A demand for more personalized accessible medical informatics in an aging world

M. Ianculescu, E. Lupeanu, A. Alexandru, E. Tudora, O. A. Coman, L. Coman

Abstract— Products and services based on new technology, such as ICT, are developing rapidly, and are used by large parts of the population – also by elderly people. Technology has potentials of raising the quality of elderly care and to make the services more adapted to individual needs and preferences. Medical Informatics is developing rapidly and has an increasingly possibility to play a role in health and care-services. It can, when implemented and used with care, be a key resource in enabling elderly people to live long lives. We want sustainable health and disability support services that can meet the needs of current and future generations of older people and support them to age positively. Ideas about aging have changed over time. Aging people are increasingly becoming computer literate and more willing to be empowered about their own state of health and way of living. This paper presents the most important features of promoting a positive aging with the help of medical informatics. AGECVD, a health informatics system, proposes a complex integrative approach of physiological aging and atherosclerosis processes which can determine a multitude of cardiovascular events. The „Multidisciplinary Complex System for the Efficient Management of the Anti-Aging information (AgingNice)" allows the sharing of the knowledge concerning the specific research and the promotion of the theoretical and practical information, both among the stakeholders from the medical area and at the citizen's level.

Keywords—Friendly ICT Technology, Aging people, Design for all, Empowerment

Marilena Ianculescu is with the National Institute for Research and Development in Informatics, 8-10 Averescu Avenue, 011455 Bucharest, Romania (corresponding author to provide phone: +4021-316-0736; fax: +4021-316-1030; e-mail: manina@ici.ro).

Elena Lupeanu is with the Institute of Gerontology and Geriatrics „Ana Aslan"9, Calcarusani Str, Bucharest, Romania(e-mail: elenalupeanu@yahoo.com).

Adriana Alexandru is with the National Institute for Research and Development in Informatics, 8-10 Averescu Avenue, 011455 Bucharest, Romania (e-mail: adriana@ici.ro).

Eleonora Tudora is with the National Institute for Research and Development in Informatics, 8-10 Averescu Avenue, 011455 Bucharest, Romania (e-mail: gilda@ici.ro).

Oana Andreia Coman is with University of Medicine and Pharmacy "Carol Davila" 8, Eroilor Sanitari Blvd, Bucharest Romania (e-mail: andreiacoman@gmail.com).

Laurentiu Coman is with University of Medicine and Pharmacy "Carol Davila" 8, Eroilor Sanitari Blvd, Bucharest Romania (e-mail: laurentiucmn@uyahoo.com).

I. INTRODUCTION

The percentage of aging people on the total of the world population is rapidly increasing, leading to remarkable effects on the social structure and the health service. This dramatic growth in numbers and proportions, increased life expectancies, and energetic life styles, now enables us to live 20 to 25% of our lives in active retirement. Moreover, today's physically and intellectually active younger generations predict that tomorrow's elderly population will be better educated, healthier, culturally literate and, as individuals, more discerning consumers.

Fig.1 Percent of the population age 60 and over 2000-2025

Demographic changes are creating a new society, and these profound social changes form a new reality: fewer young people, older workers, pensioners and very elderly people, composition of families (particularly evident in the growing number of seniors living alone). Therefore it is compulsory for the aging people to remain active and healthy as long as possible. There are many opportunities to be realized as future generations of older people are expected to be healthier, more skilled and educated, and remain more active in the workforce than their predecessors. They are consuming more new goods and services and want to participate actively in social life. Unfortunately, for some aging people, full participation in society is prevented through low sense of worth or because of restricted opportunities.

The concept of "positive aging" embraces a number of factors, including health, financial security, independence, self-fulfillment, community attitudes, personal safety and security, and the physical environment. Society as a whole has a lot to gain from these outcomes: a healthy, happy, and

confident aging population contributes a wealth of expertise and skills to the community and the workforce, places less demand on social services, and provides positive role models for younger generations.

Even though the term "elderly" is accepted in many domains, it has negative connotations and evokes such negative stereotypes. Negative stereotypes also exist about aging people' attitudes and capabilities regarding technology. However, many older adults embrace new technologies and see benefits to using technologies [1].

New ICT technologies, designed with an explicit focus on the needs of older adults, as well as their clinicians and family caregivers, can help to meet the challenges of an aging global population.

Aging people are receptive to the concept of healthcare technology, as long as it continues to provide them with a sense of control and empowerment. The elderly want to retain control over their lives and be involved in decision-making about their care.

The objectives of medical informatics are to contribute to a high-quality healthcare (especially patient care) and to the gaining of new medical knowledge. By helping aging people to become more proactive in managing their health, and providing caregivers with the tools and information they need to deliver care in any setting, from the home to the hospital, medical informatics can play an important role in addressing the needs of the coming age wave.

Health informatics systems, like AGECVD presented in this paper, can have an important contribution in reaching a positive and healthy aging, with benefits both for individuals and for our nowadays aging society.

II. RISK FACTORS THAT AFFECT OUR AGING POPULATION

Aging people are not homogenous and have various interests and competences. They have changing disabilities, sometimes they are (or feel) isolated and excluded, they have the impression being useless and they are often overwhelmed by technology.

Facing the ICT technology, the most common risk factors that affect our aging population are:

- Digital literacy is considered nowadays one of the essential skills to allow people to effectively take part in the modern society and to be involved in taking decisions about their own lives. *Digital divide* is considered the gap between those who have access to and use the potentialities of ICT for their own achievements, and those who are not in a position to access or use these potentialities. Elderly people are often intimidated by the use ICT due to: their lack of digital literacy, limitations imposed by their physical and mental disabilities, cost, geography, usability, including interface issues that arise from age-related disabilities.
- In some countries, the most important obstacle using the new technology is the *economic situation*, which does not allow older people to buy it.

- Many older persons *do not have the support* of work colleagues or an IT department, and may need to learn to use new technology on their own, perhaps with the help of friends/family.
- The *anxiety* that can result from *coming into contact with something new* might be quite a challenge for aging people in using ICT technology.
- Aging people are often considered as a *source of problems* rather than a group still able to give their contribution to the social and cultural life.
- The *early retirement* as well as *the decline of employment percentages* for people 50 years old and over can be found in most of the countries.

The likelihood of a person developing a disability or chronic illness increases with age. Many older adults are disabled in one or more aspects of self-care and, in general, the elderly require more health care services and incur higher health care costs than younger people.

As the elderly population increases and people live longer, more people will require help with aspects of daily living and disease management. [2] The new aging people want to be active, mobile and self reluctant as far as possibly. The elders of the future will have better financial resources and higher levels of education than before.

III. THE POSITIVE AGING, A WORLDWIDE GOAL

Positive aging is a term used to describe the process of maintaining a positive attitude, feeling good about yourself, keeping fit and healthy, and engaging fully in life as you age. Some researchers and policy makers feel that enough time has been spent on the negative aspects of aging and that the balance should be addressed by analyzing successful, or positive aging (sometimes defined in terms of an overlapping but separate dimension 'health-related quality of life'), with the aim of promoting well-being for future generations. [3]

Aging is often associated with many rewarding experiences. It is, however, also a time when significant changes might occur. Elderly people are most vulnerable to social exclusion.

There are a number of ways to prevent, delay or manage some of the physical, psychological, social and personal challenges people face as they age – some of these are mentioned below:

- *maintaining a positive attitude* – it's important that aging people can make choices and have control over important aspects of their life;
- *preventing digital exclusion* - i.e. to prevent that they could be left behind of the information society;
- *continuing working or to combine part-time work with retirement* - therefore the main objective of new policies should be the augmentation of employment rates at an older age;
- *keeping the brain active, alert and flexible* – this can promote good mental health and positive aging throughout the lifespan;
- *staying connected* - social interaction and relationships with others;

- *being empowered regarding their own health* – this implies access to information and knowledge and it has as a result a better healthcare and self-esteem.

All these can be accomplished with the help of new policies and ICT technologies adapted to the aging population. European Commission established for the period 2007-2013 the programme "Europe for Citizens". [4]

The implementation of preventive policies like the effective use of ICT can raise awareness of aging people about the possibilities and benefits the use of ICT can bring for them. [5]

The 2007 European Commission Communication "Ageing Well in the Information Society" supports EU policy in the areas of growth and competitiveness. It presents an action plan that considers ICT for aging well as both a social necessity and an economic opportunity. ICT technology represents a compulsory help for reaching a positive aging. [6]

IV. AGING FRIENDLY ICT TECHNOLOGY

A survey of the current literature reveals that recent technological advances have been made in the fields of "telecare and home-monitoring", "smart homes and robotics" and "health information systems and knowledge management". Innovative technologies such as wearable devices, bio and environmental sensors and mobile, humanoid robots do already exist and ambient assistant living environments are being created for an aging society. Services based on ICT technologies are already part of everyday life. [7]

Research has shown that ICT technology can radically improve the quality of life of aging people. However, the complexity and novelty of many new devices and services run the risk of rendering the majority of aging people unable to use them. In the same time, with ever-changing advances, ICT technology often creates a divide between generations, isolating many seniors from the younger generation and from key information and resources needed to function.

Aging friendly ICT technology aims to further integrate elderly persons into society and reduce social isolation by working to increase access, capacity and knowledge of technology among this population.

In order to obtain a successful positive aging with the help of ICT technology, it is compulsory:

- to design new ICT technology for a better inclusion of these socially disadvantaged people, that would take into account their special needs;
- to identify key ways or roles that the aging people can play in the design process;
- to formulate user requirements for an appropriate design taking into consideration the cognitive, sensory and psychomotor changes;
- to understand factors that influence elderly adoption and acceptance of technologies;
- to train and support them, so that the technological barriers would be marginalized;
- to raise affordability (low cost of ICT technology);
- to improve graphical icons so that their functions are easy for aging people to understand. Icons are very important because they convey language and concepts

that users need to understand in order to learn to use the application;
- to provide additional interactive guidance back to help them learn to use ICT technology.

Aging friendly technology easily-accessible worldwide should be created by taking into consideration the designing for all. The „Design for All" concept is based on an understanding of design in which the shaping of the built environment is oriented towards people (human-centred design approach).

It is a concept which consists of three strategies:

- products/services and applications should be usable by as many people as possible, regardless of age, ability or situation, without any modifications.
- products should be easily adaptable to different users.
- products should have standardized interfaces, capable of being accessed by specialized user interaction devices. [8]

Designers are trying to fit ICT technology in the lives of the elderly and aging people, and make it as pleasant in use as possible. As an example there is gerontechnology, a combination of gerontology and technology. It's designing technology and environment for independent living and social participation of older persons in good health, comfort and safety.

While ICT technology is rapidly being integrated into most aspects of life, changing the nature of work, the form and scope of personal communication, education, health care delivery, and home, aging people are highly likely to be active users of technology.

Alongside a social objective, designing aging friendly ICT technology is also increasingly gaining an economic perspective, as aging people have become an important customer group.

Knowing the needs of older consumers and considering these in the development and design of products and services promises competitive advantages and market success.

V. RESHAPING OUR MEDICAL INFORMATICS IN A SUSTAINABLE AND AGING PEOPLE-CENTERED MANNER

Health is one of the most demanding issues for aging people. This also extends to the design of medical applications; aiding memory, monitoring health conditions, and supporting communications with distant family members are exemplary applications supporting elderly persons [9]

In the nowadays society it's more likely to find aging people which suffers more from chronic conditions than acute or infectious diseases, and long-term community care is frequently more appropriate than short-term hospital care.

There is an emerging public attitude towards a new concept of health, i.e. one that not only includes the treatment and prevention of disease, but also the promotion of health and wellness and the concept of personal responsibility for it.

The use of ICT is becoming a self-evident part of the development and delivery of healthcare services. In fact, it has been proved that empowerment of the patients and technology have become critical elements of the healthcare of aging

people. ICT technology has to be adapted to aging people's self-care processes and coping strategies, and to support new ways of healthcare delivery.

Medical informatics can support this process by providing the necessary information infrastructure, contribute to standardisation, interoperability and security issues and provide modeling and simulation techniques for educational purposes. It helps clinicians and healthcare providers to make complex information useful in supporting clinical decisions, thus delivering the best standard of care for each patient. Medical informatics has the potential not only to make the provision of healthcare more efficient and cost-effective, but to encourage the independence of aging people and to improve their communication with doctors and other health professionals.

Here are some examples of types of aging people–centered medical informatics:

- Relational databases that facilitate the retrieval of data for multiple purposes;
- Manipulation of data to create information and knowledge;
- Health informatics systems used for: diagnostics (internet consultations and telemonitoring), therapy (rehabilitation and telecare);
- Point-of-care devices, computerized patient records and/or electronic health records;
- Clinical repositories as a strategic resource for quality and practice;
- Electronic interfacing systems to facilitate the sharing of data;
- Acquisitions, storage, transmission, processing, analysis of digital images of the body and providing help to integrate those images in the various parts of the treatment;
- Virtual patient visits via video conference or vital sign monitoring;
- Health education informatics systems for lifestyle management.

A. Design recommendations for sustainable medical informatics

The aging population has lagged behind younger generations in the adoption of ICT technology, including the use of it for seeking and understanding health and medical information. Age differentials within the elderly population are important. In designing aging people-centered medical informatics, the following recommendations must be taken into consideration:

- the technology must be transparent to the elderly;
- it has to be reliable and secure;
- it should adapt to age disfunctionalities - the user's limitations (cognitive and motor) and impairment (visual and hearing) are important in inserting specific features;
- it has to support the independence of aging people and empower them to control over their lives;

- the user interface must be adaptable. Aspects to consider when designing the user interface for elderly users are readability and presentation of information, navigation through the website, incorporation of multimedia, and evaluation of system accessibility and friendliness. These include, for example, simple and clear pages, clear navigation mechanisms, large buttons, large font sizes, conservative use of colours and avoidance of deep hierarchy in the information structure;
- the active involvement of future users of the application being developed (participatory design). Participation design is closely linked to patient empowerment and motivation to using the system.

The benefits of medical informatics include the ability of healthcare consumers to better manage their health. This can be achieved by the availability of modern healthcare tools such as web sites providing reliable healthcare information, Internet based health decision tools, online support groups, and personal health records. The operation of the healthcare system will increasingly depend upon the acquisition, analysis and dissemination of reliable information.

Designing health informatics systems must take into account the evolving nature of the health domain and the aging of the population, a growing trend towards primary and preventive care and the explosive growth in global networking. While, historically, storage and retrieval of data has been the main target for informatics systems development, the need to capture knowledge itself is becoming the focus for HEIS development.

B. Study Case: AGECVD

The research project "Complex Study of Metabolomics, Genomics, Epigenetics of Age Related Atherosclerosis and Cardiovascular Pathology – AGECVD" is designing a protocol of investigations, diagnosis, treatment and monitoring of atherosclerosis and cardiovascular diseases specific of aging and it is developing a system of health information for collecting and analyzing results of biomedical investigations and psychosocial surveys.

Structural and functional changes of the cardiovascular system occurring in the course of aging are involved in increasing the risk of developing atherosclerotic processes and cardiovascular diseases. Physiological aging as well as the atherosclerotic process is associated with a state of low chronic inflammation and enhanced oxidative stress, which suggest that pro-inflammatory cytokines and the balance between oxygen reactive species generation and antioxidant defense play an important role in aging and atherosclerosis.

Prevention and delay of changes associated with advancing age diminish the risk of developing cardiovascular diseases, thus enabling a healthy aging in the context of a continuously increasing average human life span.

AGECVD is a research project developed inside the National Research, Development and Innovation Plan for the period 2007-2013 (NP II) is the main instrument by which the

Romanian National Authority for Scientific Research (NASR) is implementing the National Strategy for RDI.
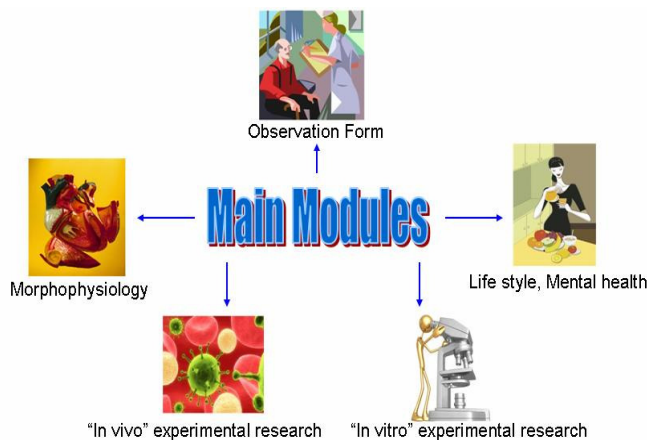

Fig. 2 Main modules of AGECVD informatics

Objectives

- establishing markers that predict the risk of atherosclerotic processes developing and progressions' as involved with aging related cardiovascular (CV) diseases and in view of a larger range of preventive strategies, which might contribute to elderly's health condition improvement; creating a framework to facilitate transfer of data, information, knowledge;

- supporting and providing arguments for the novelty of an integrative approach on aging related atherosclerotic processes that impact health condition and life expectancy increase; establishing correlations of metabolic, inflammatory status, oxidative stress parameters, life style;

- establishing associations with genes implicated in methyl group metabolism pointing out newer predictive/risk factors of developing atherosclerotic processes and cardiovascular events in the course of aging;

- design of therapeutic strategies, particularly to prevent developing cardiovascular diseases with increased risks of mortality in the elderly;

- dissemination of research outcome, organizing an open space for informing specialists and individuals of the general public with interests in preventing and treating causes of pathology induced aging;

- continuous updating knowledge on atherosclerotic processes' complexities and CV pathology by use of a health informatics application which ensures a higher degree of flexibility to changes and efficiency in handing over information.

Methods

For designing a health informatics application available on the internet able to load, store and for processing results of biomedical investigations, psychosocial survey, hence to facilitate dissemination of results, communication with specialists involved with the project and the general public, an important accent was put on usability and creating an open informational space.

AGECVD is a health informatics system that comprises an interconnected database system. It has an architecture that is structured into modules, allowing that new functionalities could be easily added.

The problem of the technical accessibility is solved by using a web-based solution, a web browser being the only necessary condition for the user to connect to a system, with no need for other applications.

It is a person-centric health informatics system with a high degree of flexibility because of dynamic and integrated structure that will accommodate to various health changable and needs of society in general and individuals in particular.

To facilitate the access to information regardless of the user's skills, there are provided clear navigation elements, perfectly adapted to the way in which links between pages are established, which provides visual clues about their function and which helps to orientation.

In terms of software architecture, the Model-View-Controller concept is used to ensure separation between user interface and objects that implement the logic of application. This approach has allowed the independent testing of application components. By using framework software Spring, Acegi and Hibernate embedded in a single container we managed to centralize and to manage automatically the configuration of application objects, thus ensuring the scalability of the implemented solution.

Results

The practical results of AGECVD put into value:

- the pointing to physiological aging newer markers and predictive factors of developing atherosclerotic processes in the course of aging;

- design of molecular target therapies; elaboration of a complex protocol of investigations, diagnose and treatment as resulted from statistical analysis correlations of obtained biomedical data;

- application of the information technology in the research field of aging and large of care, access to education, efficiency and time savings.
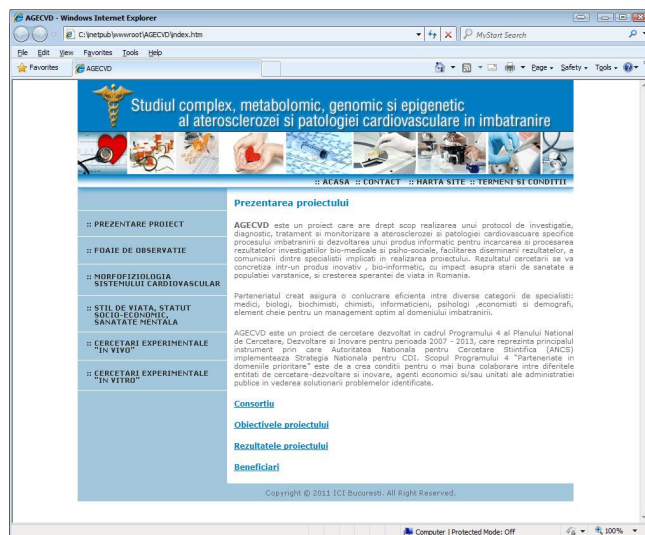
Fig, 3 Main page of AGECVD informatics system

Information provided by this system meet the qualities that gives it a high quality standard, namely: opportunity, timeliness, accuracy, completeness, availability, validity, different ways of presentation.

The performances of this health informatics system take into consideration the user-friendly interface, safety functioning and data, high response time.

It is a system characterized by modularity, flexibility, platform independence, dynamism, accessibility, multidisciplinary, interoperability and it respects the main tendencies of developing the health informatics systems.

This project is feasible because of its complex research methodology, scientific and technical particularities, quality of information, accessibility, high performance, mainly in the research topic of molecular medicine, genomics based methods of investigations and interventional methods and because of the multidisciplinary partnership.

C. Study Case: AgingNice

Anti-aging represents a new concept that tackles the body health from another perspective – the one of preventing and treating the degenerative diseases with a therapeutic protocol elaborated by a team containing all of medical specialties. The result consists in the delaying of the aging process and restoring the vitality of the mature body, but also an aesthetic appearance.

Health promotion for the increasing aging population is an urgent and essential task because evidence indicates that health promotion interventions can extend longevity and improve quality of life. Health informatics systems can play an important role in achieving wellbeing, independent living and delaying of the aging process and restoring the vitality of the mature body. [11]

Multidisciplinary Complex System for the Efficient Management of the Anti-Aging Information (AgingNice) is a research project developed inside the National Research, Development and Innovation Plan for the period 2007-2013, between Sept. 2007 – Dec. 2010.

AgingNice is an open system that is ready to be integrated in the environment of the heterogeneous, comprehensive national information system, available on many platforms and with its capacity to interface with any existing or future applications through direct access or web interface.

The system can be implemented with minimal effort and no special claims regarding the electronic equipment.

The novelty of the project is primarily brought by the approached domain.

Existing web applications in Romania focuses on the cosmetics, aesthetic and pharmaceutical fields of the anti-aging domain, and less on explaining the degenerative processes, prevention and methods of reaching a active and healthy aging.

A project like this one covers the so far insignificant use of ICT in the complexity of the anti-aging domain, focusing on presenting easy to understand information and adapting the communication strategy, according to the response and needs of the beneficiary to whom it is addressed.

Objectives
- creating an environment able to facilitate the knowledge, information and date circulation aiming an efficient management of the anti-aging domain;
- supporting and motivating the actuality of the anti-aging concept and increasing the quality in health systems;
- developing the informational space of the Romanian state of health;
- putting into value the advantages offered by ICT regarding the accessibility of the information in the anti-aging domain.

Methods

AgingNice respects the main tendencies of developing informatics solutions for the health system, emphasizing the interoperability as a must be demand to have an efficient exchange of health data and knowledge.

The used architecture is a Client Server type organized in three tiers and it has a structure composed from elements that can function autonomously, and which architectural requirements were developed both different types of users.

Each module comprises several applications structured on levels for an optimal organization of information, according to the specific aimed objectives and it was qualitatively evaluated for its ability to be linked with the others and for its coverage.

The graphic user interface has an intuitive, ergonomic and friendly feature; it has a unique structure and it allows an easy access to the functions and applications of the system.

Results

AgingNice comprises tools and information concerning anti-aging methods and strategies, clinical and laboratory investigations for aging preventing, anatomical modifications, educational models, self-evaluation tests, defining a personalized demeanor, tendencies in the anti-aging biomedicine, anti-aging campaigns and applications for facilitating the dissemination of the therapeutic protocol, study cases and recent research among the specialists.[12]

AgingNice demonstrates that the information and communication technology has a deep integrator character, both at the level of the information management and at the one of the development of the modern health systems, putting efficiently into value the opportunities offered by a fast accessibility.

Pervasive health education informatics systems generate new challenges for knowledge management, data integration and education with huge benefits for citizen and society.

The multidisciplinary complex system for the efficient management of the anti-aging information (AgingNice) creates favourable conditions for the participation of all at the Information Society, including the groups exposed at risk of exclusion because of their age.
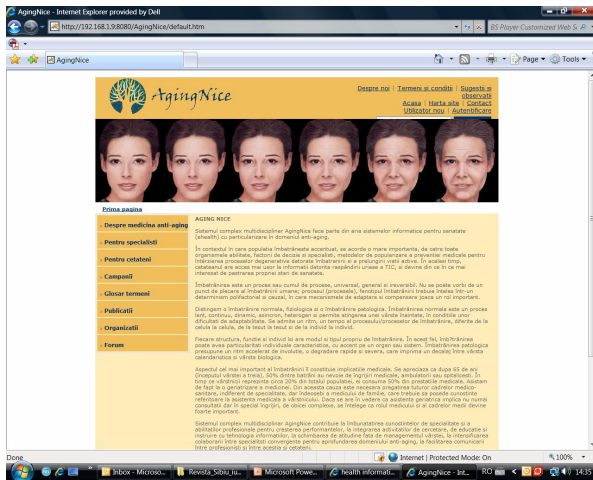
Fig.4 AgingNice – Main page

The use of the information technology in Romania in the anti-aging domain is insignificant and it doesn't cover the specialists' demands and the citizen's need of informing. By presenting cosmetics products, the existing web applications in this area center with priority on the aesthetic aspects of the aging. The physicians are interested in a domain with such implications, but they don't have access to recent and centralized information. The stakeholders at the society level haven't elaborated yet a perspective strategy concerning the prevention in this domain.

Given that the elderly are the biggest consumers of resources in the health system and that their number is growing, we appreciate that AgingNice, through the information provided, structure and purpose can make an important contribution to reduce costs at both individual and at company level. [13]
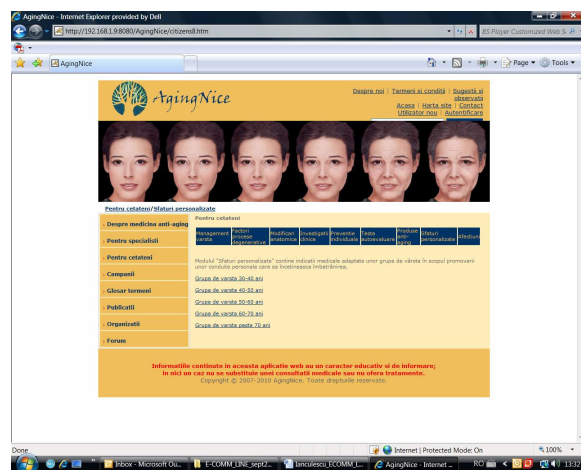

Fig.5 AgingNice – "For Citizen Personalized Advice" Module

The extensive using of AgingNice will have as consequences:

- the recognition of the timeliness and importance of the concept of anti-aging, of the multiple implications of implementing the strategies related to the individual and society as a whole,

- the understanding of the fact that, in terms of economic and financial, it is more effectively to prevent the degenerative diseases than to treat them,
- the improvement of the specialized knowledge and the professional skills for increasing the performances,
- the integration of the research, education and training activities with information technologies,
- the changing of the attitude towards the age management,
- the intensification of the collaboration among convergent specialties for considering thoroughly the anti-aging domain,
- the facilitation of the communication among the professionals and between those and the citizens.

The project emphasizes the disseminating of the results of the relevant research in the aging processes also by using the mobile communications technology to link to the Internet.

VI. OPPORTUNITIES BROUGHT BY AGING-FRIENDLY HEALTH EDUCATION INFORMATICS SYSTEMS

Health Education Informatics Systems (HEIS) can bring important opportunities for a better on quality and access to health knowledge and education. The impact can be direct for citizens, or indirect, by enabling healthcare professionals to improve the quality and efficiency of healthcare that they provide.

Benefits to quality consist in:

- *Informed citizens and health professionals* – they have direct access to data, information and knowledge about their conditions, diagnoses, treatment options and healthcare facilities, to enable them to take effective decisions about their health and lifestyles.
- *Information designed around the citizen* - allows healthcare professionals to have access to more complete and focused information. As a result, they can be more centered-patient in their work.
- *Timeliness of healthcare* - refers to appropriate timing of healthcare. This is not necessarily fast treatment. Information is used to emphasize the importance of preventive medicine to meet citizens' needs.
- *Improved safety* - information contributes to reducing risk, potential injuries and possible harm to patients to be minimised.
- *Effectiveness* - making the best decision on the most appropriate healthcare depends on information about the possible service options and their outcomes, and these can be influenced by HEIS.

HEIS can provide a vision of older people participating fully in decisions about their health and wellbeing and in social and community life.

If health and disability support services are to play their part in enabling older people to live this vision, they need to focus much more on:

- promoting wellness and quality of life to assist older people to age positively

- working together to provide an integrated continuum of care so that an older person is able to access needed services at the right time, in the right place and from the right provider
- providing community-level health care and disability support to enable older people to 'age in place'
- the fact that the patients are increasingly responsible for their healthcare decision-making.
- the emergence and increasing availability of interactive information accessible to consumers.
- guaranteed validity and consistency of the available information.
- using more efficiently the health care resources.
- a strengthening of the physician-patient relationship in which information flows in both directions.
- bridging the digital divide and bringing consumer health informatics to groups that have the greatest need.
- directing consumers to high quality information and to teach them how to assess the quality of information.
- guiding professionals and patients to use health information in educationally appropriate ways.
- developing strategies to ensure high quality standards in the publication of web based consumer health information.

To take full advantage of the opportunities brought by aging-friendly health informatics systems, we have to pay more attention to health literacy go aging and older people.

Health literacy means being able to find, process, and understand basic health information and services needed to make appropriate health decisions. Health literacy is important because low health literacy is linked to poor health outcomes.

However, an international consensus is beginning to emerge to define health literacy as a wide range of skills and abilities, reflecting the extent to which people are able to find, understand, evaluate, communicate, and use health information and concepts to make informed choices, reduce health risks, reduce inequities in healthcare, and increase quality of life in a variety of settings across the life course.

Health literacy is not simply the ability to read. It requires a complex group of reading, listening, analytical, and decision-making skills, and the ability to apply these skills to health situations.

Health literacy varies by context and setting and is not necessarily related to years of education or general reading ability. A person who functions adequately at home or work may have marginal or inadequate literacy in a health care environment. With the move towards a more "consumer-centric" health care system as part of an overall effort to improve the quality of health care and to reduce health care costs, individuals need to take an even more active role in health care related decisions. To accomplish this people need strong health information skills.

Aging persons are often faced with complex information and treatment decisions. Some of the specific tasks aging persons are required to carry out may include:

- evaluating information for credibility and quality,

- analyzing relative risks and benefits,
- calculating dosages,
- interpreting test results,
- locating health information.

In order to accomplish these tasks, individuals may need to be:

- visually literate (able to understand graphs or other visual information),
- computer literate (able to operate a computer),
- information literate (able to obtain and apply relevant information).

Health Education Informatics Systems (HEIS) can make the relevant information more accessible for doctors and other health care professionals and they can make the patients, the average citizens or the aging persons more informed about their own state of health and about the means to preserve it.

VII. CONCLUSIONS

Aging means increased social capital and new attitudes towards the aging people which have changed and significantly differ from recent past.

In this changing society, to achieve a positive aging is an important goal, in order to improve people's well being and the society as a whole.

Aging people are becoming more accustomed to using information society services and at the same time older people are a remarkable consumer group.

Among all technologies, Information Technology is the one that has a direct and constant influence on our lives. Our society is evolving around information technology, it is a "information society", and we are witnessing the emergence of a new culture – the digital culture. [14]

As ICT technology develops and brings new innovations, it will be important to remain focused on the needs of aging users with respect to their computer access and use, and their attitudes towards and acceptance of the technology. Issues such as 'design for all' complemented by participatory design will help to stimulate patient empowerment.

An aging population, increased longevity and co-morbidity of diseases have put enormous pressure on health care systems globally. Innovative ways to address this strain are needed.

By understanding the characteristics, demands and needs of aging people and including them in the design process, medical informatics can be developed to circumvent difficulties, maximize the usability and usefulness of products and technologies, hence supporting successful positive aging.

REFERENCES

[1] Fisk, A. D., Rogers, W. A., Charness, N., Czaja, S. J., & Sharit, J. (2009). *Designing for older adults: Principles and creative human factors approaches*

[2] Ianculescu M., Parvan M.: "*E-health, a Crucial Catalyst for Changing the Future of Aging*", The 31st National Conference on Medical Informatics 2010, pag. 28-34.

[3] Ann Bowling: *The Concepts of Successful and Positive Ageing*, Oxford Journals Medicine & Family Practice, Vol. 10, Issue 4, Pp 449

[4] Decision 1904/2006/EC of the European Parliament and the Council establishing the programme "Europe for Citizens"

[5]   12.10.2006 COM(2006) 571 final COMMISSION COMMUNICATION "The demographic future of Europe – from challenge to opportunity"(page 4)

[6]   http://eur-lex.europa.eu/LexUriServ/site/en/com/ 2007/com2007 _0332 en01.pdf

[7]   Yeunsook Lee, Z Bien, Mounir Mokhtari, Jeong Kim: *Aging Friendly Technology for Health and Independence* (2010) Volume: 6159, Publisher: Springer Berlin Heidelberg, Pages: 263-266,

[8]   Laura Burzagli, Pier Luigi Emiliani, Francesco Gabbanini: *Design for All in action: An example of analysis and implementation*, Published in: l Expert Systems with Applications: An International Journal Volume 36 Issue 2, 2009

[9]   Charness, N., D. C. Parks, et al., Eds. (2001). Communication, technology and aging: opportunities and challenges for the future. New York:, Springer Pub.

[10]   Ianculescu M., Parvan M.: "*E-health, a Crucial Catalyst for Changing the Future of Aging*", The 31st National Conference on Medical Informatics 2010, pag. 28-34.

[11]   Marilena Ianculescu: "*The Imperative Role of ICI for Supporting Aging with Dignity",* The 15th WSEAS International Conference on COMPUTERS" (Part of the 15th WSEAS CSCC Multiconference), pag. 124-128

[12]   Marilena Ianculescu, Monica Parvan, "*Striving After a Truly Citizen-Driven Society in the Age of Aging. Study Case: AgingNice, a Health Education Information System*", The WSEAS International Conference on APPLIED COMPUTING CONFERENCE (ACC')", 2010, TimiVoara, Romania, pag. 49-53.

[13]   Marilena Ianculescu, Monica Parvan, Bogdan Iordache: "*Enhancing the Patient Empowerment Due to the ICT and Ethical Aspects Involved*", The 12th WSEAS International Conference on COMPUTERS (part of the 12th WSEAS CSCC Multiconference) "New Aspects of Computers Part: III", 2008, Heraklion, Greece, pag. 787-792

[14]   Ioana Moisil – *Digital Culture Impact on Education*, LATEST TRENDS on ENGINEERING EDUCATION- 7th WSEAS International Conference on ENGINEERING EDUCATION (EDUCATION '10), 2010