

# Technology for Quality of Life: an enriched taxonomy

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*J.E.M.H. van Bronswijk, H.Bouma, J.L. Fozard, Technology for Quality of life: an enriched taxonomy. Gerontechnology 2002; 2(2): 169- 172.* Urban, man-made environments are the most common living environments in the emerging knowledge-based society of the industrial world. A number of technology domains frame the urban setting that in turn frames the daily quality-of-life of man, including older persons. It is argued that the five domains of core ambitions in individuals most related to quality of life include: health and self-esteem, mobility and transport, housing and living, communication and governance, and work and leisure. A reanalysis of the theoretical basis for gerontechnology indicates that the impact of technology most related to these areas of application falls into four groups: enhancement and satisfaction, prevention and engagement, compensation and assistance, and care support and organisation. A matrix of domains and impacts provides a template that embodies an enriched taxonomy of the gerontechnological field. Using citations in this journal, the matrix is used to show the areas of greatest progress in the development over the past decade as well as the most promising areas of future development. Current changes in technology require an increase in the need for user-orientation in the choices related to technology development as well as dispersal as advocated by gerontechnology since its early days. Analysis of the advances and current gaps in the matrix elements may serve as a guiding principle for a sustainable development of technology for older persons and probably for society as a whole.

**Keywords: quality of life, domains of daily life, technology impacts, sustainability**

In the industrial world man primarily lives and works in urban, man-made environments where a knowledge-based society is presently developing. Such environments have a large complexity. Many actors are involved in their creation, and the environments are full of technology products, infrastructure, and services. Disciplines involved in the creation of urban environments are manifold: natural and techno-

logical sciences, industrial design, biological and medical sciences, social sciences, humanities as well as arts. As example, the built environments are framed by architecture, building technology, civil engineering, building services, urban planning, information and communication technologies, etc. The urban environments frame the daily quality-of-life of inhabitants, residents, workers, and tourists, including

older persons in all categories. For human life takes place within this cluster of rooms, dwellings, public buildings, streets, and other public spaces. In the planning and managing process of urban environments a number of sustainabilities are involved: economic sustainability, environmental sustainability, social sustainability, sustainable health and sustainable development<sup>1</sup>. Gerontechnology especially addresses the last three mentioned

## A PERIOD OF CHANGE

Social diversity and fragmentation is growing in the developed countries, resulting in yet another increase in complexity of societal and urban issues. In order to maintain sustainability, society is in need of new governance systems and better means to stimulate social cohesion and the incorporation of cultural diversities, while maintaining economic progress<sup>2</sup> and opportunities for innovative technology for daily functioning. In addition, the increasing rate of ageing of the world population is paralleled by an increased pace of change in the technological urban environment. Applications of ergonomics and universal design related to products and services are expected to become more complex and short lived<sup>3</sup>. This increases the need for end-user orientation in the early stages of research, development, and design, as advocated by gerontechnology, and may lead to innovative services and products\*. In the end, all technology is meant for use

by man. However, to reach the common goal of prosperity for all, society's great resources should be organised towards innovative research, development, design, and distribution (RDD&D), cheap mass production, and wide distribution of suitable and adapted products, services, and infrastructure for older persons just as is common for the other end-users<sup>4</sup>. What technologies should be given priority in our time of change? In what domains of daily life can technological developments be most useful? Which of the many impacts of technology should be chosen to guide technology effectively?

## AN ENRICHED TAXONOMY OF DOMAINS AND IMPACTS

### Domains

Gerontechnology concerns technology with direct impacts on daily life of the older section of the population<sup>5</sup>. Of course, it started ten years ago with assistive technology for the handicapped and ergonomics that were applied to older persons. Nowadays the impact of gerontechnology concerns all domains of core ambitions of individuals, in particular of older persons. Earlier, these domains were indicated as health, housing, mobility, communication, and work<sup>10</sup>. With the built-up experience of Gerontechnology in mind, we propose an extended list: health and self-esteem<sup>11</sup>, housing and living, mobility and transport, communication and gover-

Table 1: Matrix of five application domains and four types of technology impact. Numerical entries indicate the numbers of published articles in the first year of Gerontechnology journal related to the Items in the matrix. Issue 1(4) was a special on Mobility and Transport.

		Application Domain					Totals
		Health & Self-esteem	Housing & Daily Living	Mobility & Transport	Communication & Governance	Work & Leisure	
Technology Impact	Enhancement & Satisfaction	0	1	0	1	1	3
	Prevention & Engagement	1	2	4	0	0	7
	Compensation & Assistance	1	5	7	4	1	18
	Care Support & Organisation	0	1	0	1	0	2
Totals		2	9	11	6	2	

nance, and work and leisure. Other disciplines are influencing daily life in a more indirect way, such as agriculture and medicine. As far as food consumed or curative interventions are directly related to normal daily life, we include the impacts in 'health'.

### Impacts

Earlier published lists of impacts or goals to be fulfilled by Gerontechnology included Enhancement, Prevention, Compensation, and Care support<sup>10</sup>. Improved research on ageing has also been mentioned. We propose to make this listing more complete as well.

Enhancement and Satisfaction is the first impact we may expect from technology. It has been shown to lead to increased comfort, vitality, and productivity. In case of communication and governance, consider journals, radio, television, Internet, the cellular phone, or automatic translating devices, as well as new forms of citizenship making a more intensive use of the life experience of older persons to enhance societal cohesion. It seems, however, that these subjects still have to become popular research subjects.

Prevention and Engagement to prevent potential capacity losses due to environmental and life-style exposures are a second impact of technology. It combats some of the more costly acute and chronic threats to health, such as accidents in and around dwellings, allergies, cancer, and depression, to name a few. Proactive engagement may lead to substantial gains in quality of life. More so than in some other domains, the technological environment ranks higher than technological products in themselves<sup>12</sup>. This approach asks for rather immediate technological investments for long-term societal results.

Compensation and Assistance for making the most of declining capacities are a third type of positive impact. As an example we

mention the recent activities for maintaining car-driving competence up to a high age<sup>13</sup>, where better mobility, communication, perceived quality of life, and a longer life span in independence were the results. In the short run these impacts may lead to sizeable reductions in societal costs of care. In general, this is still the most extensively researched impact (Table 1).

Care support and Organisation of care with optimal client independence represents a fourth goal. This is exemplified in the Technology, Ethics, & Dementia project<sup>14</sup>. In the health domain this factor may also be used to reach a sizeable decrease in societal costs of care as well as directly increasing quality of life, both aspects of increased societal sustainability.

### PROGRESS AND FUTURE NEEDS

Technology is increasingly becoming integral to daily tasks. Practitioners, developers, and the design community rely on information and guidelines that are translation products of research results. Recently, under the grand title 'Creative use of technology for better aging', current insights and applications were shown at the 4<sup>th</sup> International Conference on Gerontechnology in Miami<sup>5</sup>. As compared to the results of the previous conferences of 1999 in Munich<sup>6</sup>, 1996 in Helsinki<sup>7</sup>, and 1991 in Eindhoven<sup>8</sup>, both the theoretical framework and the array of applications of gerontechnology improved. Still, the breakthrough in research, development, design, and distribution has still to occur that will make older persons into normal and respected end-users.

Combining the different technology impacts with the application domains mentioned before results in a matrix embodying the multidisciplinary field of gerontechnology, and forming a framework for a sustainable development for the older section of the population (Table 1). Only when all matrix cells are equally covered by research, development, design,

and distribution (RDD&D) may we hope to reach our ultimate aim of a sustainable high quality of daily life in the knowledge-based society for older persons. The impact of technology on improved research on ageing works positively by feeding the elements of the matrix. The framework could also be used for defining and developing the field, as well as to form a pilot for other groups of citizens.

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\*Recently, in May 2001, a joint European Research School has been established that is explicitly devoted to end-user orientation of built environments, especially urban environments: [www.uso.tue.nl](http://www.uso.tue.nl)