

# Creating adaptive technological environments

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*H. Bouma, Creating adaptive technological environments, Gerontechnology, 2001; 1(1): 1-3.* Gerontechnology can be briefly defined as the study of technology and aging for ensuring an optimal technological environment for people up to a high age. Two developments in society have led to its emergence. Older people are emancipating as their demographic numbers increase<sup>1</sup>, and their importance in society is growing. Technology is innovating and spreading, presently in particular with new materials and information and communication technology (ICT), leading to rapid change in society. Unfortunately, the two processes tend to develop unconnected. Gerontechnology aims at directing technology towards the ambitions of aging persons such as good health, independent living, and full social participation.

**Key words:** aging, gerontechnology, independence, technological environment

Ambitions and needs of older persons are usually concerned with the following five application domains: health, living/housing, mobility/transport, communication/information, and work/voluntary work/hobbies. The domains have both human and technological aspects in that the technological environments have to support the older people. Four types of technological support can be distinguished:

- (1) Enhance human options, such as accomplished by telephone, radio and tv, e-mail, and means of transport,
- (2) Prevent potential losses, such as by quality control of nutrition and of the physical and biological environment,
- (3) Compensate for declining capacities, such as by spectacles, hearing aids, rollators, and motor wheelchairs,
- (4) Support caregivers such as by video alarms or ergonomic toilets.

Society's great resources should all be organised towards the common goal: innovative research, development, and design (RD&D), cheap mass production, and wide distribution for older people just as is common for general consumers.

## ERGONOMICS AND COMPENSATORY TECHNOLOGY

Insights and advances in gerontechnology stem from different sources<sup>2</sup>. The study of ageing dynamics of human functions belongs to the multidisciplinary domains of gerontology: perceptual functions such as vision, hearing, and the thermal sense; motor functions such as locomotion and fine motor skills; cognitive functions such as recognition, memory, attention, and motivation; social functions such as communication with family and friends and participation in the networks of society.

In two fields of study, such insights are routinely combined with advances in technology. Ergonomics or human factors have focused since long on the interaction between humans and technology: how can we adapt products and services optimally to the human user, among which the ageing user<sup>3,4</sup>. The second field deals with compensating for specific perceptual and motor restrictions, such as using closed circuit tv systems for enlarging text in cases of severe low vision, or using rollators for providing stability in locomotion.

With increasing age, decline may occur for physiological, psychological, or social functions of individuals, although very heterogeneously. Certain functionality may present almost no or little decline; also, individuals differ widely. Gerontechnology will aim at drawing upon the available functionality and compensating for hampering restrictions.

## TECHNOLOGICAL ENVIRONMENTS

Individuals live and function both in private and in public environments. Increasingly, our environments are permeated by technology. Mobile telephones and e-mail enhance communications; memory is supported by palm top applications, public communication rests on radio and tv, and the internet supports information handling and chatting. Just as younger people, older people live in such environments and can participate to the extent that they can afford and handle such applications. Following the technological trends of society and adapting the ergonomics to older people is one approach. Alternatively, ambitions and needs of older persons can be investigated, and corresponding technological environments can be created.

Core ambitions of older people are concerned with:

- (1) Health, to be answered by public health engineering;
- (2) Independent, comfortable, and secure daily living, to be answered by housing or building technology;
- (3) Proper mobility, to be answered by private and public transport technology;
- (4) Communication with relatives and friends, to be answered by communication technology;
- (5) Work, voluntary work, and hobbies, to be answered by specific corresponding technologies.

Starting with the ambitions of older people, the challenge is to see what existing or new technological environments can be designed that optimally serve such ambitions and answer such needs<sup>5,6,7</sup>.

How can we deal with the extensive heterogeneity of older persons? Technology that can be adapted to a wide range of older users avoids the well-known average fallacy (no one fits a multiple average) known from ergonomics. Technology can be smart enough to adapt itself, automatically or semi-automatically, if sensors or registrations indicate certain problems. For this, insights about the ageing process have to be translated into smart technology, for example by applying agent architecture<sup>8</sup>. The young designers that dominate new technology may also be inspired via the early evaluation of their products by representative older users.

The concept of technological environments stretches beyond products and services themselves; it includes the environment in which people live and within which the products are being used. Visual environments can be designed for optimal orientation by the systematic use of certain colours and the frequent display of cognitive markers. Auditory environments such as in broadcast or in public spaces can be designed for increased signal-to-noise ratio (decreased noise), thus aiding intelligibility. Health environments can be designed for optimal physical activity and for reduced exposure to physical and biological hazards, taking individual risks and constitutions into account.

## CONCLUSION

For strengthening the RD&D basis for such provisions in society, data and insights on the aging of human functions (perceptual, cognitive, and motor), and options from technology, in particular new materials and smart ICT, should be brought together. This will provide all pivotal elements of society with the necessary basis for a concerted and realistic effort toward improving the technological environment of the aging society: public administration, universities, industry, distributors, consumer organisations, public broadcast companies, and the older people themselves, all are partners in such concerted effort<sup>9</sup>.

Gerontechnology aims at providing the knowledge basis for technological environments that integrally serve the generations of the aging population. Ambitions of the heterogeneous older people translate into adaptive, smart technologies in five application domains: health, housing, mobility, communication, and work. Public and private institutions should take the lead for an urgent, coherent, and concerted implementation program. This new scientific journal will take responsibility for helping achieve such aims both in industrial and developing areas of our world.

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