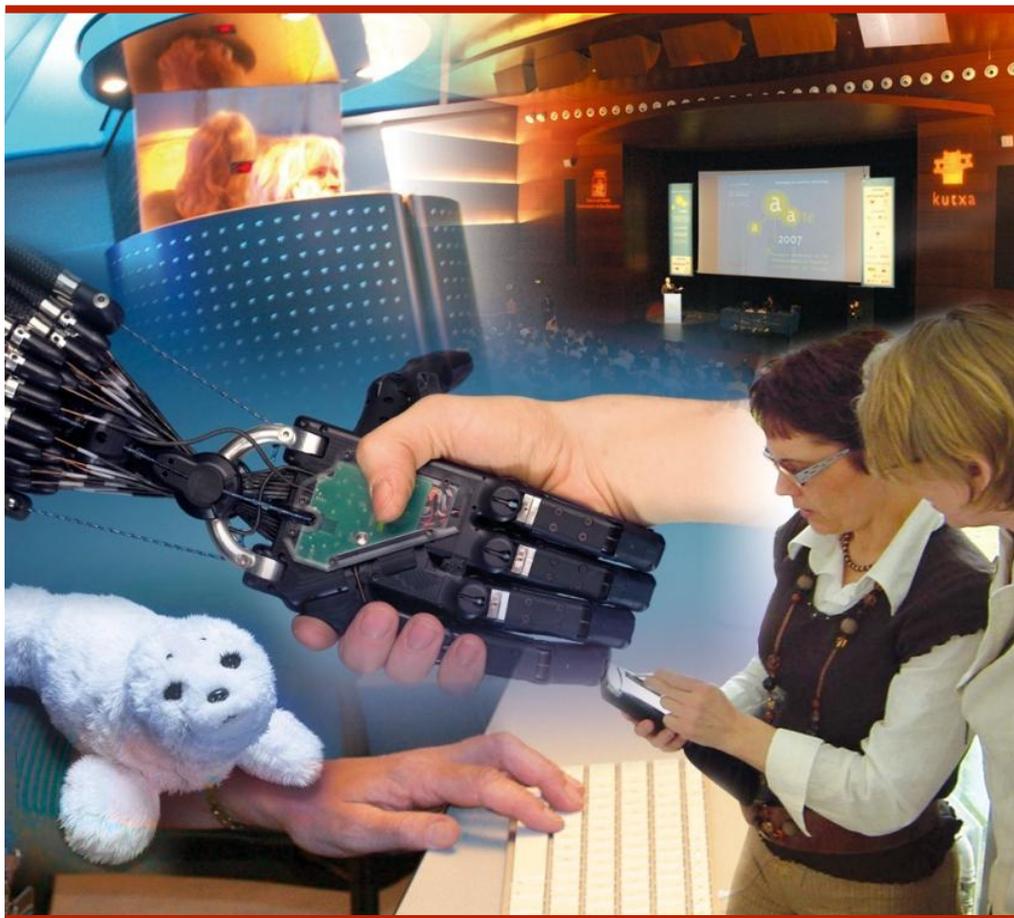


AN AGEING EUROPE

Assistive technologies and lifelong learning



AN AGEING EUROPE: Assistive technology and lifelong learning.
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Background and purpose

The “4 leaf clover” is an EU Leonardo da Vinci supported project under the Lifelong Learning Programme. The project is addressing the staff competence challenges in senior services. It is assumed that it is crucially essential to enhance lifelong learning (LLL), and that there are many opportunities in pursuing such an aim in this sector.

The components in the “4 leaf clover” project are as follows:

- A mapping of the future senior service sector with a 15-20 year perspective
- Recommendations for changes in CVET patterns and training solutions, taking into account LLL principles
- Models for the CVET providers in Europe.

A broad perspective is adapted in the project. It comprises issues about institutional structures, and it addresses assistive technologies, human resources and service concepts. “The 4 leaf clover” includes partners from Denmark, Portugal, Poland, Germany, Italy, and UK.

The project attends to many topics of relevance for the future of senior services in Europe. One major issue is the use of assistive technologies, which can benefit the elderly by providing them with enhanced mobility, improved senses and practical help. Thus, ICT and mechanical/electronic devices represent a rapid modernization in the senior service, readily being adopted by many seniors. However, assistive technologies can also change the work of the caregivers, who will be faced with new challenges as well as many opportunities. The organizations that provide services for the elderly are in the process of choosing and adopting technologies that must accommodate for the needs of the staff and for the elderly at the same time.

The project develops CVET tools to be used in the training of personnel and students in the senior service sector. This report is one of the CVET tools. It shall provide a brief overview of important categories of technologies in the senior services. The report is to be used together with DVDs and Internet tutorials. Overall, the report will organize the categories of technologies, thus helping staff and students with an initial overview, while the other CVET tools will explain the use, impacts and perspectives connected to selected technologies in greater depth.

Assistive technologies are products, devices or equipment used to maintain, increase or improve the functional capabilities of individuals with disabilities. The technology may be acquired commercially as standard goods, or delivered in modified or customized versions. The technology can enable people with disabilities to accomplish daily living tasks, assist them in communication, education, work or recreation activities, in essence, help them achieve greater independence and enhance their quality of life (www.rehabtool.com). Within this general purpose, the assistive technologies may be acquired and operated by the disabled individual themselves or by their assisting persons, no matter whether these are staff or relatives.

There is no authorized categorization of assistive technologies. Some categories follow medical diagnoses. In addition, target groups are often blurred, as the same devices can be used by fragile elderly and severely disabled, and across diagnoses, and both in home environments and institutions. A key effort for policymakers in the field is to ensure that the needs of the disabled are mainstreamed into general product design so that, for example, computers, buildings and leisure areas can be used by people with disabilities with no or minor adaptations.

In this report there is a focus on the newest groundbreaking technologies. Well-known assistive technologies such as standard wheelchairs or hearing aids are not given any particular attention. The crucial point is that the advanced technologies both provide challenges and new opportunities for caregivers' lifelong learning.

After an introduction to lifelong learning, the report will briefly address the technologies in the following categories:

- Administrative technologies
- Self-diagnoses and health monitoring systems
- Robotics in assistive tools
- Supervision
- Communication and social relations
- Intelligent homes.

ICT is becoming pervasive and the technologies are increasingly flexible and interactive. This is a major challenge and it is crucial for the senior service staff to increase their competences in order to make the best use of the technology. As technologies are changing and developing continuously, there is a need to give lifelong learning opportunities a higher priority.

Some of the learning opportunities may be embedded in the technology itself. The report will specifically address such prospects. It is not the purpose of the report to assess the technological development in any sense; rather, it will outline the portfolio of prospects as a platform for discussion and implementation at the workplace and in educational institutions.

The report is mainly the result of desk research using academic sources and the Internet. An important supply of information is the AAATE conference on Assistive Technologies, where breakthrough concepts and technologies were presented in August 2009.

The report will be relatively brief. In order to make it possible for the readers to inform themselves further and to use the report in LLL-environments, it is supplied with references to publications and Internet sites.



Lifelong learning as a transgressive phenomenon

For many years, formal adult vocational training has constituted the essence of education for people who have left school and who are in an active work life, and thus, vocational training institutions have had the role as main actors in the promotion of lifelong learning. But lifelong learning is more than formal courses and upgradings. The lifelong learning paradigm has helped shift attention away from traditional teaching activities and towards a broader concept of how individuals, communities and workplaces acquire new skills and knowledge through more comprehensive learning processes.

Lifelong learning is inherently transgressive, in the sense that it denotes a series of practices that span conventional training grounds and organisational boundaries. Disciplines which were previously well defined are reshaped in new formats and combinations, as they are included in work practice. An intriguing expanded notion is also emerging: *Lifewide* learning. It recognizes learning throughout all phases of the lifespan and in all life situations and widely in social relations, including leisure, and not solely those encountered in vocational adult life.

Lifelong learning takes place as a result of individual determination. Committed workers see the need to learn in order to fulfill their tasks, to increase their efficiency and, in a wider perspective, to stay in their jobs or enhance their employability. Much of lifelong learning is self-motivated, and this self-motivation is decisive to the general lifelong learning concept, noted by the OECD (1996):

“Despite its all-embracing nature, the new concept of lifelong learning has several features that give it an operational significance for education and training policy in distinction from other approaches:

- the centrality of the learner and learner needs: that is, an orientation towards the “demand side” of education and training rather than just the supply of places;
- an emphasis on self-directed learning, and the associated requirement of “learning to learn” as an essential foundation for learning that continues throughout life;
- a recognition that learning takes place in many settings, both formal and informal; and
- a long-term view, that takes the whole course of an individual’s life into consideration.”

A third element in the concept of the transgression is the intermediation through technologies. E-learning is, naturally, a known phenomenon, where the learning opportunities are available at locations and times suitable for the individual learner, and where the instruction can take place discontinuously. Longworth (2003) notes that the (electronic) media are so influential that its place in the comprehensive learning picture is, for better or worse, unavoidable.

However, lifelong learning is also a matter of political decision and endorsement. It is more than just a simple repackaging of standard policy objectives and measures. In the past decade, LLL-advocators have emphasized the need to widen the LLL from the privileged few with good, further educational backgrounds and a traditional drive for the acquisition of knowledge to those with no or limited vocational training (Field, 2006). In fact, and unfortunately, lifelong learning can be one of many mechanisms of exclusion and control. Lifelong learning means self-determination and self-responsibility in educational tasks, including the financial aspects, since the learner has to ‘co-finance his own learning’ (Commission of the European Union, 2000, p. 15). In terms of less privileged groups, who in numbers are accounting for the largest segments on the labour market, new understandings and incentives are needed in order to reduce the barriers to efficient and effective informal learning.

OCED and EU, which are influential organizations in LLL, unmistakably recognize the social divides in the take up of learning opportunities. OECD (2007) outlines the ways in

which qualification systems might enhance lifelong learning by building better bridges. It recommends that an effort is done to increase the confidence in the investment of time and effort vis-à-vis the learner, and that new skills are properly recognized. It is also claimed to be of major importance that public actors take on board the financing tasks. Many of those who are not so familiar with learning environments will need to have clear understandings of the purpose of LLL, and they will want a proper recognition at certain intervals. Eventually, OECD reminds the authorities and the training institutions that they still have a role to play in the organization of comprehensive and supportive learning environments and opportunities.

After 2000 and the Lisbon Treaty, the European Union let lifelong learning become a more central ingredient in the overall strategy. Building knowledge infrastructures, enhancing innovation and economic reform and modernising social welfare and education systems necessitates a new focus on learning, and the lifelong learning concept was found applicable in most member countries. The follow-up and the support by formal educational institutions and resources take place through sub-programmes, one of which is Leonardo da Vinci.

Over the years, there have been many studies of the intrinsic nature and processes of learning at the workplace, and inevitably the studies demonstrate the importance of social relations. Learning is, to the highest degree, facilitated by other human beings (colleagues, managers and customers) in empathetic environments. In contrast, there is generally less emphasis on the importance of machines and technology as part of the learning environment. In a large study about the digital world and the impact for self-directed learning, Candy (2004) points six crucial and interrelated preconditions:

- **Connectivity** which implies the existence of telecommunications infrastructure and affordable charge, access to hardware and software and access to technical support
- **Competence** with a focus on adequate ICT literacy, appropriate 'information literacy', and a blended concept of 'digital literacy'

- **Content** where Candy mentions sufficient high quality digital resources in the learner's area of interest, affordable access to relevant digital resources, preservation and continuity of digital documents and resources
- **Credibility and confidentiality** where the following is pointed out: confidence in the consistency of the technology, confidence in the credibility of the information, and trust in the confidentiality of sites and transactions
- **Capturing information** which includes agreed protocols for storing, tagging and retrieval of digital materials, and search engines and other resource discovery mechanisms
- **Collaboration** where the following is considered: Existing or emergent networked communities and co-creation of knowledge.

These six C's are essential, but hardly at place in the present situation. In the case of technology and LLL in the eldercare sector, the current environment is highly experimental. Technologies are transgressive factors in the LLL, but we still need to investigate how it takes place in practice. This report is therefore addressing the LLL in a very conceptual way. In the future there is a need for more empirical studies of the learning potentials and barriers.

Administrative technologies



IT and computers are moving rapidly into the eldercare sector, mainly in administrative fields. The principal purpose has been to raise the efficiency in the services delivered in home care and nursing homes. Work planning has become more rigid, and so has registration of activities and time consumption.

These electronic systems have been objects of heavy critique, mostly from the caregivers, but also from the elderly and their relatives, arguments being that such systems offer too little flexibility. The caregivers feel that they cannot provide extra services or exchange some services with others, if it is required, and therefore the human dimension is ignored. On the other hand, both governments and the relatives are keen on systematic quality assurance and documentation in the eldercare sector. IT-based systems are inevitable, as they have the potential to make eldercare operations more economically feasible.

The implementation of administrative technol-

ogies in the care sector seems to follow the same phases as seen in other sectors: First a rationalization phase, then a flexibilization phase and lastly a services enhancement phase. The content of these phases will be elaborated below.

Rationalisation – IT in planning and administration

In this phase, existing work processes are computerised, for example booking, planning and documentation. Information about medical issues can also be computerised so as to create a better overview and safer medication procedures.

“Mobipen” is a good example of rationalisation, but one among many others. It includes a registration of the caregivers’ visits in the homes of the elderly. The pen is an electronic device that registers the time of the visits, and the caregiver can also note activities undertaken for the information of the elderly, relatives and other caregivers. Information is automatically stored in the pen and taken back into the information system through a mobile telephone or at a simple docking station in the office. It facilitates correct information about the clients too, for example health, personal and relatives, and it is an instrument to ensure an optimization of resources. At the start of every work-day, the caregiver can, on the screen, be informed about previous events to do with their clients. The pen resembles in many ways a normal pen, and therefore the training of staff is claimed to be very simple.

<http://www.youtube.com/watch?v=tou6TadXtS8>

As a result of administrative systems, the single caregiver may feel that the work is split up and “tailored”. In the rationalization phase, the managers are the primary information handlers, and the critique raised is that there is a risk of monopolizing of information, which may be (mis)used for managerial purposes without consulting care staff.

Flexibilization and job enhancement

The technology is used for the collection of information of many kinds. In the flexibilisation phase the systems will be opened up for a wider communication between the eldercare management and the caregivers. Accordingly, work routines may change. The caregivers

can be given tools to undertake the detailed work planning themselves. They can also use the system to collect information that they need in specific situations, for example, information about medication and follow-up on hospital treatments. The caregivers can add information of importance for other caregivers.

At one stage, the impact may consist of both higher efficiency and upgraded quality. But the requirements to the qualifications of the caregivers will also be raised, and they will have to be adaptive to changes to a higher extent.

The Danish “Caremobil”, launched in 2003 and now in operation, is a typical second phase project. Caregivers can use it for time registration and ordering of medicine in the pharmacy. It is also an instrument in the visitation of new services or changed services. The device can send text messages to the main office. The evaluations of the pilot project demonstrate saved work hours and the caregivers express a satisfaction with the system.

In relation to phase 2, the division of work between skilled nurses and caregivers might gradually be altered. Access to information and guidelines can lead to higher proficiency among those with lower qualifications and a higher level of safety in the operations, as information is codified and accessible in new ways. A well-functioning system may, for example, lead to situations where the caregivers acquire more complex (para)medical tasks.

New services – the users on board

In Phase 3, technology is further developed to an extent where the users might also experience a better quality of service. In phase 3, the technology includes a platform for the user’s interaction. The elderly or his/her relatives will be able to read the documentation continuously and to communicate with the care systems and caregivers. As a consequence, the character of the service will change entirely and the users will be better informed and empowered. For example, by using the system, the elderly client will know when the caregiver expects to come and he/she can plan his/her day. The system might also be available for the user to check his/her intake of medicine and medical records.

There is potential inter-linkage from the caregivers into the health system. Electronic medical records are emerging, and they are important in the planning and implementation of follow-up treatment in the home or the nursing home. Rehabilitation requirements are sent out from hospitals but still have to be implemented by the caregivers etc. A so-called pervasive health care system is underway, although quite slowly. Some of the wider perspectives are outlined on

<http://www.pervasivehealth.org/cfd.shtml> and <http://www.pervasivehealthcare.dk/>

It is likely that the roles of the health and care staff will change completely in connection with a full implementation of phase 3. New collaborations will have to be nurtured, not least with the now better informed relatives, who might follow the situation at a substantial geographical distance. Phase 3 implies a transparency and de-monopolization of information, which are crucial for the elaboration and communication of quality and quality standards. There is no doubt that some caregivers and their managers will be skeptical, and that developments in this direction will require significant adaptation and retraining of caregivers.

Implications for lifelong learning

IT has a good deal of potential for the integration of learning possibilities in flexible ways and in close connection with work situations. Help-functions can, for example, be gateways to learn about new technical functions and possibilities. However, many individuals prefer to learn new skills by using not the electronic devices, but observing colleagues operating the systems. IT embedded learning opportunities will be ingredients in a more comprehensive learning portfolio. It is necessary to have managerial attention in order to cope with to the variation in learning styles

As described in phases 2 and 3, the administrative systems may even contain information that will provide caregivers with opportunities to up-grade their knowledge, for example in medical fields. It is, however, unlikely that the caregivers will take on board these learning opportunities without substantial introduction to formal education, and without user-friendly interfaces in technical systems. General learning attitudes much be established and refocused to include a mix of learning modes.

In phase 3 caregivers might have to instruct the clients and the relatives to make the best of the information provided. It is well-known that teaching others is an excellent opportunity to learn and to discover for ones self.

Self-diagnoses and health monitoring systems

Self-diagnoses

Everybody can, with their own senses, observe health symptoms but most people need help from medical experts to verify health problems or to monitor risk factors. However, very rapidly the self-diagnosis and self-monitoring systems are emerging. They can help patients to be prepared for consultations with doctors or to provide a basis for a second opinion. A continuous or frequent health monitoring system may shorten the time from suspicion of illness to treatment, which is generally life and cost saving. Self-diagnoses and health monitoring may also have a function as a preventive measure.



Self-service tests have been known for decades, for example pregnancy tests or allergy tests. They can be purchased widely and the diagnosis is fully, or almost fully, established after having used the test. New tests are, however, coming up continuously also for illnesses that are particularly frequent among the elderly.

Examples on tests:

- Strips for diabetes indication
- Allergi test
- Colorectal cancer indicator
- Prostate cancer screening set
- Cholesterol indicator
- Influenza-type determiner
- Tests for alcohols and tobacco addiction
- Blod type determiner

- Bladder infection test
- Bovel disorder tets
- Kidney decease test
- Cystitis test

www.craigmedical.com

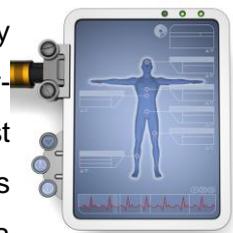
www.valuemed.co.uk

Some of the tests are completely self-contained and they provide an immediate answer. Others imply the collection of a sample, which will be analyzed by a laboratory. All tests attempt to be simple to perform and to interpret.

In more recent times it has been possible to purchase genetic tests, which conclude about dispositions for various deceases, such as Parkinson's, breast and prostate cancer, heart attacks etc. The tests are hardly definitive, but they may help people with dispositions to undertake necessary lifestyle changes. The organization 23 And Me offer tests and substantial supplementary services and promotes research in categories of illnesses that affect many people. (www.23andme.com)

Mechanical and electronic devices for health monitoring

Some of the devices are used to monitor deceases that are already diagnosed and where the patient is in treatment. The purpose of a personal device in the home or on the body is to allow the patient to adjust the treatment themselves, or to seek a doctor if the monitoring shows alarming signals. There have been a number of devices available for a number of years and new and improved tools are entering the market constantly.



Persons with blood pressure issues or their relatives or care persons can easily ensure a continuous monitoring under far more optimal conditions than in the doctor's consultation or a hospital. The development of equipment has improved so that patients may even

carry the devices on them all the time. The monitoring can be of crucial importance for medication and an early discovery of risks for fatal incidences.

Several manufacturers offer “wrist clinics” which include a variety of measurement possibilities of major or minor importance. Some of the measurement devices are electronically linked to a computer, where data are collected for later medical calculation and inspection. The files may be available for patients, doctors, caregivers and/or relatives. The wrist clinic includes for example:

- Heart rate
- ECG
- Blood pressure
- Heart rhythm regularity
- Respiratory rate
- Oxygen saturation (SpO₂)
- Body temperature
- Stepcount

www.youtube.com/watch?v=E594hDrK9tQ www.telcomed.ie/index.html

Glucose meters. Over the past few years, diabetics have been able to regulate their own diabetes through regular measurement of glucose. These instruments are easy to handle. Further developments soon to be introduced include continual measures and an adapted insulin pump system.

<http://public.medapps.net/Pages/HealthPALGlucoseDemo.aspx>

Asthma monitoring. There are systems available where users and doctors can collaborate on the monitoring of asthmatic symptoms in order to ensure correct medication. Some systems utilize mobile telephone to send text messages in case of an emergency. For asthmatic patients there are facilities for recording and analyses on the iPhone platform.

Sleep disturbance is common among elderly and people with dementia and may lead to a loss of life quality. Measurement and management of sleep is therefore important, and various instruments are currently being developed.

Physical condition measurement. Over the years, most fitness centers have introduced a range of instruments that measure physical conditions. Some of these instruments take into account, for example, gender and age. The use of measurements can be an element in the continual monitoring of health problems. Many of the gym instruments are actually finding their ways into private homes or into the eldercare institutions. Some of the machines in fitness centers are “proactive”, as they can suggest elements of a training program, adapted to the previous, registered performance of the individual, and modify in accordance with age and health conditions.

There is an immense effort to miniaturize the meters and instruments. If they are too bulky, they are inconvenient to wear, and people with dementia tend to take them off. Wristwatches or finger rings are preferable. Some instruments can be placed just under the skin, with simple surgery.

We can foresee a development where health and medical monitors are networked to the personal handset via Bluetooth or other short-range technologies. There will also be a plethora of health-related smartphone applications that will be able to receive and analyze data from medical devices.

<http://mobihealthnews.com/>

Telemedicine



Increasingly, the devices for tests and measurement are linked up to the communication network. Telemedicine has been discussed – and practiced – for many years, but the new instruments are increasing the possibilities dramatically. Welfare gains can be obtained in the sense that the elderly can stay at home instead of being hospitalized and still receive a degree of medical supervision. Incidences can be discussed with doctors faster than if the patients have to be transported to the hospital. Mobile phone cameras may be sufficient, as the quality is rising quite ra-

pidly, and other mainstream computer equipment might also be of importance such as webcams, skype systems etc. Technologies are merging into such items as ultrasound scanning and echocardiography, where the units are becoming more and more mobile and connected with communication devices.

Telemedicine also includes treatments for psychiatric problems, using very simple tools such webcams, cameras and microphones. There is an ongoing discussion of how to help, for example, elderly with dementia through electronic cognitive training instruments. These instruments might be “unstaffed” – self-service, computer programs. Services might also be staffed with skilled psychotherapists, psychologists etc. The caregivers will increasingly have a role as instructors of and facilitors in tele-psychiatric sessions.

The lifelong learning implications

The producers of many of these tests and tools have made them simple to use and understand. However, caregivers need to be continuously informed about what is on the market and how and for whom it works. At the same time, new opportunities are added at a rapid speed, and new categories of elderly will find them useful. Caregivers must be aware of new products on the market, so as to be able to suggest them directly to the client or as an element in a comprehensive plan for the care. An advantage is that some instruments are becoming more mainstreamed into, for example, mobile telephones, which most people find easy to handle.

Self-diagnosis and monitoring will increasingly take place at home, and the caregiver will have to master some medical interpretive skills. He/she has to be able to discuss the results and guide the elderly to further medical assistance, possibly after repeated test and other types of inquiry. Perhaps the client needs to adjust his/her lifestyle, and the caregivers have to be able to see the link between the tests and measurement and the work in the home

and with the care, for example, in terms of food supplies. The caregivers' role will then increasingly become more paramedical. In that case, there is a necessity to supplement the continuous informal and workplace learning with some formal training.

Presently, caregivers hardly have any “backing system” if the elderly want to use advanced equipment. There is seldom any competence infrastructure in place where caregivers can go to find help to solve medical or technical problems. It is likely that much of this development is “learning by doing”. Some equipment providers, mostly in IT, have set up communities where users can ask questions and expect answers from other users in openly accessible fora – genuine web 2.0 environments. We still need to see such places for caregivers, and some time will probably elapse before a majority of caregivers feel comfortable with this way of technology supported informal learning.

Robotics in assistive tools

Normally, we'll think of manufacturing industries in connection with robots. But gradually small, mobile and flexible robots are being developed, and it is no longer science fiction that robots are integrated into housekeeping and care tasks.

Robots for housekeeping



There are already a number of robots available which can vacuum clean carpets, mow the grass and rinse the swimming pool. They are not developed particularly for elderly citizens, but they may be helpful for those with functional disabilities, and they may prolong an independent life in their own apartment. Vacuum cleaners have been implemented as a labour saving device in the home eldercare sector in Denmark. Developments are ongoing to produce robots which are able to serve food or sweep floors. A challenge is to achieve a higher sensitivity of robots so that they do not harm furniture and people. In addition, the communication between the user and the robot is crucial. It is essential that it is simple to give instructions and that the robot understands its owner's personality.

The development of robots that are accompanying the elderly on trips outside the home is emerging rapidly. They are not only an electric support for the functionally disabled, but they can help to find their way in the street or in shopping centers through a GPS-integration. Communication about navigation takes place with synthesized speak and speak-recognition, so that users without digital abilities can still use the robot to guide them safely around in the local area.

A robot is able to remind people suffering from dementia where to find things and when they last had a meal, took their medicine etc.

<http://www.youtube.com/watch?v=NtD2vwV61-w>

Robots and entertainment

Robots have entered the playrooms of kids, but they also have potential for the entertainment and companionship of the elderly. Japanese citizens are more apt at personalizing the technical instruments than Westerners usually are. A Japanese nursing home has implemented “roboteddies” with a variety of functions. A teddy remembers the name of its owner, and it reminds him/her it to take medicine and to do specific routines such a personal care. Telephone messages from relatives may be given through the roboteddy. Some even have integrated sensors with a role in terms of monitoring the wellbeing of the elderly. Gradually, nursing homes in Europe acquire an interest in investing in the robots. It is documented that roboteddies have an importance to reduce risk of depression.

<http://www.youtube.com/watch?v=6T8yhouP0I0>

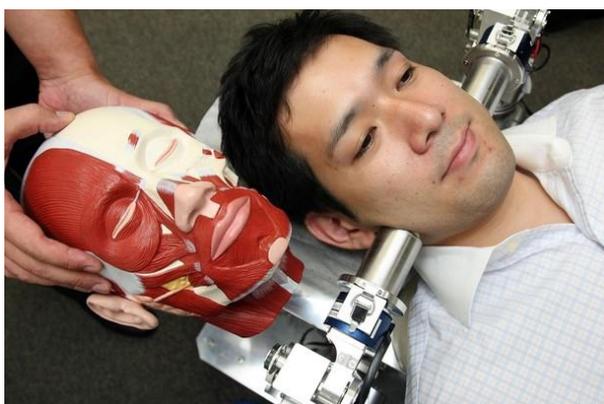
Robots for personal hygiene and care



It is likely that robots will be implemented to a larger extent to undertake tasks in relation with personal hygiene and care. The advantage is that the elderly and disabled can make their own decisions and avoid being completely dependent on assistance from caregivers. The elderly can get out of bed easily, and move around. A Japanese “washing robot” has already been developed for more fragile older people and in it the user can wash, rinse and dry. The response from the elderly is generally positive, as long as the tools can be adapted to their personal needs. Ideally, robots should have a subtle sensitivity if they are to handle human beings. They must be applied with artificial “skin” that can

register pressures and temperatures in the same way as human caregivers. They must be able to react promptly and adequately on the users' body signals. Robot research environments are working on solving these problems.

Rehabilitation robots



The next generation of robots may answer many requests in one and the same personalized machine. A personal robot is not only able to assist the elderly by collecting, bringing, doing housework etc, but it can also mobilize the user in a way that fits the physical conditions and needs for exercise and training. Robots are likely to be used further in rehabilitation, as

“personal” trainers for those who are regaining strength after, for example, a fracture of a limb. Such robots have already entered hospitals, but there is a need to personalize and adapt them for use in private homes and nursing homes.

There is a convergence of technologies used in the fitness industry with robots in households and for rehabilitation purposes. Today, skilled therapists are essential for the control of the rehabilitation process, but the next step is to program the technical tools so that they are addressing personal needs on a continual basis in an artificial intelligence environment. The challenge is to supply the rehab robots with various, personalized guiding videos etc. At this stage of development the instruments will probably enter private homes and nursing homes on a more permanent base.

Exoskeletons



Exoskeletons have emerged from military research, but are now moving into the rehab-sector. An exoskeleton is an extra and electronically controlled framework mounted on the outside of the robot and it helps the user to walk and carry things. It compensates for low strength and bone stability. Some exoskeletons are constructed to be worn on the full body, others are dedicated for example to a leg. When adapted, the person will be able to function normally. Exoskeletons are for example being developed for patients with rheumatism.

<http://www.jneuroengrehab.com/content/6/1/21>

The exoskeleton can also be used by caregivers. Working in nursing homes sometimes involves heavy lifting and the exoskeleton can be a “power suit”. With the skeleton, a person weighing 60 kilo can carry another person with the weight of up to 74 kilos. The power suit has sensors that measure the movements, and the energy is transmitted to parts of the construction where it is needed.

Some of the developments emerge from the car industry. Toyota has launched a “walking shell” that can take the stairs or walk in the forests where normal wheelchairs cannot go.

Lifelong learning implications

Caregivers are often very concerned that robots will lead to a reduction in jobs and job qualities. However, as baby-boomers get older there is need for new labour saving devices just to keep pace. It is a challenge for caregivers to accept and to work with the idea that robots can represent a genuine augmentation of nursing and caregiving practice. The robots solve

some of the heavy and repetitive tasks. Using the robots demands adaptability to the situation and the caregiver will have to learn through practice. An attitudinal and technical foundation has to be given in formal training, but generally the development in robotics is quite experimental and will be so for a number of years. The implementation will have to take place with caregivers as creative collaborators. Robotics includes the potential for learning processual skills at many levels. There are numerous possibilities in the interaction between robots and the user and there will be space for improvement of the caregiving practice.

Many caregivers will need to be in a workplace community where the tools are tested and discussed in groups of colleagues and managers. In proactive environments, the caregivers may even acquire the insight and opportunity to affect the development of the products. Their observations of the users and their needs are valuable for producers. The refinement of observation skills is an ingredient in lifelong learning.

Supervision

Over some decades it has been an established element in social policies that the elderly should remain in their own homes for as long as possible. Different types of supervision and communication instruments help to postpone the time where it is necessary for an elderly person to move to a nursing home. Supervision is also an element in terms of letting people out of hospitals faster, or in avoiding hospitalization altogether.



There is a keen discussion about ethics in the supervision of the elderly. If supervision is accepted on an informed basis by the elderly themselves, it is generally considered acceptable and feasible especially if it leads to improved quality of life. It is more controversial if the supervision includes all elements of the behaviour, or if the elderly is without real insight into the circumstances and consequences, for example, because of a dementia. For ethical reasons, most supervision is activated by the elderly themselves in case of emergency.

Monitoring can be connected to registration and data processing of daily behavior and deviations from the norm. If, for example, the door to the refrigerator is not opened over the period of a day, the caregiver may be alerted. Likewise, non-standard sounds in the bathroom can alarm the caregiver's office.

Electronic tagging systems

Electronic tagging is increasingly used for people with dementia. It allows them to move fairly freely around within well-known areas. The tag is built into a wristwatch, or could

also be placed just under the skin. The tags have GPS and communicate with a control center. The alarm is alerted if the person moves beyond the safe boundaries. It is easy to find lost individuals and there usually is no need to call the police, which may cause disturbance and anxiety.

Tagging can also be used for people who have difficulties in remembering their door keys. Further, in relation to obesity, it is necessary to control access to food storages and refrigerators.

Sensors on the person

Sensors are being developed and improved rapidly and they are applied in many situations. They can register temperature, pressure, airborne substances, light etc. Sensors may be placed on the body, in clothes or anywhere in the environment of the elderly.

A sensor for intelligent bandages has been introduced. It measures humidity, temperature and bacteria. The bandage is in electronic connection with the health center. A faster and more targeted healing may take place and the patient can stay at home. In principle, the patient may even follow the healing process on his/own computer.

<http://secure.theengineer.co.uk/Articles/310770/Smart+bandage.htm>

Research finds that the elderly are not in opposition to health related sensors and tagging, as long as it provides a freedom that they would not have normally had. People who can afford to may choose to, for example, visit the beach while still safely connected with the professional medical expertise elsewhere.

Implications for lifelong learning

Tagging and sensors may raise ethical dilemmas and that is a matter which caregivers have to address. There are communication skills that need to be developed and the practice with sensors and tagging offer continuous opportunities to enhance the skills with a humanistic ingredient.

Tags and sensors are matters of rapid technological development. Therefore, there are chances to be upgraded and to be able to suggest opportunities to other elderly people who might benefit. Well-informed caregivers can represent a mode of dissemination.



Communication and social relations

Many elderly people are, at a high age, in possession of their full mental capacity, but have declining mobility. Everybody does, however, wish to communicate with others as communication is crucial for practical purposes and for a better quality of life.

Augmentation technologies

Development of instruments that can make communication easier for the elderly has occupied producers of technology for many years. For example, the ability to remember telephone numbers can decline and dates and weekdays may be difficult to follow for some elderly. There are a broad variety of products on the market which can help, for example, telephones with pictures of individuals often in contact and calendars which move on automatically. Such instruments can also play sounds and alarms remind the user about activities such as medication, appointments etc.

Mobile telephones can be adopted to include only the facilities that the users themselves prefer. Computers can be set-up to increase the size of the text and interfaces or to read the text aloud.

Technical augmentation facilities are now mainstreamed to a considerable degree and it is often not necessary to purchase extras to be able utilize these facilities. This mainstreaming is extremely crucial as assistive technologies may otherwise be very expensive and therefore not generally available unless included in welfare services. Mainstreaming represents a significant financial advantage for the elderly and for the public authorities in charge of eldercare services.

Social networking

Facebook and other social networking sites are available to people of all ages. However, new dedicated sites are occurring helping Internet-savvy senior's battle loneliness and make new friends with the click of a mouse and in the comfort of their own homes. Social networking is a possibility to keep in touch with friends and relatives and to make new relationships.

Many sites are for people with special interests and they offer opportunities to share the joy of, for example, playing games together on the Internet, chatting about books, films, religion, etc. Role plays that might also be of interest to the elderly are currently being developed far beyond the types found for kids and teenagers.
www.socialimpactgames.com/index.php

There are social networks that target people who need support and encouragement, for example, www.dailystrength.org, www.wellsphere.com and www.caringbridge.org for those with health challenges. www.diaboom.com is for people with disabilities. The site www.patientslikeme.com gives the opportunity to discuss specific illnesses with others and compare treatments offered. Through patientslikeme, the users might get "second opinions" and acquire knowledge so that they are in a better position to discuss their case with the health system. www.23andme.com is a place offering genome tests and subsequent networking.

Implications for lifelong learning

Just like many other technologies mentioned in this report, the communication techniques available to the elderly indirectly affect the qualification requirements to the caregivers. Computer literacy at a certain level is necessary. During the process of assisting the elderly, caregivers may get chances to update their knowledge on various issues that are important for their own activities as caregivers. Social network sites not only offer chatting opportunities – diaboorn, for example, also provides updated information about the newest technologies for the disabled, and it discusses political and practical issues of relevance.

Much social networking and web search is in English. It does exclude many caregivers who come from a background, where language skills are not common.



Intelligent homes

Housing design and town planning that enhances accessibility has been on the agenda for many years. Ramps instead of step, elevators and toilets adapted for disability, appropriate lightening etc are measures quite widely used. Curtain control systems and cupboards that can be moved up and down are also well-known features.

However, intelligent homes represent a new concept in this field and there is a demand for more of that, as these houses also represent quality improvements for other users. Architects and engineers emphasize the design of comprehensive and integrated electronic control systems for heating, ventilation, light, etc, thus controlling the total machinery in the home from one portable control pad.

Self-cleaning surfaces and other measures that limit maintenance are also elements in smart homes.

The refrigerator becomes a computer. Sensors register the durability of the products in order to avoid food poisoning, a particular risk for fragile elderly. The refrigerator also notices when the stock of essential and/or preferred products is low and the machine can be programmed to order new deliveries from the supermarket or the care center. Freezer and microwave ovens can also be programmed. It is likely that there will be a convergence of technologies so that the oven can keep the food cool until the proper time of heating.

In instances where water leaks onto the floor, the house senses it and alerts the resident or the caregivers. If the resident falls, the floor with sensors can alert help. When a visitor comes to the door, sensors pinpoint which room the resident occupies and a camera beams the visitor's picture to a TV screen there. If the resident wants to unlock the door, he or she can tell the cell phone, which then transmits a code to open the electronic latch.

www.confidence-eu.org

An intelligent interface that monitors the residents' movements, and learns to recognize their habits, can notify loved ones if the habits are interrupted. In addition, a smart home has the capability of monitoring the vital signs of residents. If an elderly person has a medical condition that could be of concern, vital signs can be routinely sent to the appropriate medical facility. The smart home equipped with artificial intelligence will learn to distinguish dangerous events and alert medical personnel immediately.

Implications for lifelong learning

The smart homes are measures that might reduce the workloads on the caregivers and make it easier for disabled residents to help themselves. The caregivers will have to learn to urge residents to make the best of the smart technologies as part of a therapeutic program. There is a variety of technologies and in all probability the caregivers will have to become acquainted with operational details and simple repair work. There is a higher demand on technical skills. As soon as the smart homes are implemented, they will be places for hands-on exercise for the caregivers after some formal introduction.

A de-learning has to take place as well, and old practice has to be replaced with new ones. As the homes are becoming more automated there might be a chance for the caregiver to focus on personal services rather than practical tasks.



Eleven dilemmas for the LLL

In the previous sections we have gone through a number of interesting emerging technologies under the assistive technology umbrella. We have outlined the potential implications for lifelong learning of caregivers. This outline demonstrates that there are substantial possibilities embedded in the technologies and the technological systems for enhancement of skills and competences. In some cases the technology set-ups immediately provide learning opportunities, in other cases learning can take place in the technology-human interaction, where clients, colleagues, managers or relatives are intermediating in the learning process.

There are, however, a number of dilemmas, which have to be addressed by organizations that employ the caregivers and as part of general educational policies and in the practice at the educational institutions:

On the one hand...

There is a clear need to recruit personnel for the senior care sector who possess average computer literacy skills and an interest in medical technologies and its progress.

However.....

The average age among caregivers is fairly high, and many enter the sector as a second career option. Although there are exceptions, IT literacy declines with the age of the workforce, and many of them do not consider technology as a core ingredient in their work, no matter how important it might be for the health and wellbeing of their clients.

Assistive technologies are becoming easier to operate.

There is often a fear to get acquainted with the technology and to use it in practice. There might also be a resistance to changing work procedures and methods, and therefore technology remains un or under used, if not given a specific emphasis by managers.

The advancement of assistive technology in the senior service sector calls for multidisciplinary and trans-mural teams, which also include health and leisure staff.

Caregivers work in teams with other caregivers and their trans-mural relations are often limited. A strong community of practice has its advantages, but it tends to hinder “incidental” inspiration from non-standard sources.

The incentives for the public sector to launch technology in health and care are quite strong as the pay back can be rapid.

The managers in the eldercare sector need to include the caregivers in decision making processes and work with issues such as job security and flexibility.

Caregivers are usually experts in their fields and most of them want to improve their skills. They listen to colleagues and managers.

In terms of technology, caregivers have to seek advice from a broader group of “mentors”, which also include the clients, relatives and people from other segments of the health sector.

Observations by the caregivers during their work with the elderly may be essential for innovation with assistive technology manufacturers and service providers.

Caregivers and their organizations are not participating to any extent in the assistive technology communities. Unions or shopstewards at the workplaces are not invited to assistive technology events and the concept of user and employer-driven innovation account for very little in this sector. The accumulated knowledge of the caregivers is not acknowledged and let into more comprehensive learning circles in the sector.

Warm hands and personal attention is the core of most caregiving paradigms. Learning takes place in the dialogue and through observing and responding to human action.

Many caregivers find it difficult to see technology as parallel learning mediators. Machines are regarded as mono-functional tools. There is a lack of inclination to experiment with the technology in order to discover its potential and limits.

Implicitly, there are possibilities for learning in technologies, but they are best exploited by people with a strong curiosity and experimental attitude.

There is a need to make the learning ingredients more explicit in the technologies through, for example, easily accessible help-functions, embedded tutorials etc.

Formal vocational training institutions must introduce technology paradigms to students in a way that they get a proactive attitude before they start working in the sector

Presently, formal training has a limited emphasis on technical tools and the technologies introduced are mostly ones which are in common use. Prospects for future technology development are almost absent in the curricula.

Assistive technologies are increasingly becoming mainstream, which means that caregivers operate the same tools at home as with the clients. What they learn about the techniques in their leisure time is a stepping stone for learning for their vocation and improving their skills.

Some techniques still have to be adapted to individual needs and that is an extra learning challenge for the caregivers. Besides, caregivers may not see the links between their own leisure practice and their vocation clearly.

Caregivers will have to take on board new tasks and obligations and they will have to be able to cover a wider range of paramedical function in a professional manner, assisted by technological tools.

The social recognition of the caregiving profession is relatively low. Changing and upgrading the role of the caregivers will demand a multifaceted effort by political bodies, unions, educational institutions, employers and from the caregivers themselves.

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ICT is becoming pervasive and the assistive technologies are increasingly flexible and interactive. This is a major challenge and it is crucial for care service staff to increase their competences in order to make the best use of the technology. As technologies are changing and developing continuously, there is a need to give lifelong learning opportunities a higher priority.

The report purpose is to outline the portfolio of lifelong learning prospects for caregivers as a platform for discussion and implementation at the workplace and in educational institutions.