

# Gerontechnology, Digitalization, and the Silver Economy

Digitalization in healthcare is posed to change the way the older population is treated, the way health workers relate to them, and the participation of computing professionals in the mix.

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The ongoing evolution from an industrial society to digital society will lead to radical changes in how we solve and organize the welfare society. This development is converging with another trend: a global increase of older people. And since the quota of working versus retired people is sinking, there are no more possibilities to increase the number of people working in the health and welfare sector. Thus the only way forward is the increased use of technology to support and relieve both professionals and those in need of services.

Surely this is a match made in heaven?

## INTRODUCING GERONTECHNOLOGY

Digitalization is a process that enables new models and concepts that, in turn, lead to new services and new ways of delivering services. Digitalization is horizontal, meaning it affects all areas, sectors, and businesses. This development is seen as an essential part of how society can cope with future demographic changes and ensure efforts in the welfare sector, especially in health and care. Digitization is the actual process of converting the analog into digital. Digitization of existing and new artifacts means they can be integrated into care and everyday life in a more systematic and sophisticated way. Digitalization has a strong potential to fundamentally change how we view older people as patients, careers, citizens, and consumers. For the aging

population, this will lead to new opportunities but also new challenges. What will be the consequences for the elderly? How can this be affected?

Digitization is to be understood here as the broad change that follows IT development, which includes both existing applications that are now being digitized and new applications based on the technical synergies that developed during recent years, and have given rise to applications such as artificial intelligence (AI), robots, and a whole lot more.

Digitization is systemic beyond individual applications, and affects older people in particular to a greater extent. More and more information is being digitized—e.g., the security alarm, the ordinary telephone system, TV, etc. And more and more of gen-

eral communication in the community, and particularly in elderly care, is taking place via digital media and in connection with home monitoring and other data transfer between the home and caregivers. In addition, this trend occurs in the elderly's everyday lives where they themselves become equally essential links in the chain as professional users.

Older people's use of technology involves multiple converging trends in technology development. Technology use by older people does not constitute a problem per se, but could be problematized from several perspectives, or seen as an opportunity. The research area where this is done is called "gerontechnology."

Both the design perspective and technology adoption perspective are



essential to ensure appropriate functionality and removal of various barriers to use. Personal factors such as self-efficacy (the individual's confidence in coping with an action in a particular situation) and proficiency (the actual level of skill and knowledge to perform this action), as well as subjective technology adaptability, have also been identified as significant predictors of technology use in old age. If this is done correctly, the results are very beneficial and empowering for the elderly with increased independence in daily life and home environments.

An area that has attracted particular interest is the use of technology for older adults in various health settings, both in formal healthcare and from preventive healthcare targeting social isolation and participation. However,

there is a strong need to determine evidence of effectiveness and efficiency of health technology interventions, and it is becoming increasingly important as the number of available health technology solutions grows.

#### **NOT WITHOUT MY BANKID**

On the other hand, it has also been noted there are problems with this development where certain groups (including older people) are excluded in this brave new world and end up on the wrong side of the digital divide.

As an example, we can look at the use of BankID in Sweden. Bank ID is a credential for digital services. BankID is used in the services of most authorities, regions, banks, and a number of other services in society, not least digital payment services. In Sweden,

9.5 million internet and mobile banking customers could have a BankID e-ID issued by their bank. At the end of 2019, 8.2 million bank customers had a BankID, and from this group 7.4 million had a Mobile BankID. The mobile version can be used from a cell phone; thus it can be used outside of the home and without requiring access to a stationary computer. The number of logins and signatures amounted to 4.1 billion in 2019, and the vast majority were made by Mobile BankID.

This is, of course, very good and, to some extent, a cornerstone in the possibility of a transition to the digital society. A fast and straightforward way to establish identity and to give fast and easy access to a wide variety of digital services is seen as a necessary requirement, and the penetration in

the population is of uttermost importance. As of 2019, 98.7 percent of Swedes between 21 and 50 years old are using one (or more) BankID. For Mobile BankID, the corresponding statistics are 97.4 percent. For the 51 to 60 age group, the corresponding number is 94.8 percent; and for those between 61 to 70 years old, the number is still rather high (87.3 percent). In the 71 to 80 age group, it goes down to two-thirds of users, or 66.4 percent; and finally, in the group 81-plus, only 37.9 percent have access to a BankID.

This is, of course, a rough measure of how the use and access to digital services looks in the older population. In reality, of course, the picture is more complex, and to some extent, a passing problem, since it is easier to continue to use familiar technology in old age than to pick up new and previously unknown technology. Older people are far from homogenous, and the introduction and penetration of technology are still very connected to various other sociodemographic factors.

But still, it is an instant picture of the situation today. And given that BankID is necessary to access an ever-increasing number of services within the health and welfare sector, already existing differences could widen rather than become narrower if the problem is not addressed. It is of utmost importance to keep up-to-date knowledge of the opportunities and challenges that new technology and new services entail for different parts of the older demographic in Sweden.

## FROM SNAC TO AI

The purpose of the Swedish National Study on Ageing and Care (SNAC) is to augment knowledge in several areas from an interdisciplinary perspective in the area of aging and care. The study was initiated through an initiative by the Swedish government in 1998. Almost 20 years of following a large cohort of the Swedish population over 60 years of age has produced a large amount of data describing the aging process.

The creation of the sub-study SNAC-IT, with a focus on how IT and digitalization provides both opportunities and challenges for the elderly, enables valuable knowledge acquisition about social development in relation to demo-

graphic changes. The study takes into account sociological, technical, and health science perspectives in order to elucidate the effects of digitalization on the aging population. At the same time, SNAC offers unique opportunities for an interdisciplinary approach, together with studying the impact of new information and communication technology on the daily lives and quality of life of the elderly.

The study addresses factors that are important for an individual's ability to access and use technology in different contexts, but also factors in the importance of optimizing society's various support systems for the aging population. It is particularly critical to study this from a perspective outside of metropolitan areas and central locations, focusing rather on those where geographical proximity and access to care can be limited and the distance to relatives can make contact difficult.

The use of deep-learning methodologies to create AI systems that could support both healthcare and welfare professionals, as well as the group of aging people, is becoming an increasingly important use of the SNAC data. Letting the computer backtrack in the vast amount of data, makes it possible to find factors that could be essential for the development and prevention of a wide variety of diagnoses. The first results from this research have been promising, although they still need fine-tuning.

Another area of research that people with mild cognitive impairments and dementia could benefit from is the introduction and testing of the SMART-4MD application in a randomized

controlled study including more than 1,000 people in Sweden and Spain. Collecting and filtering data about an individual's use of the tablet, along with creating custom-made information, support, personalized reminders and decision support for said individual, establishes a communication interface with the healthcare system.

## THE CASE OF PUTTING THE BRAIN IN THE POCKET

One group of chronic diseases that predominantly affects older people are various cognitive conditions such as mild cognitive impairment (MCI) and dementia. The general increase in lifespan will continue to increase the number of people living with mild cognitive impairments. People suffering from dementia in Europe alone are estimated to reach 13.4 million by 2030, and the challenge of ensuring a good life for all is likely to remain formidable. Healthcare policies are focused on extending the ability of older people to continue to live independently, as one way of meeting these challenges. Since medical treatment options currently remain centered on symptomatic treatment, the use of technology, and specifically information and communication technologies (ICT), is suggested as a way to support function and maintain a good life. For people with neurocognitive disorders, a good quality of life means they are able to keep a certain level of independence and self-management of daily-life activities, which may be improved by using technology.

Cognitive problems affect both the individual as well as their surroundings. Living together with and/or caring for a person with MCI or dementia can also compromise the well-being and health of a family member due to a feeling of being overwhelmed in the caregiving role.

Many devices and digital apps to support the day-to-day living activities at home for people with neurocognitive disorders have been developed. However, the majority of solutions focus on cognitive impairment training or support and safety for people living alone. Most of them are single apps or devices, but few are integrated into a single solution or product.

**The number of older adults in the population, as well as their proportion within the total population, is increasing in many parts of the world.**

The introduction of technology in a degenerative cognitive process, in its early stages, or preferably before, is considered to be an essential factor.

When looking at the problems people with mild cognitive impairments are having and the potential of AI for decision support, it is as if the concept were custom made for this group

### THE SILVER ECONOMY

Both at the global and the European level, this issue has been highlighted as one of the most important areas of development. In the EU's "Digital Agenda for Europe 2020," e-health and aging are highlighted as a particularly important area to develop, specifically "aging well with ICT." An important factor here is the so-called "silver economy," i.e., the new market opportunities that arise as a result of public and private spending in connection with the wishes, rights, needs, and requirements of the growing older population. In a report from the Technopolis Group and Oxford Economics this market is estimated to have the potential to expand by approximately 5 percent per year through 2025, at an estimated €5.7 trillion. The study experts also forecast the GDP contribution of the European silver economy to reach €6.4 trillion and 88 million jobs by 2025. This would be equivalent to 32 percent of EU GDP and 38 percent of the European Union's employment. In order to properly develop and design sustainable services and products, it is of utmost importance to have up-to-date and detailed knowledge of the users' needs, as well as how they use and perceive existing services.

Expectations are high. An increasing number of older people are expected to need service and healthcare from a shrinking proportion of employed people. A meaningful way to meet this development is by using new technology to create opportunities for preserved independence for the elderly, delaying the need for nursing care. Digitalization also provides new opportunities for participation based on individual needs, desires, and abilities. Digitization offers opportunities for increasingly individualized welfare services, leading in turn to better results for the invested efforts. The development

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of more and more personal services and transferring to network services is an opportunity for higher quality and equal care, but we need more research on how this should be done to fit the needs of older persons.

As mentioned before, the number of older adults in the population, as well as their proportion within the total population, is increasing in many parts of the world. In Europe, population aging has had and will continue to have major social and economic consequences. This is, of course, a fundamentally positive development where added lifespan is of great benefit for both the individual and the society. Active and healthy aging offers excellent opportunities both for individuals and for society as a whole. This increase in active years and aging in good health has the potential to allow individuals to work for more years but also travel, learn new things, and have active and meaningful spare time when reaching retirement age. Goods and services targeting the aging population will be of great importance.

Still, the risk for one to contract chronic diseases and disability increases with age. This may cause problems for an individual to live his/her life in the way that they desire. It also exerts pressure on health services and support systems for older people. The costs for care are rising sharply in most countries, and there are several incentives for changing our systems for health and social care. Because we will simply not have the finances nor the people to guarantee a good and healthy life for everyone, and especially not for the aging

population. But, on the upside, technological development gives fantastic new opportunities to build new systems, services, and products.

### INTRODUCING COMPUTERS AS HEALTHCARE PERSONNEL

Will "Skynet health" take over? Well yes. Well no. Well sort of. Even though computers and information systems are ubiquitous in healthcare today, and create support systems that we couldn't do without, we are not really there yet. We are not even close.

In a report from the Swedish National Board of Health and Welfare, it was noted although there has been much discussion and research on AI, so far, only a few applications are up and running in regular healthcare. A common area where AI is used today is patient monitoring and support at home. Still, one of the conclusions of the report is the quality of care can be improved with the help of AI. The National Board of Health also draws the picture of more knowledge-based and person-centered care, since AI can weigh medical data from different databases and make proposals for decisions based on the individual rather than on the basis of rules created at the population level. In the area of patient security, there is much to gain since AI performs its task "robustly," while human performance is more "varied."

So, no. Not today, and maybe not tomorrow. But the machines will take over more and more of the things we humans are typically not very good at, such as juggling a lot of facts without prejudice and optimizing decisions and diagnosis—and doing it fast.

And then, of course, we absolutely need to employ more engineers and computer specialists as professionals in healthcare and the welfare sector. But that is another story.

#### Biography

Peter Anderberg is an associate professor in applied health technology at Blekinge Institute of Technology Sweden. He is head of the Health Technology Research Lab. He leads several research projects in the area of health and technology with a particular interest in the development of technology and services for older people and how decision support with artificial intelligence and deep learning could be used. Please visit [healthtechnology.se](http://healthtechnology.se) for more information.

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