

**International collaboration**  
– Towards joint research activities in the strategic partnership



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International collaboration – Towards joint research activities in the strategic partnership

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## Internationalisation in HAMK and strategic partnerships

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Globalization is posing challenges for society, the world of work and higher education. At HAMK, internationalisation has been one of the main focus areas of development activities since the very beginning. Especially during recent years, we have also been launching new activities to meet the rapidly growing challenges.

### Visions

HAMK's Development Plan for Internationalisation 2015 states in its vision for international activities the following: "At HAMK, the international perspective is a natural part of all our activities and our environment is highly international with a tolerant atmosphere. The international partner network has a significant role both in education and research, and students and staff members participate actively in international networks. Internationalisation at HAMK has had a significant impact on the internationalisation of the region's enterprises and the community. There are several workable and effective ways of action in use. The strategic partners and other actors in the target areas experience and value HAMK UAS as a higher education institution and a partner." We also prepared a statement in which we ensure that all students during their studies will be involved in activities that develop their international competence. International RDI operations will be developed and strengthened in cooperation with partner higher education institutions and research centres as well as with the region's business and industry and regional developers.

The international aspect is one of the strategic elements of the HAMK Strategy 2020. Based on the strategy, we will be a solid part of the national and international higher education community. Forward-looking professional higher education is important for our region, whose standard of education, rate of internationalisation, growth rate of enterprises and R&D input are

still lower than the average level. We are responsible especially for educating young people and providing them with the capacity for a good life. This will be guaranteed by ensuring the development and vitality of the region. Degree programmes taught in English are linked to the internationalisation of the region. Student, teacher and researcher mobility in all fields of study is systematic and directly supports our operations. Four research units that support the workplace and education operate according to specific focus areas. The research units cooperate with strategic international partners. The operations of and project funding for the units have increased. We actively publish the results of our research work. Both the HAMK Strategy 2020 and the Development Plan for Internationalisation 2015 offer excellent guidelines and support for the development of international activities.

## Actions

In the old mind set, internationalisation only meant the mobility of students and staff rather than a situation wherein an international perspective is a part of all our activities and of our community being highly international – one in which our operating methods of education and RDI are more international. The focus has now been shifting. When discussing students, one challenge is the international competence needed in the world of work. It is clear that mobility is not possible or reasonable for everyone. The demand of international competence for all graduates has to be taken into consideration when developing education both in terms of content and methods. Internationalisation is also a fundamental part of many of the degree programmes in terms of professional growth.

HAMK plays a significant role in regional internationalisation, and the research and development projects promote internationalisation in a broader perspective. In addition to foreign partners, co-operation agreements regarding regional development include, for example, cities, municipalities, businesses and research institutions. There are a large number of different players involved in the joint research activities. The processes are demanding. International co-operation in research is quite a new focus area for international activities at universities of applied sciences, including HAMK. Participation in international research and development projects has been at a low level and has depended on a few key participants.

One of the main challenges when developing research activities has been funding. The Ministry of Education and Culture recently published a report by an international panel, “Towards a future proof system for higher education and research in Finland” (Publications of the Ministry on Education and Culture, Finland 2015:11). One of the recommendations was that universities of applied sciences should be just as eligible to conduct research and apply for research funding as other universities. HEIs that show insufficient scientific quality cannot continue to operate as before. One of the recommendations of the panel stated that the quality of both teaching and research should

be the emphasis of the UAS rather than their regional role. There is still a strong regional role for them to play, but the UAS are first and foremost knowledge-producing organisations and it is as strong knowledge producing organisations that they can play a better regional role in the future.

## Partners

At HAMK, the international partner network has a significant role both in education and research. International networks were actively created at the beginning of operations in particular. Excellent personal international relationships created through mobility at the early stages of internationalisation have promoted the internationalisation of the whole community. Now we are discussing much more often the main reasoning of the partners and meaningful mobility by staff members. Collaboration with international partners is for us one way to enhance the quality of our organization; lecturers and researchers improve both education and research in international networks. Through all of the joint activities with our partners we have a greater capacity to develop our community. There are also situations where we need a partner with specific know-how.

Several years ago we identified a need for deeper collaboration with partners and started a strategic partnership process. During the initial phase in 2010, we wanted to identify partners whose profile was in line with the HAMK Strategy and the HAMK International Strategy at that time. We conducted an evaluation process of the partners with respect to the degree programmes. In this bottom-up approach, we identified several key partners and started strategic partnership process discussions with those whose profile best fit our own.

It was a rewarding experience to rather easily develop joint criteria for the strategic partnership. A commitment to collaboration, mutual trust and respect at both the personal and university level, and a willingness to deepen and extend the partnership seemed to lay a solid foundation for the partnership. We agreed to identify the strategic areas in which the partner universities have particular strengths. Our partners will benefit from those strengths, making the universities stronger in the long run, and the partnership will create synergy in the common education and research areas. Extending the cooperation to include more fields of education was also believed to be essential for developing education processes (programmes, pedagogical development). One aim was to increase the mobility of students, teachers and the administrative staff. Joint research and development activities in shared focus areas and a shared expertise in regional development were also important aims of future collaboration efforts.

The first strategic partner seminar was held at HAMK on 21 – 23 September 2011. In this seminar, we discussed further forming strategic partnerships and strategic partnership agreements were signed with Feevale University,

VIA University College (Denmark) and Jiangxi Science & Technology Normal University (China). Annual strategic partnership seminars proved to be good way to enhance the collaboration.

In the second strategic partnership seminar at Jiangxi Science & Technology Normal University between 20 November and 1 December 2012, the topics were as follows: forming a university plan or vision for international education cooperation; the positive routes for and impediments to further deepening cooperation between the strategic partners; modes of cooperation between applied universities and enterprises in the current international environment; and teaching in applied universities. Every partner gave their own presentation on each topic, which broadened the overall knowledge and understanding of the members. The visit also offered the partners an opportunity to become familiar with Jiangxi Science & Technology Normal University. The various faculties introduced their activities both in education and research. As a result of this seminar, HAMK started discussions with Jiangxi Science & Technology Normal University to widen bilateral collaboration within several fields of education.

The third strategic partner seminar took place at Feevale University on 22 – 24 May 2013. The theme was International Education Cooperation: Quality Management and Regional Impact. The topics were quality and quality assurance in higher education policy (with examples from each country); quality management in the strategies for of higher education Institutions (with examples from each partner institution); regional impact programmes offered to the community and their impacts; managing regional networks and perspectives on international cooperation – ideas for optimising cooperation modes. Unfortunately, Jiangxi Science & Technology Normal University did not participate in the seminar. In this seminar, we decided with Feevale University and VIA University College to foster joint research activities in particular.

The fourth seminar closed the circle. It took place at VIA University College on 19 – 21 May 2014. The topics included the innovative learning environment – how to make it a part of daily teaching; the innovative learning environment – how to include the local business sector in the process; entrepreneurship – why is it an important part of our student’s education and how do we make it a part of our teaching. Discussions on these topics stimulated ideas on the need to arrange joint virtual courses. ”Work around the sun” is a learning process where students work in a joint entrepreneurial project. The other subject will be ”Energy efficient housing”.



## Joint research activities

The participants felt that the idea of joint research activities discussed at Feevale University in 2013 was important and the willingness to move forward in this capacity was strong at HAMK. The first draft for collaboration in research was written on 31 May 2013; the statement identified the joint fields of interest. We decided to have joint research groups and organise an annual workshop in applied research for digitalisation, bioeconomy and environmental issues. Every university named representatives to a coordination group and theme groups. The HAMK theme group visited both VIA University College and Feevale University to plan the process further.

At that time, HAMK was renewing the strategy discussed earlier. Four research units were established: Bioeconomy, Professional Expertise, a Sheet Metal Centre and Smart Services to “function in important research projects with our international strategic partners”. This decision has positively affected the research process at HAMK. Recognition of, a commitment to and participation in collaboration efforts have been obvious at all levels. The key focus theme groups have been formed and they started their work in autumn 2014. One of the ideas is that more experienced researchers will guide the inexperienced staff members and students. The first research seminar for the strategic partner network “Applied Research Seminar on digitalisation, wellbeing and bio-economy” took place in Hämeenlinna, Finland on October 27–29 2014. During the seminar, workshops were also organised, with the topics being successful ageing, water & energy, big data analysis and digitalization and the change of leadership in organizations. The results of this process will be seen in a few years’ time.

Internationality is realised in human relations. At the organisational level, the top management sets the aims for operations based on the strategy. But a commitment to participation is also important. At the operational level, bold and active team players are needed especially when challenging old mind sets and creating something new. Our leadership and operating culture is strongly supportive of these processes and the staff members involved in the activities. This makes it possible to move towards our aims together with our partners.

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# Researching Professional Excellence Regionally, Nationally and Globally – The Research Unit for Professional Excellence

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## The Research Unit for Professional Excellence

The mission statement of the Research Unit for Professional Excellence is to acquire new, practice-based and applicable knowledge of professional excellence, competitiveness and welfare. This is accomplished through research, development and experimentation the new educational culture in vocational education and training (VET) within the world of work – regionally, nationally and globally.

The research interest areas of the unit are as follows:

- Professional excellence and future career skills
- World of work and knowledge management
- Digital learning environments and learning solutions
- Higher education and competence development
- Guidance, counselling and special educational needs
- Global education and international collaboration

VET plays an important role in providing professionals with the necessary competitive skills that match labour market needs. Accordingly, the current challenge for VET is to integrate learning by doing and authentic problem-solving into working practices and to resolve the challenges pertaining to digitalised working environments.

The Research Unit for Professional Excellence produces customer-oriented and demand-driven research, development and evaluation for finding new knowledge and applicable solutions for the challenges of the world of work and educators. The principal goal is to strengthen the competitiveness of the current educational system, which is needed to maintain a globally competitive region.

The research unit is interested in the process of learning in different organisations, and in multidisciplinary co-operation. According to the latest research (see e.g. Davies, Fidler & Gorbis 2011), there is a need to strengthen an entrepreneurial attitude, accelerate learning innovations and train future working skills in the labor market, higher education and at the vocational upper secondary level.

An advanced digital learning environments serves as a precondition for educational and social innovations in Finland, and creates new business opportunities for companies with respect to new digitalised services, for example in health care and wellbeing. Furthermore, The Research Unit for Professional Excellence offers, with the co-operation of other HAMK research units, an open platform for the culture of experimentation and joint research and development of digitalization.

Research should operate in networks with open discussion among the international research society. Therefore, the research unit is networking internationally with new universities and companies. Countries in Europe, Africa and Asia have provided new opening and co-operation with HAMK's strategic partners in Denmark and Brazil continues as well.

## The 21st Century so far

The Research Unit for Professional Excellence was established in 2014 in the School of Professional Teacher Education. In principal, research and development have been important instruments in deploying HAMK's strategy in the School of Professional Teacher Education and other degree programmes for decades. The students are encouraged in new knowledge acquisition, inquiry learning and developing research-based innovations in their studies. For example teacher students observe their own authentic learning and working environments and plan new methods, tools and practices for their future working.

The School of Professional Teacher Education has published regularly on regional and national research and development projects since the beginning of this century. The main source of project funding has come from ministries, European Union programmes and regional funds. The research interest areas have been VET teachers' and counselors' training, digital learning, special educational needs and on-the-job training.

In addition, The National Skills Academy for Skills Excellence, formerly Skills Trainers' Academy, offers new knowledge about VET in the School of Professional Teacher Education. The National Skills Academy researches vocational skills and talent development as well as offering coaching, sparring and support for the skills competition organisations. It is funded by the Ministry of Education and Culture and it is connected to Skills Finland and World Skills Organizations.

During the last few years, the research, development and innovation processes have become increasingly international. The research projects funded by the European Union have produced new knowledge especially about on-the-job training, entrepreneurship and digital learning. Also, there have been several international projects focusing on education, welfare and sustainability in developing countries, for example in Nepal, Vietnam and South Sudan.

Cooperation between companies and businesses is a strengthening trend in the research unit's initiatives. The latest plans include research of knowledge management, digital learning solutions and teamwork in a business context.

### **The International Activities of Global Education R&D**

The HAMK Global Education team in the School of Professional Teacher Education has made considerable progress in the past few years in the field of international continuing education services. Recently, the School of Professional Teacher Education has established the Global Education R&D research group as a strategy for applying research-based knowledge in ongoing educational service design. Research-based development is a crucial method in developing influential training services for highly competitive and rapidly growing global training markets. The trusted educational brand demands constant new ways of acquiring knowledge, quality assessment and open dialoguing with customers and collaborators.

The increased activity in international research is partly credited to the successful implementation of continuing teacher education programmes for international markets. The main aim of education is to enhance the teachers' abilities to become pedagogical leaders and to help them transfer high-quality pedagogical methods, leadership models and development ideas to the context of their home countries. The continuing education programmes last for three to ten (3 – 10) months and the participants stay in Finland for a considerable length of time. Hence, these programmes form a living laboratory and test platform for research on pedagogy, educational innovations, technologies and future training services.

The programme participants act as developers of education and experts on several specific subject fields (e.g. ICT, renewable energies, agriculture, STEM studies, biology, healthcare), and many of them are doctors with a great deal of experience in research and publishing. Consequently, the training

programmes serve also as international research communities. The joint research interests arise from educational implementations and continuous dialoguing between HAMK professionals and programme participants. The goal of the Global Education R&D team is to publish ten to fifteen (10–15) articles per year and extend the research community to include external sponsors and international scientific networks.

### Examples of ongoing activities

In recent months, the School of Professional Teacher Education has hosted study groups from Kazakhstan and Brazil. With the VET Teachers for the Future programme, a group of Brazilian teachers are conducting research in Finland as part of their ten-month (10) journey in professional development in 2014–2015. There are thirty-one (31) teachers currently studying in the programme and a new cohort of students is currently being chosen. The Brazilian experts are intrigued by the current pedagogical approaches, the pedagogical use of technologies and models for cooperating with businesses. Several new research initiatives regarding pedagogical innovations, ICT in societal changes and narratives of participation in educational reform derive from the Brazilian study group. The first research results will soon be published in conference publications stemming from the Nordic Latin American Research Conference in Helsinki and Educational Media and Technology Conference in Ottawa.

In July 2014, twenty-one (21) upper secondary teachers from Kazakhstan completed their nine-month (9) internship programme in the School of Professional Teacher Education. Their training consisted of language studies, which included content and language integrated learning (CLIL) and pedagogy tailored to their needs in light of Kazakhstan's massive educational reform. The key principle presented in the training was the transformation and paradigm shift from a teacher-centred to a learner-centred approach. As a result of the training, a new educational culture has been widely disseminated since many of the participants have been promoted to principles or vice-principles in their schools. The research co-operation continues with the Kazakhs and the positive impacts of the training will soon be published and discussed further.

### Conclusions for the future

The new research unit has already established several new research projects and produced its first publications. The collaborative process in research networks has been reviewed, further developed and directed to the strategic research themes. One of the current targets is to acquire external funding for new RD&I projects with international partners and networks. Future research will include, e.g. comparative and development-oriented applied research in research interests related to VET and managing educational change.

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## Bioeconomy offers multidisciplinary solutions based on local resources

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The increase in and aging of the human population, climate change and the unsustainable exploitation of natural resources and the irreversible loss of biodiversity all combine to make the world we live today quite unstable. The bioeconomy, however, provides an answer, one for which there is no other option: a mandatory change must be realized.

Bioeconomy aims to replace processes that utilise fossil fuels with bio-based alternatives. According to the EU's Bioeconomy Strategy (2012), bioeconomy encompasses the production of renewable biological resources and the conversion of these resources and waste streams into value-added products: food, feed, bio-based products and bioenergy. The change is systematic throughout all society: it engages actors from research and education, industry and public administration as well as all of the inhabitants of a particular region. Bioeconomy is part of an economically sustainable circular economy, where sustainable production and the use of natural resources meet with technology, entrepreneurship and socially sustainable community.

The natural resources of a given region set the ecological borders for green growth in bioeconomy. Depending on the available resources in a particular region, bioeconomy can be divided into different sectors (Figure 1).

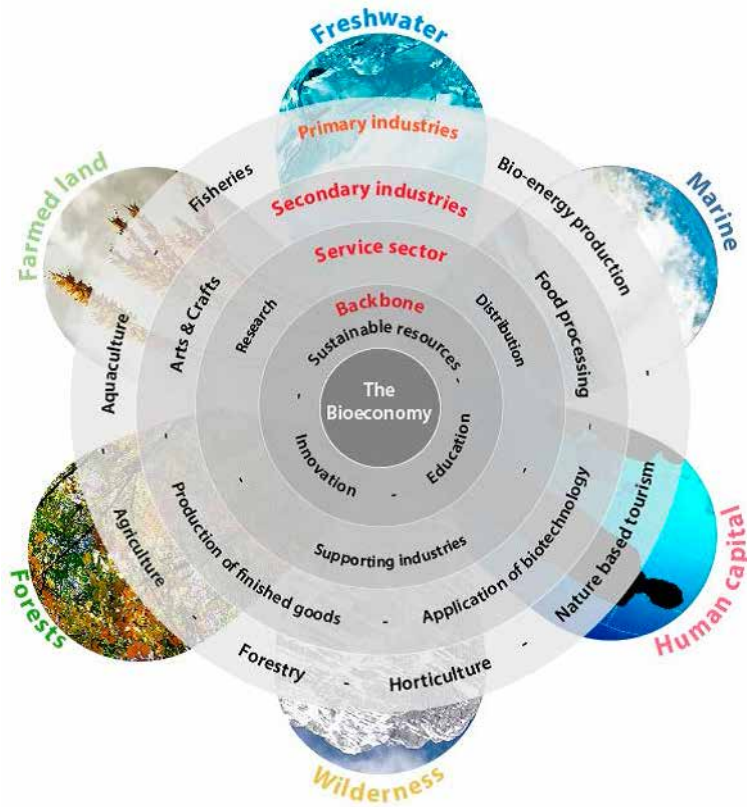


FIGURE 1. An overview of the bioeconomy model proposed by Matis and the Environment Agency of Iceland (Smáradóttir et al. 2014).

In Finland and Sweden bioeconomy is often referred as green bioeconomy, where the biomass for different biorefineries comes from the extensive forests. Skilled forest management in Scandinavia ensures a continuous supply of biomass despite the fact that the two countries are harvesting more wood than ever before. According Finnish forest inventory results for Finland (Luke 2015), the growth and production of forests in Scandinavia occurring at a greater rate than has been recorded at any time in the past hundred years.

The inhabitants of a particular region are the ones who are key to the success of a bioeconomy. Green Growth is dependent upon human resources and human actions. In rural areas, the bioeconomy is bound up with longstanding traditions: it is the primary means of production from forests, fields, lakes and the sea. The opportunity for green economic growth comes from finding additional value for primary production. This can only be achieved via co-operation between different actors involved in the whole value chain of production.

The central part of Figure 1 shows that sustainable resources, education and innovations are the main drivers of change. However, in order for change to happen it must also be economically sustainable. From primary production thorough the side stream of production all the way to the highest value product, value must be added to the product to ensure the economic feasibility of a particular action.

Bioeconomy is often discussed in the context of promoting entrepreneurship and co-operation in rural areas, but actually bioeconomy is also a matter of concern for people living in urban areas. An increasing number of people are living in cities: having access to locally produced food and energy is in part the result of individual choices, but it also depends on local administration and politics – e.g. sustainable urban planning and rural-urban cross sectorial living and business environments. Often rural areas are seen as the areas of primary production, whereas urban areas are for end-users and/or places to upgrade products. However, as discussed earlier, bioeconomy relies on local resources. The raw material for biorefineries can just as easily consist of side streams from forestry and agriculture or from industry and municipalities. A common goal in both environments, in all actions related to bioeconomy in fact, is to minimise waste and maximise value.

At Häme University of Applied Sciences, the Bioeconomy Research Unit has two main focuses:

1. the sustainable use of natural resources and primary production; and
2. co-operational development of both rural and urban areas.

The sustainable use of natural resources and sustainable primary production deal with questions related to the efficient use of resources (land, nutrients, water and energy) in primary production. Management of side-streams and closed circles of production are studied and applied at the farm and village scale, sometimes in larger clusters; such clusters are needed to optimise the circulation of resources.

The co-operational development of rural and urban areas deals with, for example, decentralised energy production and supply, local food production and logistics, and sustainable urban planning. The cleantech solution for water and energy management in both rural and urban environments enhances the sustainable development of the areas. When rural and urban planning are considered in the same framework, the scope of bioeconomy becomes broader. Especially in built environments, the need to engage society in the decision-making process is crucial. Previous ecological and economic borders were discussed as markers for green growth in bioeconomy. Two additional variables can be added to the picture: social and cultural sustainability (Figure 2).

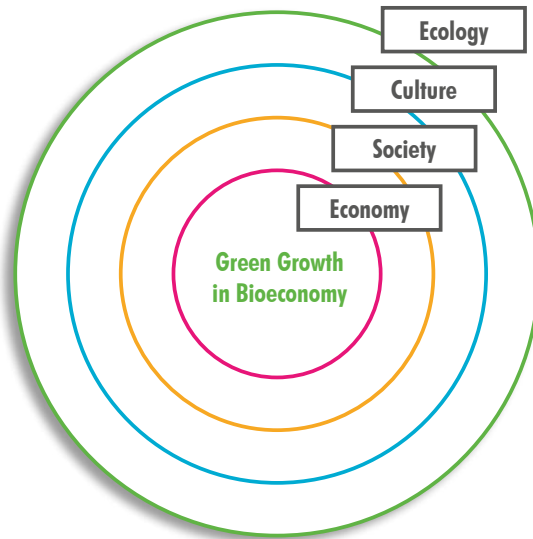


FIGURE 2. Circles of sustainability that establish the framework for green growth in bioeconomy.

McCormick and Kautto (2014) have discussed the distributed model in the case of bioeconomy. They introduced the term “glocal” to describe bioeconomy. Whereas problem setting and the visions related to bioeconomy are global, the answers and actions must come from local processes. This restraint stems already from logistics: biomass cannot be easily or cheaply transferred across long distances. Luoma et al. (2014) stress in their model for distributed bioeconomy that sustainable bioeconomy needs many interconnected local production units, which are integrated with each other via a value chain, to ensure the full utilisation of residues and wastes in different processes. This differs regionally. Sustainable bioeconomy is developed by taking into account each region’s natural, economic and human resources. As a rule, copy pasting cannot be used with respect to the bioeconomy.

The human resources needed for green growth in bioeconomy are distributed in the same manner as biomass resources. To fully optimise the added value of production chains, minimise waste, maximise value and achieve the highest possible sustainability at all levels, a multidisciplinary and cross-sectorial approach is needed in research and in applications (Pfau et al. 2014).

Research collaboration between the strategic partners in the university network can make a strong contribution to bioeconomy research in all three countries: Brazil, Denmark and Finland. The locality of bioeconomy gives different perspectives on green growth, and the differences in the competences of the partner universities ensure that bioeconomy research will have added value and that all levels of sustainable development will be taken into account (Figure 2).

Research collaboration in bioprocesses and the sustainable use of distributed energy is set to begin. When it comes to bioeconomy, a diverse education and knowledge about research collaboration are obligatory prerequisites.

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## Microbiological Contamination of Environmental Matrices in Southern Brazil

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Waterborne diseases, especially diarrhea and hepatitis, are a major threat to public health worldwide (Dey et al. 2011; Ford 2006; Vizzi et al. 2011). The World Health Organization (WHO) claims poor sanitation may be related to 80% of all hospital admissions in developing nations. A lack of proper sanitation is still associated with poverty affecting mostly low-income populations (Dey et al. 2011). Diseases related to water and sewage system deficiencies with inadequate hygiene account for the deaths of nearly 2 million children per year due to diarrhea and other waterborne illnesses, with a higher prevalence in low-income countries (Ford 2006).

Viruses are most frequently found as etiological agents in gastroenteric diseases. More than 100 different types of viruses can be found in human faeces, and these viruses are potentially transmitted by water (Okoh, Sibanda, & Gusha 2010). It is known that enteric viruses, including the norovirus and rotavirus, adenoviruses and hepatitis A and E viruses, are excreted from the gastrointestinal tract of infected individuals, being eliminated through faeces in large quantities (up to 10<sup>11</sup>/g of faeces) (Ahmed et al. 2014). These microorganisms are highly resistant in the environment (Ford 2006). The techniques and regulations currently being applied to monitor water safety do not successfully diagnose the presence of these viral agents in water and irrigated vegetables. Since thermotolerant coliforms are not reliable indicators of viral contamination, further efforts are needed to develop cost-effective techniques for detecting these viruses in water and soil (Staggemeier et al. 2015). On the other hand, the conventional water treatment used for the production of drinking water has no satisfactory efficacy for disinfecting it of such non-enveloped viruses (Okoh et al. 2010; Vecchia et al. 2012). Thus, another major goal is to characterise the quality of water bodies used in water intended for public consumption.

Water companies typically do not monitor viral particles due to the difficulty and complexity of the procedures needed to accomplish this task. However,

a wide range of viruses responsible for various diseases, such as acute gastroenteritis and hepatitis, have been detected in different matrices of aquatic studies in many countries, including Brazil (Kluge et al. 2014; Victoria et al. 2010; Vieira et al. 2012).

Our research group has conducted a number of studies on the presence of these viral agents in water from the rural and urban areas of southern Brazil. We have noted that the occurrence of these viruses is widespread throughout our geographic region of study.

Porto Alegre is the largest city in southern Brazil with a population of 1.5 million inhabitants. The urban area is cut in two by a canalised stream named Arroio Diluvio, which receives untreated sewage from approximately 500,000 people. In a study conducted in 2009 (Vecchia et al. 2012), different enteric viruses were detected, including enteroviruses (EV, 64.28%), followed by the Torque Teno virus (TTV, 28.57%) and adenoviruses (HAdV, 21.43%), after three samples taken in January, April and September. Rotaviruses (RV) were not reported. More than one kind of tested virus was detected in five (35.71%) of the 14 samples. This was the first description of viral genomes in water samples taken from the city of Porto Alegre (Brazil). At the same time, we searched for the same viral agents in samples of raw and treated wastewater from the main sewage treatment plant in the city (Vecchia et al. 2012). In raw sewage, we detected HAdV (25%) and RV (28.6%) genomes. Analysis of the effluent samples revealed the presence of HAdV (50%), EV (37.5%) and TTV (12.5%). In all of the samples, regardless of the month in which they were analysed, we detected at least one virus genus. It is clear that improvements in sewage monitoring and treatment processes are necessary in order to reduce the spread of viral agents into the environment in Porto Alegre. The same situation has also been reported for other Brazilian cities (Victoria et al. 2010; Vieira et al. 2012).

In another study, we looked for HAdV, EV and RV in tap water samples collected from schools located in six municipalities in the state of Rio Grande do Sul, in southern Brazil (Kluge et al. 2014). Seventy-three (73) schools were included in the study. We detected higher rates of EV (27.4%), followed by HAdV (23.3%) and RV (16.4%). Our major concern is that the tap water samples were from the kitchens of the schools.

We have also conducted similar studies in rural areas. We conducted one study in the municipality of Taquara, in landscapes that are highly representative of the dairy farms in southern Brazil: the farms are small, with high animal densities per grazing area, the management of manure is poor and the sanitation for human excreta is also deficient. We took water samples from 27 collection sites in 10 dairy farms. We collected two of the samples after wet and dry weather conditions (De Oliveira et al. 2012). After 18 consecutive days of rain prior to the first sampling, six (22.2%) samples gave positive results for HAdV and only one sample was positive for RV. For the second sampling, which was done during dry conditions, four (16%) of the samples



were positive for HAdV whereas ten (40%) samples gave positive results for RV. EV was found at lower rates (9.6%). We found that faecal contamination of water bodies is widespread on these farms and may be influenced by the weather conditions (De Oliveira et al. 2012). In a second study conducted at dairy farms in the neighbouring municipalities of Riozinho and Rolante, we detected HAdV in 87.3% of water samples, followed by Avian AdV (27.3%), Canine AdV (20%), Bovine AdV (7.3%) and Porcine AdV or EV (1.8%) (Staggemeier et al. 2015). Most viral particles in water samples are non-infectious, which we concluded after conducting cell passages. We detected infectious HAdV in four samples (8.8%). On the other hand, it is significant that five sediment samples (25%) gave positive results for the presence of infectious viral particles (Staggemeier et al. 2015).

In a recent study, both urban and rural areas in the Rio dos Sinos watershed (in southern Brazil) were monitored in cooperation with the state water company as part of a larger study. We evaluated the occurrence of EV and HAdV in water samples and their relation to different physical-chemical and bacteriological parameters (CT, total coliforms and faecal coliforms (CF) represented by *Escherichia coli*). Samples of 500 mL of raw water were collected monthly, from May 2011 to June 2013, from eight water treatment stations along three stretches of the Sinos River Basin (SRB), in southern Brazil (Dalla Vecchia et al. 2015). Initially, we applied the samples to the virus concentration method and viral DNA/RNA extraction. Subsequently, we analysed the products using real-time polymerase chain reaction (qPCR). The results were negative for EV, and they revealed the presence of AdVs from different species, human (HAdV), canine (CAV1 – 2), bovine (BAdV), porcine (PAdV) and avian (AvAdV), along the three stretches of the basin, indicating faecal contamination from different sources and proving the inefficiency of the wastewater treatment measures for water in the SRB. Statistical analyses revealed no significant correlations between the concentrations of TC and FC and the concentrations of AdVs. We observed a small, non-constant and unstable correlation between viruses and physicochemical parameters. These correlations were not sufficiently consistent to establish a reliable association; therefore, this study corroborates previous findings that only the viral assay itself is reliable for diagnosing faecal contamination by viruses in environmental samples (Dalla Vecchia et al. 2015).

These studies are good examples of research activities that could be duplicated for monitoring viruses in Finnish water bodies. Likewise, researchers and students from Finland are welcome to contribute to and participate in further studies in Brazil.

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## The Smart Services Research Unit supports industry, commerce and society in digitalization and service development needs

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The task of the research unit is to create and execute, together with a cooperation network, well-addressed R&D activities for the region and its enterprises. The Smart Services Research Unit supports the utilisation of digital technologies and service business development across sectors: similar solutions can be adapted in various lines of business.

The research unit supports business development for the region's public and private sector partners. It operates in the following lines of business:

- Wellbeing solutions and services
- Flexible logistics and smart traffic
- Smart buildings, home and the environment
- Environmental business and services (cleantech)
- Industry digitalization and lifecycle services
- New working environment and lifelong learning.

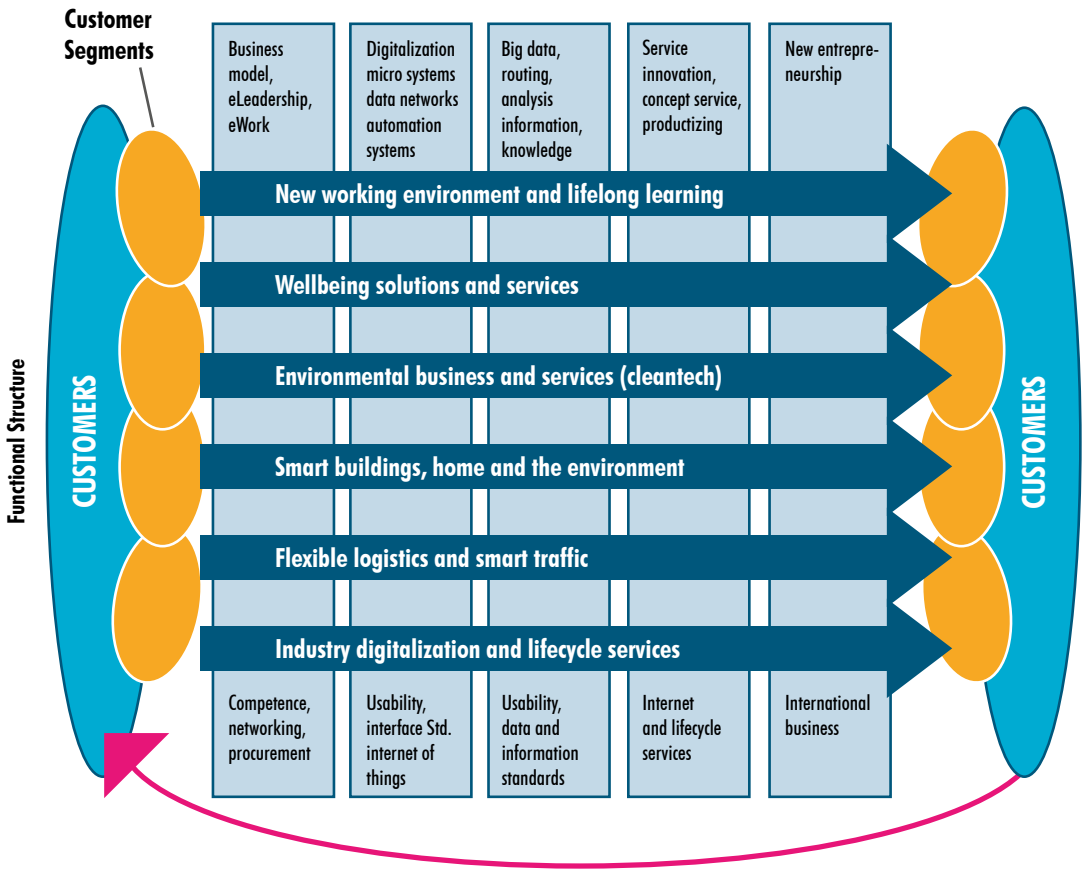


FIGURE 1. Smart services, research unit

The research unit aims to serve the region's industrial and commercial strategy. The overall objective is to increase the competitiveness of the whole region.

The Smart Services Research Unit acts in the following capacities:

- It serves as a dynamic environment for applied research, development and innovation services supporting transformations in business enterprises, wellbeing organizations and everyday life as digitalization increases and service systems are further developed.
- It also supports new a digital work environment and lifelong education.
- It generates knowledge and expertise in the field of digitalization and services.

- It supports customers via knowledge transfer, examination methods, research and development activities, and testing.

It supports transformations in business enterprises, wellbeing organisations and everyday life as digitalization increases and service systems are further developed.

The Smart Services Research Unit includes the following research groups:

- Flexible Logistics and Smart Traffic
- Multisensing and Supporting Technology
- Everyday Services and Digitalization
- SME Companies and Digitalization
- Industrial Digitalization and Life Cycle Services
- Customer Value Creation and Proposition in Digitalized Service Business
- Sustainable Development, Energy and Services
- Intelligence and Smart Service Concept Development.

These research groups interact with one another in order to address complex phenomena and search for solutions in a multidisciplinary way.

The article “Successful Aging and Digital Services” is an example of successful co-operation on strategic research between HAMK’s Smart Services Research Unit and the University of Feevale.





## Successful aging and digital services

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### Introduction

Demographic changes and the rapid aging of people are occurring throughout the world. Elderly citizens are healthier and live longer than in the past. They need new kinds of services for independent living at home. As they age, they tend to become more interested in maintaining good health or in managing a chronic condition. The new kinds of services that they need and want to use must be interesting, easy to use, flexible, accessible and cost-effective.

Elderly persons try to find strategies to cope with the changes and difficulties that arise in relation to aging. Client-orientation and customer perspective are important points of view when developing digital services for the elderly. We have to understand the elderly from different perspectives, understand the needs of the elderly as a social group, a group that is heterogeneous and diverse in their interests, education, health or socioeconomic level, in their own environment. It is very important to support elderly people living at home in many different ways and via different kinds of services (Gonzales et al. 2012).

Many researchers define seniors as people who are at least 65 years old. The health condition and life context differ significantly among individual persons between the ages of 65 and 80. The terms seniors, older adults and the elderly are used interchangeably. The health situation of 65–80 year old citizens influences their need for services. When people are healthy and in good condition, they need different services than patients with certain chronic diseases, for example dementia and Alzheimer's disease. The new group of consumers are healthy people between the ages of 65 and 80 who want to travel, who engage in recreational activities and hobbies, and who also want and need digital services. They have high-quality computers, smartphones, cars, etc., and it is possible for them to pay for the services.

## The successful aging concept

Successful aging is an important concept in gerontological literature. Many researchers have tried to define this concept. It has been defined, for example, as the process of aging throughout a person's lifespan or as vital aging or active aging. Moody (2005) has defined successful aging as “key ideas such as life satisfaction, longevity, freedom from disability, mastery and growth, active engagement with life and independence.” (Martin et al. 2012)

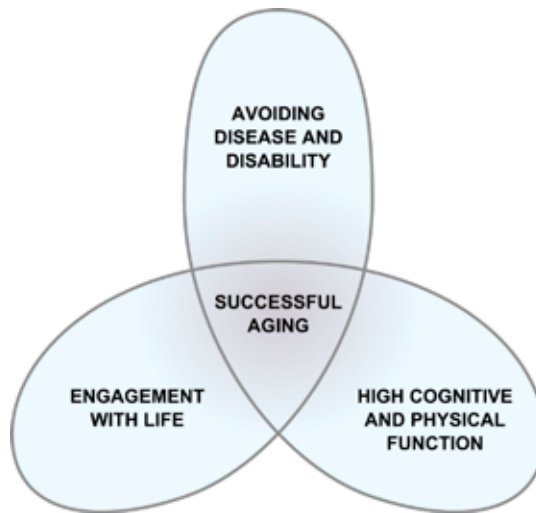


FIGURE 1 The concept of successful aging (Rowe & Kahn 1997).

Rowe and Kahn (1997) have determined that successful aging includes three main components: low probability of disease and disease-related disability, high cognitive and physical functional capacity, and active engagement with life (Figure 1). Successful aging is about more than the absence of disease and about more than just maintaining functional capacities. Both are important components of successful aging, but it is their combination with an active engagement with life that represents the concept of successful aging most fully. Peterson and Martin (2014) have conducted a linguistic analysis of the term success. The term success is often used in the context of war, religion and medicine. It can have a neutral or negative connotation. This analysis helps gerontologists understand the meaning of successful aging (The Gerontologist 2015).

Successful aging was defined for the first time in 1961 by Robert Havinghurst. He created a theory of successful aging. He envisioned his theory as

*“a statement of the conditions of individual and social life under which the individual person gets a maximum of satisfaction and happiness and society maintains an appropriate balance among satisfactions for the various groups which make it up—old, middle aged, and young, men and women, etc...”*

Havinghurst proposed two different themes for successful aging: activity theory and disengagement theory. According to activity theory, successful aging means maintaining middle-aged activities and attitudes into later life. This theory was quite popular among researchers. Disengagement theory indicates that a person who is aging successfully wants, over time, to disengage from active life. People have tried to provide an operational definition of successful aging and a method for measuring successful aging (Martin et al. 2012; The Gerontologist 2015).

Havinghurst (1961) operationalised the concept of successful aging in the following way:

1. a way of life that is socially desirable for this age group;
2. maintaining the activities of middle age;
3. a feeling of satisfaction with one's present status and activities;
4. a feeling of happiness and satisfaction with one's life. He and his colleagues consequently analysed a person's life satisfaction with his or her present and prior life and developed the Life Satisfaction Index based on five components:
  1. zest vs. apathy
  2. resolution and fortitude
  3. goodness of fit between desired and achieved goals
  4. positive self-concept
  5. mood tone(Martin et al. 2012).

Later, Neugartner (1972) suggested that personality is an important component of the aging process. A person's coping style, prior ability to adapt and life expectations as well as her or his income, health, level of social integration, freedom and relative constraints with respect to the human personality all impact the aging process. MacArthur published three criteria for successful aging: freedom from disease and disability, a high level of cognitive and physical functioning, and social and productive engagement. In MacArthur's study, 1000 older adults who met the criteria were followed over a period of seven years.

Many other researchers have also defined the concept of successful aging. Baltes and Baltes (1990) define it as “selective optimization with compensation”. This means that successful, individual development (including aging) is a process made up of three components: selection, optimisation and compensation. In the same year (1990), Fries wrote about successful aging as follows: it “consists of optimizing life expectancy while at the same time minimizing physical, psychological and social morbidity overwhelming concentrated in the final years of life”. For their part, Depp and Jeste (2006) define successful aging as consisting of disability/physical function, cognitive functioning, life satisfaction/wellbeing, social/productive engagement, the presence of illness, longevity, self-rated health, personality, environment/finances and self-rated successful aging. (Martin et Al. 2012; *The Gerontologist* 2015.) Kahan and Kahana (1996, 2003) define it as consisting of social and psychological resources, preventive and corrective adaptations, psychological components and existential and social well-being. Likewise, Phelan and Larsson define successful aging as freedom from disability, independent functioning, life satisfaction, active engagement with life, longevity, positive adaptation and mastery/ growth. Rowe and Kahn define successful aging in the following way: low probability of disease and disease-related disability; high cognitive and physical functional capacity; and active engagement with life. (Rowe & Kahn 1997; *The Gerontologist* 2015.)

In recent decades, a number of additional studies have addressed the concept of successful aging (*The Gerontologist* 2015). A 2014 study by Cho, Martin and Poon yielded some interesting insights: 1) physical health and social resources have direct effects on the positive aspects of subjective well-being, 2) cognitive functioning and education have indirect effects on positive well-being, 3) social resources mediate the relationship between cognitive functioning and positive well-being, 4) cognitive functioning and social resources mediate the relationship between education and positive well-being, 5) physical health mediates the relationship between cognitive functioning and positive well-being, and 6) cognitive functioning and physical health mediate the relationship between education and positive well-being. In Europe as well as in the United states, the idea of active aging has been the most common way to think about successful aging. In the future, the term successful aging will become a more multidimensional concept than it is today. For now, we can see much about successful aging in magazines and on internet pages. In the future, experts want to develop more effective ways to promote people aging successfully (*The Gerontologist* 2015)

Hörder et al. (2013) interviewed 24 old people (between the ages of 77 and 90) using open-ended questions. They analysed the interviews using qualitative content analysis. The elderly people in the study defined successful aging as “self-respect through ability to keep fear of frailty at a distance”. This embraced the content of four categories: “having sufficient bodily resources for security and opportunities”, “structures that promote security and opportunities”, “feeling valuable in relation to the outside world”, and “choosing gratitude instead of worries”. In the study, ageing seemed to be a dynamic pro-

cess rather than a static structure. Paying attention to attitudes and treating older person with respect, particularly with regard to their worries about increasing vulnerability, can lead to better ways of promoting successful ageing. Dignity is important for people throughout their lives (Nicholson et al. 2012).

## Digitalisation in elderly services

A number of studies highlight ways to exploit ICT solutions for supporting older people in their desire to live at home. These solutions focus on telehealth and telecare applications at home. The care technology for home health care, health promotion, monitoring and measuring health, home automation and robotics has been considered and developed quite extensively in recent years. In Europe, services are continuously being created to support the elderly and their families in maintaining a high quality life at home (Tejima 2001; Magnusson et Al. 2004; Nasmith & Parkinson 2008; Ali et al. 2012; Gonzales 2012; Svensson & Eriksson 2012.)

In a 2013 literature review, Hallows addressed the question of whether or not the internet has had an impact on the health information literacy of online seniors since its acceptance as a mainstream source of health information. At the beginning of the 21st century, there were more than 70,000 websites provided health information and more than 50 million people were browsing them online. The literary review was limited to English-speaking countries. Considerable research on the information-seeking behaviour of older populations has been done in various parts of the world, including the United States, Germany, Finland and Austria.

The results indicate that being trained in how to use the internet is effective for the elderly. The number of elderly people using the internet has increased since the year 2000. The attitudes of the elderly have become more positive to the internet as well. A combination of knowledge about computers and sufficient cognitive abilities is required for successful information seeking. Very old people (at least 85 years of age) may be impeded by a relatively rapid decline in their cognitive abilities and they may have difficulties, for example, in turning on the computer. People with Alzheimer's disease and related forms of dementia may lose their ability to type, which precludes the use of a computer regardless of the availability of internet access. Hallows (2014) provided three reasons for supporting the oldest group of people: "the oldest old are the fastest growing segment among older people", "there is a lack of information behavior research involving this specific age group" and "evidence suggests that age may be more of a factor for this age group than for the younger aged". Hallows concluded that the internet has had a positive impact on the health information acquired by some seniors, but not by all seniors.

In the studies on technological solutions for living at home, the most important issues were safety and independence. In home care, we can exploit many technological solutions for caring clients. Learning and using new techno-

logies is seen as a demand for older people to be integrated into society and as a factor related to active aging (Kenttå et al. 2007.). Gonzales et al. (2012) found a positive correlation between participation and a positive attitude toward ICT and elderly people having confidence in their ability to learn and in their general self-confidence. In their study, elderly people said that they enrolled in different activities to learn and to keep their minds active, and they thought of training as a means of social participation and lifelong learning.

We have many kinds of technical solutions for helping elderly people in their everyday lives. In Italy, Spinsante and Gambi (2012) investigated a system based on wireless medical devices and interactive television as a form of communication media between the client and a health care monitoring centre. The system can be adapted for different clients and needs, from low-cost delivery of medical information to advanced video communication.

Ali et al. (2012) have developed a nutritional education package. The package is a piece of software that can be used with a touch-screen computer. The package has four modules: healthy eating guidelines, a quiz (about nutrition), a BMI calculator and physical exercise demonstration videos. Many kinds of digital solutions for professionals in primary health care have recently been developed. These solutions help professionals share information and organise their work. Thornberg et al. (2012) studied the use of digital music for promoting the health of elderly people. The aim of the study was to produce knowledge about elderly people's experiences when participating in a dance workshop. They obtained two important results: first, "a surprising awareness about the connection between body and mind" and, second, that "participation leads to personal growth". An open network and dialogue between users and other participants are needed when digital services for elderly people are being developed. It must be possible for the elderly to participate actively in the development process. The goal of the development process is to empower the elderly.

### Older people's ability to use digital services

Several studies have been conducted in recent decades on the effects of cognitive training based on digital inclusion as well as the use of different digital tools. The use of digital tools has been important due to an interest in maintaining cognitive abilities in old age. Cognitive decline has been one of the problems comprising well-being in old age, starting with forgetfulness and light cognitive impairment and reaching the dreaded level of dementia. As stated in a study by Cosenza and Malloy-Diniz (2013, p.337): "There is the hope that cognitive decline can be postponed as well as to avoid the pathologies associated to old age, through cognitive stimulation."

Ribeiro and Cosenza (2013) explain that, during the aging process, there are changes in the peripheral and central nervous system that can interfere with the operation of the motor, sensory, emotional and cognitive systems. Howe-

ver, there are other variables besides the neurobiological variable that can also influence the performance of these systems, like education, intelligence and sensory skills. These variables influence the differences between individuals and the responses of elderly people to enhancement activities or efforts to rehabilitate their cognitive abilities.

While previously it was believed that cognitive decline was a normal and irreversible part of old age, experts now know that there are two plasticity processes. There is a negative plasticity process resulting from a decrease in cognitive activity from the structural point of view and also a decrease in cognitive behavioural activities. On the other hand, it is possible to reverse cognitive loss through plasticity. This reversible process of plasticity can occur through behavioural strategies that can stimulate the sensory, cognitive or motor areas, thereby aiding in the development of a cognitive reserve (Cosenza & Malloy-Diniz, 2013). Souza and Chaves (2005) investigated the effects of memory stimulation on performance using the Mini-Mental State Examination. The study included 46 elderly people who were members in a memory workshop and it identified a significant correlation between the MMSE scores applied before and after the workshop. Studies conducted with the video game Nintendo Wii® show that the game can have positive results in the treatment of elderly people with cognitive impairment. The results demonstrate that they can experience both quantitative and qualitative improvements in their functional activities and quality of life. Thus, video games, too, can be a useful tool in rehabilitation processes (Batista et al. 2012). Verona et al. (2006) conducted a study on the views of older people relative to the internet. The results showed that 40% of elderly people feel that the internet facilitates communication, while 25% feel that it contributes to their overall knowledge and 10% that it eases their daily life. Of the 32 subjects who participated in the study, 53.1% reported experiencing difficulties when using the internet. The study shows that older people consider the internet a positive tool and that, despite their fear and resistance, there is an interest in learning to use this technology. Mincache et al. (2011) conducted a study to identify the needs and interests of older people in using technologies to support in the construction of a virtual learning environment adapted to the reality of the elderly, based on themes identified by them as being the most relevant. The results were based on responses to a questionnaire administered to 85 women and 43 elderly men who use computers and the internet and they point to a new way of experiencing sociability. The elderly people in the study associated the internet with efficiency and practicality; making it a "vehicle to find friends or meet new ones, when you are in solitude, empowering the elderly and releasing them from the nearest, to expand the network of relationships beyond the family and so on" (p. 298). Finally, the study identifies four important issues with respect to the elderly: health and living; social interaction; citizenship and products and services.

## Conclusion

Due to all of the theoretical considerations presented here, we consider it essential to study the use of technologies for the current generation of elderly people. All theories on successful aging consider the importance of developing the potential of the elderly, mostly in new areas that can be optimized. With the increase in diseases related to cognitive performance, it is becoming even more important to develop studies that evaluate the functionality of digital tools for improving cognitive abilities during the aging process. Based on such studies, it will be possible to develop improvement programmes or forms of cognitive rehabilitation that promote well-being in the successful aging process and also assist in situations related to the syndrome of frailty and different types of dementia. Thus, we can help the advancement of gerontology with an objective that not only seeks to add years to our lives but also to add quality of life to these years.

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# Successful aging, cognition, and perspectives for digital interventions in elderly living in southern Brazil, at the city of Ivoti

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## Introduction

Increased longevity is a phenomenon that causes many discussions and social, economic, biological and emotional speculations. But the increase in life expectancy does not occur uniformly in the world, with some regions with high average expectation, others with higher maximum expectation and still others with good quality of life in the aged years, currently considered as successful aging. Therefore, the most important for the social and biological sciences is to find out how one can live up to its maximum life, which is approximately in 122 years of age, free diseases, and especially, how to actively live these years in our society.

Each society observes the aging according to the adopted culture and there may be the notion of respect or contempt. Currently, the concept and the aging experience are going through a restructuring process. The new form of definition of human aging and the research conducted within the development theory are being built gradually. They are associated with cultural issues that directly influence the biological, social and health issues, but there are still many questions and few significant findings were found. Old age, according to Moragas (2010) is the result of the natural aging process. There are many ways to set the aging and also to measure it.

In Brazil, mainly in the Southern states, this situation is not different. Despite being a recent phenomenon in Brazilian reality, the increased longevity has proportions that reveal the lack of preparation of the society to this new demand. The increasing presence of elderly in Brazilian society has led to a number of cultural, economic and personal changes. The elderly always had difficulties in having their rights respected in our society. Currently, we have several laws that protect them and ensure their rights, such as the Statute of the Elderly and the National Policy on Care for the Elderly Health. Particularly regarding the health of the elderly population, the National Policy for

Health Care of the Elderly is a very important step forward. However, many steps need to be given to the Health System offers effective and efficient responses to health needs and demands of the elderly population.

The guarantee of legal rights does not diminish the prejudice that is still present in our culture, incurring physical, economic and emotional violence. Be retired in Brazil is still not a joy classification by the working time devoted to the nation's development. The income received by the elderly do not match their expenses for health treatments and for leisure.

There are many taboos regarding to the aging process, but the most important is the fear of becoming dependent. The situation of physical, economic or emotional dependency, at this time of life, proves to be one of the major barriers to quality of life. Unfortunately our society has not yet developed a policy to response the dependency situations properly. It occurs because our families are not structured to take care of the elderly, the professionals still have not appropriate training elderly care and finally, we do not have adequate physical infrastructure for this task.

Camarano & Kanso (2010) note that population growth in the elderly age group in Brazil is directly associated with the uncertainty of the conditions of care for people who are experiencing the possibility of living for a longer time, reaching and surpassing the 100 years old.

Paul Baltes and Margaret Baltes developed with their interdisciplinary team of researchers at the Max Planck Institute for Human Development in Germany, studies that led to a conceptual framework widely accepted for studies in the life development cycle area. The Lifespan theory, or theory of development throughout life, has been consolidated by the study entitled The Berlin Aging Study (BASE). From these studies consolidated the theory of successful aging process (Successful Aging) and created an intervention strategy called SOC - Selection, optimization and compensation (Papiaia & Feldman, 2013; Baltes, 2001).

Strategies for successful aging are analyzed by Baltes & Baltes (1993) in seven propositions: a) Human beings need to pay attention to lifestyle that adopts for the body to remain in a healthy condition; b) Due to the heterogeneity of the aging process, simplistic and standard formulas should not be created, people should understand the need to take their own attitudes as well as the society should have the flexibility to accept them; c) Environments that allow the development of latent capabilities of the elderly are necessary; d) To address the capabilities that the elderly can use and its limits; e) The use of resources and technology to supply the deficits of the aging process; f) Aging process involves the balance of gains and losses, and finally, the importance of the latter, g) Ego resilience capability.

Baltes & Silverberg (1995) report that the successful adjustment is correlated to the existence of networks of social relations that allow greater intimacy in

conversations, reinforcing the importance of closer links between people, rather than the broader social relations. According to the authors these close relationships form a protective system for difficult and stressful times.

Given these elements, the purpose of this article is to present descriptive data on successful aging with cognitive impairment parameters, depression and fragility of a sample of Brazilian elderly in the city of Ivoti, State of Rio Grande do Sul.

## Method

This study presents a quantitative research, with cross-sectional design. This study involved 197 subjects of both sexes, from the urban area. The inclusion criteria used for recruitment were to be 65 years old or older, understand the instructions, agree to participate and be a permanent resident in the household and in census tracts. Following the methodological recommendations of Ferrucci and colleagues (2004) were considered ineligible for research through observation: a) elderly with severe cognitive deficits suggestive of dementia, evidenced by memory, attention, spatial and temporal orientation, and communication problems; b) those who were using a wheelchair or finding themselves temporarily or permanently bedridden; c) those with serious sequelae of cerebrovascular accident, with localized loss of strength and / or aphasia; d) patients with Parkinson's disease in severe or unstable stage, with severe motor impairments, speech or affection; e) those with severe hearing or vision deficits that severely hamper communication; f) those who were terminally ill.

The instruments used were: questionnaire with sociodemographic data; Mental status assessed with the Mini-Mental State Examination of Folstein et al. (1975) and adapted to the Brazilian reality by Brucki et al. (2003); Depression evaluated by Geriatric Depression Scale-GDS-15 (Yesavage et al, 1982; Adams & Adams, 1999); Fragility: 1) unintentional weight loss, as self-report (A dichotomous item and a response item structured by the elderly); 2) Fatigue assessed by self-report (Items 7:20 of the CES-D with 4 points each); 3) handgrip strength. It was measured with Jamar dynamometer (Lafayette Instruments, Lafayette, USA) placed in the dominant hand of each elderly in 3 attempts, respecting 1 min. interval between them. For each elderly, was calculated the average of the three measures, which was adjusted by gender and according to the body mass index ( $BMI = \text{weight} / \text{height}^2$ ). The cutting points for men were:  $IMC \leq 23$ , cut point (PC)  $\leq 27.00$  kgf;  $23 < BMI < 28$ , PC  $\leq 28,67$ kgf;  $28 \leq BMI < 30$ , PC  $\leq 29.50$ ;  $BMI \geq 30$ , PC  $\leq 28.67$ . For women, were:  $BMI \leq 23$ , PC  $\leq 16.33$ ;  $23 < BMI < 28$ , PC  $\leq 16.67$ ;  $28 \leq BMI < 30$ , PC  $\leq 17.33$ ;  $BMI \geq 30$ , PC  $\leq 16.67$ ) (Marucci & Barbosa, 2003). 4) Self-report measures on the weekly frequency and duration of daily physical exercise and domestic activities and the maintenance of these activities in the last 15 days, in the last 3 months, and in the last 12 months. 30 items dichotomous and of structured response by the elderly, based on the Minnesota Leisure Activity Ques-

tionnaire (Taylor et al, 1978;.. Lustosa et al, 2010) adapted for this research. weekly metabolic expenditure in kcal is based on the value of each activity in metabolic equivalents (METs) according Ainsworth (2000). 5) Gait speed. The gait speed test was referenced to time (timed in seconds) that each elderly took to go in usual step, a distance of 4.6 meters marked on the floor plan, using duct tape. This stretch was delimited by cross marks the line of 4.6M. Before and after this line were added 2 m lines each. The first 2 m section was used for output and acceleration and the time to walk it was not counted. So did the next one to the line of 4.6m, which served to slowdown. It was allowed to the elderly to use a cane or walker. Three attempts were made. The examiner calculated the mean result, recording in the protocol (Guralnik et al., 1994; Nakano, 2007). The average of each individual was adjusted by gender and height. For men, the cutoff scores were height  $\leq 168$ , PC  $\leq 5.49$  sec; height  $> 168$ , PC  $\leq 5.54$  sec.; for women were: o  $< \text{height} \leq 155$ , PC  $\leq 6,61$ seg; height  $> 155$ , PC  $\leq 5.92$  sec).

The project was submitted to the Ethics Committee of the Faculty of Medical Sciences of Unicamp by the evaluation 208/2007 and the CAAE number 0151.1.146.000-07

## Results and discussion

The sample is characterized by being composed mainly of women (Table 1), reflecting a global trend of old age feminization. In terms of age, most of the subjects is between 65 and 74 years old ( $n = 135$ ), with a lower frequency of individuals above 75 years (Table 2), confirming the assessments of the last Brazilian census (Brazilian Institute of Geography and Statistics, 2010).

TABLE 1 Distribution of absolute frequency and percentage of the variable sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	138	70,1	70,1	70,1
	Male	59	29,9	29,9	100,0
Total		197	100,0	100,0	

TABLE 2 Distribution of absolute frequency and percentage of the variable age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	65–74	135	68,5	68,5	68,5
	75 or older	62	31,5	31,5	100,0
Total		197	100,0	100,0	

The results of the MMSE in all age groups are part of an initial screening for cognitive ability in this population (Table 3). In this sample, 81.2% of individuals would be theoretically able to exercise activities related to digitalization, such as the use of applications for daily living tasks or training and cognitive tests, although it is also possible to develop activities for those 18.8% who have cognitive deficit, as long as they are in the early stages of decline.

TABLE 3 Distribution of absolute frequency and percentage of variable cognitive deficit

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No deficit	160	81,2	81,2	81,2
	Deficit	37	18,8	18,8	100,0
Total		197	100,0	100,0	

The data on depression shown in Table 4 were evaluated only in the sample of 160 individuals without cognitive impairment. This procedure was to ensure the reliability of the results, because the test requires cognitive understanding of the subject.

TABLE 4 Distribution of absolute frequency and percentage of variable depression

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Depression	147	74,6	91,9	91,9
	Depression	13	6,6	8,1	100,0
Total		160	81,2	100,0	
Missing	System	37	18,8		
Total		197	100,0		

Finally, the assessment of frailty status shows that the majority of the sample would be able to perform intervention activities related to scanning, since both the pre-frail and non-frail participants could benefit themselves from cognitive training and memory exercises, based on applications for tablets or PCs (table 5).

TABLE 5 Distribution of absolute frequency and variable percentage Frailty Syndrome

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Frailty	17	8,6	8,6	8,6
	Pre Frailty	94	47,7	47,7	56,3
	No Frailty	86	43,7	43,7	100,0
Total		197	100,0	100,0	

## Conclusion

We still have to search for elements that remain obscure in the aging process, since it is permeated by many variables, such as genetics, environment, socioeconomic status, family, personality, power, and a number of others, that have been studied in different nuclei of gerontology studies.

This information, when combined with interdisciplinary studies, will allow us to develop research methods that could answer questions regarding to well-being in old age, and thus, to increase life expectancy, in a healthy and enjoyable way.

The results of this study suggest that it will be possible, in conjunction with the Ivoti Prefecture, through the Municipal Secretariat of Education and Culture, to develop a plan of intervention strategies based on the use of digital tools. These activities are already being developed in Ivoti, at the group for the elderly called "Living and Learning in the Age of Technology".



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## Durability of Materials in Brazil and Finland

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Sheet Metal Centre is the oldest research unit in Häme University of Applied Sciences. Our main emphases are research services related to the forming and joining of sheet metal, development work on materials and coatings, weathering tests, structural analyses and loading tests. We work in cooperation with businesses and other research organisations, both in Finland and worldwide, and students are also very actively involved in our work.

One of Sheet Metal Centre's research groups is focused on coatings and long-term durability. Participating in this group are Ph.D. Kauko Jyrkäs, M.Sc. (Tech.) Tiina Vuorio and M.Sc. (Tech.) Petri Fabrin. One of the group's research topics is climatic corrosion of metals and durability of materials under different conditions. In connection with these topics, we are participating in international projects and carrying out outdoor testing together with other European researchers. Feevale University in Brazil is one of HAMK's international strategic partners, and we are initiating research together with them on the durability of materials and products in Brazil and Finland.

Materials and the products made from them should last for the guaranteed length of time in their normal operating conditions. What kind of guarantees are given for products, and how can it be ensured that they will last this long? Operating conditions vary significantly depending on geographical location. In Finland conditions can vary considerably depending on location: coastal or inland, rural or right next to the factory. On the global scale, differences are even larger, and so in the global market this needs to be taken into consideration.

There are countless different factors affecting materials located outdoors. These include solar radiation, temperature and temperature variations, the relative humidity of the air, precipitation, prevailing winds and wind speed, the proximity of the sea, contaminants, air pollution, biological growth, and pollen.

It isn't possible to have practical experience of the durability of products that are still in development, but somehow their durability needs to be assessed. This is best achieved by testing the product in the worst conditions that it may face. There are numerous companies worldwide that are specialised in outdoor testing, and so samples can be submitted for testing both in many European locations and also other regions such as the US and China. HAMK Sheet Metal Centre has two outdoor testing sites. One of the test areas is situated in the courtyard outside SMC, and the other test area is located in a forest, and it is used to study how materials endure Finnish forest conditions (e.g. the effects caused by biological growth, pollens, solar radiation and moisture).

Feevale University is located in Novo Hamburgo, in the state of Rio Grande do Sul in the southernmost part of Brazil. At the end of last year, we agreed to begin cooperative research on material durability. Materials are sent to the outdoor testing sites in Feevale, and also from Brazil to us. Sample preparation is already under way, and the first samples will be sent to the outdoor testing sites in spring 2015.

Conditions in Hämeenlinna and Novo Hamburgo are totally different. Hämeenlinna has a humid subarctic continental climate with cool summers whereas Novo Hamburgo has a warm humid temperate climate with hot summers. The temperature variations in the two locations are of a very different nature. In Finland materials must endure cold and frozen conditions, while in Brazil the samples must survive the heat, the abundant sunlight, and especially the UV radiation.

The average temperature in Hämeenlinna is 4.0 °C. July is the hottest month of the year (16.2 °C) and February is the coldest (-7.6 °C). During the year, the average temperature varies by 23.8 °C. In Novo Hamburgo the average temperature is 19.4 °C. The warmest month of the year is January (24.5 °C), and June is the coldest (14.8 °C). During the year, the average temperature varies by 9.7 °C. Total annual solar radiation in Hämeenlinna is 3536 MJ/m<sup>2</sup>, while in Novo Hamburgo it is 5693 MJ/m<sup>2</sup>. In Hämeenlinna the shortest day contains 5 hrs and 21 mins of daylight; the longest day 19 hrs and 30 mins. In Novo Hamburgo the shortest day contains 10 hrs and 13 mins of daylight; the longest day 14 hrs and 4 mins.

Average rainfall in Hämeenlinna is 615 mm, while in Novo Hamburgo it is 1467 mm. Precipitation types are also very different. In Hämeenlinna there is drizzle (2 %), light rain (15 %), moderate rain (29 %), heavy rain (1 %), light snow (13 %), moderate snow (33 %), heavy snow (2 %) and thunderstorms (6 %). The chances of there being snow on the ground is highest around 1 February, when the probability is 73%. The season in which snow is relatively likely to be on the ground stretches from 9 November to 15 April. The snow is typically at its deepest on 2 March, with a median depth of 31 cm; the depth exceeds 47 cm only one year in ten. In Novo Hamburgo there is drizzle (6 %), light rain (34 %), moderate rain (18 %) and thunderstorms

(41 %). Over the course of the year in Hämeenlinna, the dew point typically varies from  $-13^{\circ}\text{C}$  (dry) to  $14^{\circ}\text{C}$  (comfortable) and is rarely below  $-26^{\circ}\text{C}$  (dry) or above  $17^{\circ}\text{C}$  (mildly humid). In Novo Hamburgo the dew point typically varies from  $8^{\circ}\text{C}$  (dry) to  $23^{\circ}\text{C}$  (very muggy) and is rarely below  $1^{\circ}\text{C}$  (dry) or above  $25^{\circ}\text{C}$  (oppressive).

Material durability in outdoor conditions is a matter of importance for all materials and products which are used outdoors. Sheet Metal Centre is particularly interested in the durability of building materials in Brazil's humid and sunny conditions, while being one of the world's largest shoe manufacturers area, Feevale is for example interested in the durability of shoes and the materials used in them in Finnish winter conditions.

The outdoor testing sites will also clarify the test site corrosion categories in accordance with the relevant ISO standard: *SFS-EN ISO 9223 Corrosion of metals and alloys. Corrosivity of atmospheres. Classification, determination and estimation*. Corrosivity determination will be done based on corrosion rate measurement of standard specimens. The standard provides corrosion rates for the first year of exposure for the different corrosivity categories for carbon steel, zinc, copper and aluminium.

Globalisation is posing challenges for society, the world of work and higher education. At Häme University of Applied Sciences (HAMK), internationalisation has been one of the main focus areas of development activities since our very beginning. Especially during recent years, we have also been launching new activities to meet the rapidly growing challenges.

HAMK's research units play a key role in meeting these challenges. We have four research units:

- Bioeconomy
- Smart Services
- Professional Excellence
- Sheet Metal Centre (since 1998)

The units promote regional impact and customer-oriented research. They also have a strong international dimension. The research units and research groups function in important research projects with our international strategic partners, which are Feevale University in Brazil and VIA University College in Denmark.

In this publication, we will introduce the strategic basis for HAMK's international activities and also the starting points and examples of international research activities.

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