

Gerontechnology for Architecture and Construction

Ger J. Maas MSc

Royal BAM Group, Bunnik, The Netherlands
ECTP - the European Construction Technology Platform
ENCORD - the European Network of Construction Companies for
Research and Development
Department of Architecture, Building and Planning,
Eindhoven University of Technology, Eindhoven, The Netherlands
E: GJ.Maas@bamgroep.nl

Jens-Peter Grunau PhD

Züblin AG, Stuttgart, Germany
ENCORD – the European Network of Construction Companies for
Research and Development
E: jens-peter.grunau@zueblin.de

G.J. Maas, J-P. Grunau. Gerontechnology for architecture and construction. Gerontechnology 2010; 9(1):1-4; doi:10.4017/gt.2010.09.01.005.00 Building construction is a large and complex sector. Many links between construction and gerontechnology can be seen among which the aging workforce and the actual use by older people of the built environment. Current large-scale trends in the built environment are supported by the construction industry, such as a reduction in energy consumption. Challenges for construction are also connected to the aging society that calls for new technologies like embedded systems that do not need extra effort for users. Two European organizations, ECTP and ENCORD, have taken steps to define a R&D and implementation agenda at the boundaries of construction and gerontechnology.

Keywords: construction, gerontechnology, aging workforce, built environment

The building construction sector is a key industrial sector. It shows breathtaking complexity with a multitude of unique projects. The economic impact of the construction sector is manifest from the total amount of materials required for construction purposes in Europe. This exceeds two billion tons per year, making it the largest raw material consuming industry¹ with a significant environmental impact.

CONSTRUCTION AND GERONTECHNOLOGY

The construction sector plays a key role in a number of application domains of gerontechnology: housing, mobility, communication, leisure, and work². In addition to Architecture & Building (Construction), it concerns Information & Communication,

Mechatronics & Robotics, Ergonomics & Designs, and even Business management of the technology disciplines, and Physiology & Nutrition, Psychology & Social psychology, and Medicine & Rehabilitation of the gerontology side of the cross-fertilization matrix³. In this matrix objectives of the Strategic Research Agenda⁴ of ECTP have been put in the perspective of gerontechnology (*Table 1*).

Disciplines and domains mentioned above are all involved in every day processes of construction. Issues include guaranteeing health and safety of both workers and the public, and utilizing knowledge and experience of older engineers and construction workers. Other areas are influenced

Table 1. Objectives of ECTP (European Construction Technology Platform)³ placed in the cross-fertilization matrix of gerontechnology⁴ to show their contributions to societal sustainability during current demographic change

		Technology disciplines					
		Chemistry Biochemistry	Architecture Construction	Information Communication	Mechatronics Robotics	Ergonomics Design	Business management
Gerontology disciplines	Physiology Nutrition		<ul style="list-style-type: none"> - 50% reduction of accidents at home due to poor indoor environments - Hazard protection in place for buildings and structures subjected to natural and manmade disasters - High tech construction integrates IT services, sensors, actuators and diagnostic tools 	<ul style="list-style-type: none"> - Integrated information systems encompass all processes in the whole life cycle of a building - High tech construction integrates IT services, sensors, actuators and diagnostic tools 	<ul style="list-style-type: none"> - Human factors are considered in the design of machinery, equipment and tools - Remote control techniques and automation take over dangerous work processes 	<ul style="list-style-type: none"> - Systematic integration of available technology in construction and management - Increased productivity 	
	Psychology Social psychology		<ul style="list-style-type: none"> - Improved well-being of people through better indoor environments - Improved safety and security at home, at work and during travel 			<ul style="list-style-type: none"> - Underground spaces are accessible for all, just as comfortable, safe and secure as surface spaces, interconnected to the surface built-environment 	<ul style="list-style-type: none"> - Well-designed, well-functioning, technologically-advanced cities support a creative business life and a strong social life for all
	Sociology Demography						
	Medicine Rehabilitation		<ul style="list-style-type: none"> - 20% reduction in sick building syndrome - ≥20% reduction of persons suffering from asthma, allergies - Combining healthy and comfortable indoor environments with low-energy use 	<ul style="list-style-type: none"> - Integrated information systems encompass all processes in the whole life cycle of a building 	<ul style="list-style-type: none"> - Elimination of occupational disease - High tech construction integrates IT services, sensors, actuators and diagnostic tools 	<ul style="list-style-type: none"> - High tech construction integrates IT services, sensors, actuators and diagnostic tools 	

by the results of construction. Think of an office building, a residential home, a hotel, a home for the aged, a highway, a park, a subway station, a car parking, district meeting places, distributed medical care, etc. All these results together define how we live and how aging persons can be an integrated and valued part of society.

The phenomena of an aging society in a rapidly changing world of technology, and the emerging knowledge-based society are all part of everyday work concerns in the construction sector. And as such are a focus of the sector's research, development and innovation activities, ranging from initiatives within single companies to broad joint activities at the European level.

With this background, it is natural for those involved in gerontechnology and the construction sector to combine forces to find the best solutions to the challenges, that the combination of a built environment and an aging society poses and to support changing life goals and lifestyle preferences into advanced age.

TRANSFORMATION

The construction industry has many faces. Most visible are construction companies. Companies operate at different scales: worldwide, European, national or regional. Some large players with a strong background in Research, Development and Implementation (R&D&I) are exporting European technology, for instance, architecture design, tunnels, financial engineering, performance-based building, etc. These global players invest increasingly in R&D&I. Many incremental innovations are, however, developed project-wise. This industry has to operate by regulations with local roots and needs.

The current challenge for the construction sector is to transform to a performance oriented sector. Major topics to be addressed are climate change (reduction of energy consumption, rising sea levels, CO₂ reduc-

tion, etc.) and ambient assisted living. Both topics are relevant for refurbishment of the existing building and housing stock. The ICT revolution changes the use of offices and houses as well as the building process itself.

By improving functionality, durability and efficiency of materials and developing innovative combinations and processes to use the materials, significant improvements for the environment and quality of life can be achieved. Recent advances in nanotechnology, nano-structured materials with enhanced structural and functional properties, modeling, analytical techniques and other technologies have the potential of creating breakthrough innovations in the production and use of building materials as well as in the whole construction process.

CHALLENGES

Apart from the implications from demographic and climate change there are other challenges that the construction sector faces. One example is a changing approach to the existing infrastructure to improve competitiveness for enterprises and comfort for citizens. There the industry has to meet the paradox of the growing urban sprawl with increasing mobility, and sustainability issues like environmental concerns such as decreased air quality, noise stress, a destroyed structure of inner cities, and devastation of biodiversity.

The topic of 'water' is also an issue with a wide variety of items to deal with. From the viewpoint of health⁵, water is one of the greatest challenges of this era. Many people do not have sufficient water for daily living and the quality of the available water stores drops year after year. The lack of good quality water will influence the health of mankind. 'Water' also appears to be a safety issue⁴ as rising sea levels threaten living areas as a consequence of climate change.

FOLLOW-UP

Currently the major challenge for architecture and construction is the aging society. It

calls for new specific construction characteristics for housing, utilities and infrastructure: new technology that supports people as a kind of embedded system without extra effort for users. Accessibility both of dwellings and inside homes is one of the main issues to deal with as well as adaptable kitchens and floor plans. The aging society also influences construction in its industrial activities. It creates the need for a more collaborative working environment that is adaptable to an aging workforce.

Two organizations, the European Construction Technology Platform (ECTP) and the European Network of CONstruction com-

panies for Research and Development (ENCORD) have taken steps to deal with the present challenges. A long and interesting journey still lays ahead of us. Refurbishing the existing stock of buildings and adding domotics and home automation will reduce energy consumption and, in particular, support ambient assisted living for an aging society.

ENCORD's and ECTP's next step is an international workshop to create a development agenda at the interface of Gerontechnology and Construction. The invitation will be published on relevant websites and is open for guests.

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ERRATUM

J.L. Fozard, H. Bouma, A. Franco, J.E.M.H. van Bronswijk. *Homo ludens: Adult creativity and quality of life*. *Gerontechnology* 2009;8(4):187-196; doi:10.4017/gt.2009.08.04.001.00;

The Hebrew text of reference 11 was in reverse order, it should read:

הויזינחה י. האדם המשחק: על מקור התרבות במשחק (Homo ludens) [in Hebrew]. Jerusalem: Bialik Institute; 1984

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