gerontechnology. Insights in the age-related changes should come from disciplines such as gerontology, sociology, psychology and physiology. The translation of these insights into task performance in complex activities is a challenge for human factors researchers. Task demands are often dictated by the technological shaping of the working and living environment. Such task demands then, have to be fitted to task performance. Moreover it becomes clear that the ergonomist can catalyse the interaction between life sciences and technological sciences and engineering.

The lines in figure 1 show a hypothetical relation between maximal task performance ( $T_p$ ) and task demand ( $T_d$ ) during human life. A positive outcome of  $T_p$  minus  $T_d$  is called comfort, a negative dependence. The scheme indicates that children are dependent during their learning period. The scheme also shows that the elderly are at a higher risk of becoming dependent with increasing age because their surplus of comfort is getting smaller. This means that, when suddenly confronted with a high task demand (like driving on a dark rainy night in an unknown area), an unexpected drop in maximum task performance and a temporary total or partial impairment might occur.

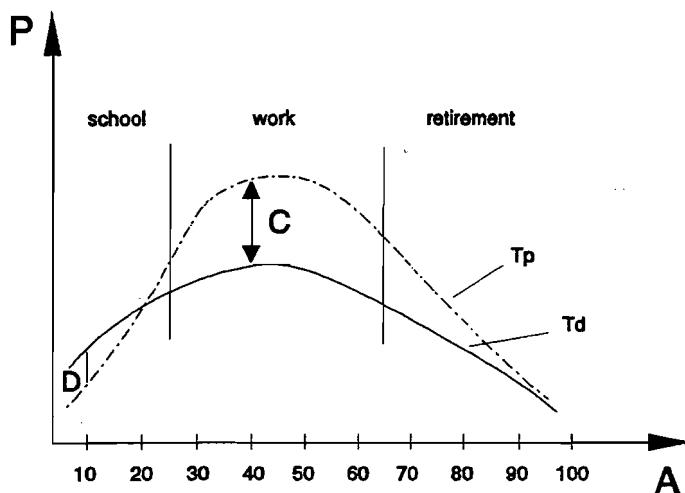


Fig. 1: Relation between task performance  $T_p$ , task demand  $T_d$ , comfort  $C$  and dependence  $D$  during human life.

These situations can be prevented. One approach is avoidance of risk situations, probably leading to disengagement and lower levels of activity. Consequently, maximal task performance will decrease more rapidly. A positive approach might be to exercise in such a way that maximal task performance for most activities of daily life is kept at a sufficient level (mind and body "jogging").

In conclusion, one might state that a good understanding of the interplay between task demand and task performance can nourish engineers and designers with the type of information that is needed to create a functional environment, which is comfortable for the elderly. These actions can also have a trickle down effect for other age groups.

The concepts of task performance and task demand are well-known in human factors research. However, if the challenge is to fit the task and the environment to the needs and capacities of the elderly, the already multidisciplinary approach of human factors is still lacking input from social sciences.

What is known and what should be done? We can adopt the statement that social interaction and active participation depend on the balance between human characteristics, task demands and environmental conditions. Then, activities of daily life, work, study and leisure can be seen as a continuous cycle in the presented model (fig. 2).

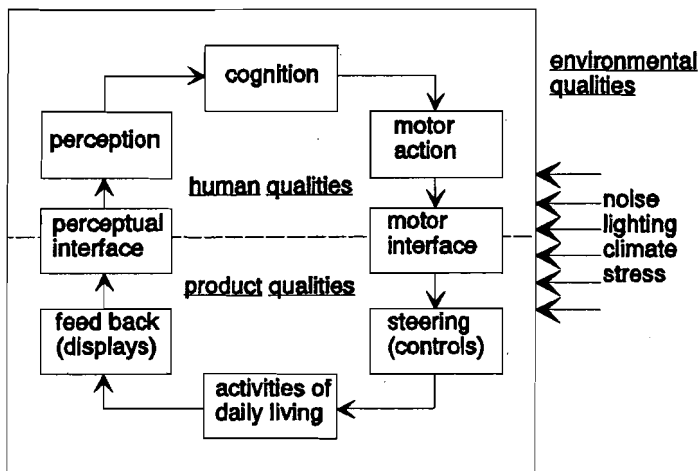


Fig. 2. Man-product environment interaction.

The quality of the interaction will be determined by the weakest link in this cycle. The contribution of gerontechnology is threefold. One obvious role for technology is in the types of research we can do to understand the aging process and how this affects the qualities of the human links in this cycle. An even more important role for technology is to optimize the technical and interface links in this cycle by matching them to the characteristics of the aging user. A third role for technology is to create the optimal environmental conditions for the interaction.

## **Pitfalls and opportunities**

Looking at the gerontechnologies in support of independent living it is indeed important to develop criteria for the introduction and assessment of these technologies. In order to nourish the discussions on this a few statements are presented here:

### *Cost-benefit, cost-effectiveness*

Home care is important. The magnitude, complexity and diversity make it hard to define the best strategy to put into operation efficient and effective home care. Large investments are made in home care projects. However, technological aspects do not receive enough attention. There is not much coherence between projects, nor much mutual exchange of information. The cost-effectiveness of all this effort should be improved. It is recommended that a supranational platform be established to achieve this goal. Tasks of the platform could be co-ordination, "brainstorming", progress control, knowledge and information transfer, development of an expertise centre and international collaboration.

### *User orientation*

The development of home care should be oriented to the patient and his or her situation. Identification of patient problems and needs must have the highest priority. Projects could be aimed at solving problems of a given individual in a given home environment.

### *Categorization*

Efficiency demands a certain scaling-up based on categorization of problem areas. This categorization should be related to function and user related (act-utilitarian approach as opposed to rule-utilitarian approach).

To meet the criteria for this function relation, a division in four main target groups is suggested:

- patients who are chronically ill or handicapped
- patients who are temporarily ill or handicapped
- patients who are terminally ill or who have a progressive disease
- elderly.

As far as the technological aspects of home care are concerned, these target groups cluster a number of similar technical problems. This is a fact for the degree of technical complexity, as well as for the organizational/infrastructural problems that arise with the necessary complementary care and financing.

### *Networking*

Networking of companies that could be active in the delivery of total packages of home care products plus additional services is necessary. It is not only the medical technology industry per se that participates in these networks.

### *Product = product and care*

Companies that participate in home care projects must not only be capable of product realization, but should also be responsible for providing the necessary care system that comes with the products.

It is obvious that existing health-care agencies could be incorporated into this proposed system.

#### *Turn key delivery*

Some product innovations are mostly changes in concepts of care and service delivery systems. A total package of home care products plus additional care and service includes:

- instruction, training and manuals for the introduction of products and services
- guarantees, maintenance, routine checks and liability laws
- safety and user-friendliness criteria
- round-the-clock accessibility and service
- additional support for medical, paramedical and technical staff.

#### *Project development*

Each new project should incorporate the full size of an underlying problem. This implies that within each project equal attention should be paid to all phases until completion. This includes steps from problem analysis to technical realization, to assistance with introduction and evaluation. Each project should be:

- matched with other projects on a national level (Collins, in press)
- aimed at a specified target group (Czaja, 1990)
- clear in its technical complexity (Czaja, 1990; Drost, 1989)
- specific in its demands concerning the need for additional infrastructure for service and care (European Science Foundation, 1991; Graafmans 1989).

#### *Low tech*

It is recommended that the highest priority should be given to development of products that support or substitute the home care that, until now, is delivered by care professionals.

Characteristic for this category of products is that they combine technical complexity with "user-friendliness", high reliability and a low price. These over-the-counter products are typically designed for non-professional users. Some examples are pregnancy-test, eye drip aid and blood pressure meter.

#### *Adapted technology*

Much is expected if alternatives to the "hotel" function of hospitals are developed. Therapeutic and diagnostic techniques are often carried out in hospitals because of the medical technology that is available there. When this technology is adapted for and transferred to the home environment, a lot of additional care and service is necessary. Through improvement of product design, most of this extra care might become superfluous or could be left to professionals and partners with less training.

#### *High tech*

Until now most attention has been given to the adaptation of hospital-based technology. The results are not astounding, although many medical technology industries have put great effort in this area.

Some "high tech" treatments can be realized in the home environment, but the high complexity of the additional infrastructure and feelings of fear by the patient, justified or not, cause a shift back to in-hospital treatment.

#### *Consumer technology*

Home care technology is totally different from hospital-based technology. Products designed for hospital use are, even after adaptation, rarely successful in the home environment. Home health care products demand a conceptual design on their own.

#### *Training and education*

More emphasis should be put on technical and ergonomic training and education of health-care professionals. It is recommended that a new function in home care is introduced: the technical therapist.

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