

European Union's Growth Strategy for Healthcare

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The European Union (EU) is investing extensively in healthcare-related research and development as part of its Europe 2020 growth strategy, striving to address such long-term issues as the ageing population and increasing unemployment. Research has been conducted mainly in the areas of understanding chronic disorders—prevalent among people of advanced age—and medical system efficiency. There has also been research on developing new drugs and developing methodologies, tools, and technologies to deliver healthcare adapted to individual needs such as personalised medicine and telemedicine. Horizon 2020, a new framework programme that began in January 2014, builds on previous research on advanced medical technology and includes many open projects related to information and communications technology (ICT) that are focusing on self-reliance support for the elderly, patient self-management, integrative care systems, new diagnostic aids, and other topics. Such efforts are directed toward reducing healthcare costs through the enhancement of data-based medical technology, personalised medical care, and home care systems. In addition, they should generate more employment by creating a data-based healthcare industry. In tandem with the EU's healthcare growth strategy, Fujitsu Laboratories is conducting joint research in Ireland, together with Fujitsu Ireland, to leverage daily health-related data to improve both disease prevention and illness management. This paper presents a summary of research programmes in relation to the EU healthcare growth strategy in terms of their structures and scope, followed by accounts of the joint research project currently being conducted in Ireland by the authors.

1. Introduction

In Europe, social and economic issues due to ageing are looming larger than ever. The inherent tendency of Europeans to live in nuclear families meant that the rate of ageing was higher in European countries such as Italy, the UK, and Germany than in Japan up until 1995.¹⁾ Therefore social systems were already introduced in the 1970s to facilitate independent living and at-home nursing, before corresponding measures were implemented in Japan. To give one example, Denmark has introduced a system of 24-hour at-home care for one region's elderly residents (in public rented accommodation) based on the theory of separation between living and care. This enabled support for "Ageing in place," whereby people can live independently and with dignity while using home care optimised to changes in their situation as they get older, enabling them to live for as long as possible in the same region.²⁾

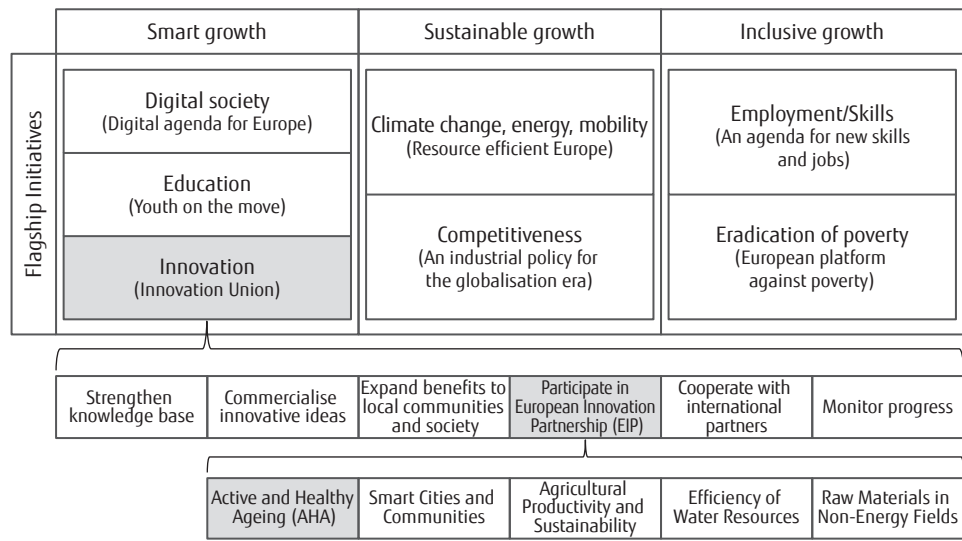
The idea of using information and communications technology (ICT) to provide innovations and solutions for the widespread implementation of this sort of 24-hour home care has recently been gaining momentum.

This paper introduces the recent growth strategy and research project trends in the European Union (EU) and summarises the latest healthcare research trends in the EU. It also introduces the activities of the joint research project in Ireland in which we are participating.

2. Previous EU healthcare growth strategy

This section presents an overview of the growth strategy that the EU has been pursuing and how it relates to earlier policies and shows the interrelationships between market-oriented programmes.

To establish guidelines for the resolution of long-term issues such as the ageing population and growing



Preparation based on references 3) and 4)

Figure 1
Europe 2020 strategy (excerpt centred on healthcare-related issues).

unemployment, the EU devised the Europe 2020 strategy³⁾ encompassing both the economy and society. Europe 2020 includes seven flagship initiatives addressing three priority issues—“Smart growth,” “Sustainable growth,” and “Inclusive growth.” One of these initiatives is “Innovation,” which comprises six core themes including the European Innovation Partnership (EIP).^{note 1)} Healthcare-related measures are being implemented by the Active and Healthy Ageing (AHA) Partnership⁵⁾ ^{note 2)} under the control of the EIP. It has taken on a challenging goal: achieving a two-year increase in average life expectancy among EU citizens by 2020 (**Figure 1**,

shaded portions).

The interrelationships between the programmes in the AHA Partnership are described below. By 2013, three programmes had been implemented: the Seventh Framework Programme (FP7),^{note 3)} the Ambient Assisted Living Joint Programme (AAL JP),^{note 4)} and the Competitiveness and Innovation Framework Programme (CIP).^{note 5)} The relative positioning of these programs is illustrated in **Figure 2**. They are arranged along two axes representing their corresponding policy areas and the time to market for their products, services, and systems. Programmes further to the left have a more prominent research aspect, so their products, services, and systems will take longer to reach the market. The products, services, and systems of programmes further to the right are closer to becoming commercialised. The products, services, and systems of FP7 are more research-oriented (5–10 years to market), those of CIP are more market-oriented (commercialisation imminent),

note 1) One of the six key themes of Innovation Union—one of the flagship initiatives at the core of Europe 2020. It focuses on major social issues such as energy security, transportation, climate change, and resource efficiency, so a platform consisting of industry, government, and academic stakeholders was set up so that all the parties involved could work together on such issues as regulating investment, promoting standardization, and stimulating demand. To date, partnerships have been launched in five fields—Active and Healthy Ageing, Smart Cities and Communities (SCC), Agricultural Productivity and Sustainability, Efficient Water Resources, and Raw Materials in Non-Energy Fields.

note 2) A programme for ageing healthily while continuing to participate in society without any reduction in quality of life.

note 3) A research framework programme that supported research, development, and demonstration activities from 2007 to 2013.

note 4) A funding programme aimed at enhancing the quality of life of older people and strengthening the industrial base in Europe through the use of ICT that ran from 2008 to 2013.

note 5) A programme aimed at strengthening innovation and industrial competitiveness and supporting ICT policies that ran from 2007 to 2013.

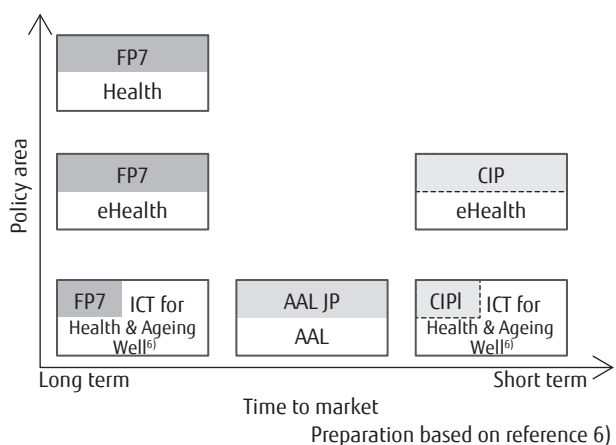


Figure 2
Positioning of FP7, AAL JP, and CIP in AHA partnership.

and those of AAL JP are somewhere in between.

FP7 targeted many research fields, including ICT, health, transportation, nanotechnology, energy, and the environment. It had a total budget of €53.2 billion, including €9.11 billion for ICT and €6.05 billion for health. Regarding ICT, to which this paper relates, the aim was to create an ICT future in which the EU has stronger industrial competitiveness that meets the requirements of society and the economy. Regarding health, the aim was to enhance the competitiveness of health-related corporations and businesses and thereby improve the health of EU citizens and tackle global health issues.

AAL JP focuses on the utilisation of ICT for health-care and the support of independent living (total budget: €0.7 billion).

CIP (total budget: €3.62 billion) is aimed at supplementing FP7 by focusing on strengthening innovation and industrial competitiveness. The ICT Policy Support Programme (total budget: €0.73 billion) was related to healthcare and promoted innovation through the widespread introduction of and investment in ICT.

The large budget for the FP7 programme, which had the longest time to market, shows that the EU is focused on cutting-edge research in the healthcare field, which takes a long time to commercialise.

The projects tackled in each programme are listed in **Table 1**. The main research themes can be grouped into three categories:

- 1) Understanding chronic diseases and other ailments

Table 1
Projects and details.

Project	Details
[FP7] Health	Research related to aging, human development, and neurological diseases, and research related to drug discovery for the treatment of chronic diseases such as cardiovascular disease, diabetes, and cerebral vascular disease
[FP7] eHealth	Researching the use of ICT for purposes such as disease management including rehabilitation from chronic diseases and health guidance based on personalised health management
[FP7] ICT & Ageing well	Advanced research using ICT to help people grow old while continuing to live independently and enjoy a high quality of life
[AAL-JP] AAL	Various studies aimed at improving the quality of life for the elderly and using ICT to strengthen the EU's industrial base
[CIP] eHealth	Researching the management of lifestyle and disease, including telemedicine, personal health records, health status monitoring, and rehabilitation, in a large-scale demonstration experiment
[CIP] ICT & Ageing well	Using existing ICT to perform large-scale verification trials for the elderly, with a focus on evidence gathering and business model construction

- 2) Resolving issues related to drug discovery and improving the efficiency of medical systems
 - 3) Developing methodologies, tools, and technologies for personalised medicine and telemedicine
- These research themes were inherited by the research framework of the Horizon 2020 programme that started in January 2014.

3. Long-term healthcare strategy—Horizon 2020

The Horizon 2020 programme aims to connect innovation to economic growth, and employment. The total budget for its seven-year life is €77 billion (2014–2020).

One big difference with Horizon 2020 is its integrated framework (**Figure 3**). Unlike the FP7, CIP, and AAL JP divisions in the previous AHA Partnership (**Figure 2**), the Horizon 2020 programme integrates programmes that are regarded as being strongly innovative and close to market. This enables funding to be allocated by concentrating on the identification of research that will bring added value to the EU. This

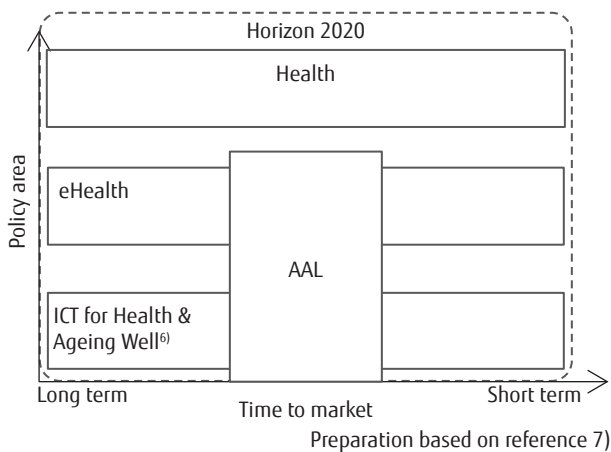


Figure 3
Positioning of Horizon 2020 in AHA partnership.

integration strategy clarifies the way forward to commercialisation of R&D results and its effect on the market.

The background of this change is that while FP7 played an important role by using strengthened industrial competitiveness and world-level research funding, to lure researchers to the EU and keep them in the region, a limited number of projects showed positive economic and social benefits.

As shown in **Figure 4**, the Horizon 2020 strategy comprises three pillars, “Excellent Science,” “Industrial Leadership,” and “Societal Challenges,” and they rest on four foundation elements: “Science with and for Society,” “Spreading Excellence and Widening Participation,” “European Institute of Innovation and Technology (EIT),” and “Euratom.” The strategy for healthcare is included in “health, demographic change, and wellbeing” in “Societal Challenges.” The total budget for efforts related to “health, demographic change, and wellbeing” is €7.5 billion,⁴⁾ or about one-tenth the total budget for Horizon 2020, making it the one of the largest components of the wide-ranging Horizon 2020 project, so there are high expectations that this strategy will contribute to solving healthcare-related problems.

The aim of the healthcare programme is to discover solutions for the construction of a high-quality, economically sustainable medical framework. At the same time, by providing people of working age with employment opportunities, it also aims to contribute to increasing the rate of employment,⁸⁾ which is one of

the primary aims of Europe 2020.

The “Health, demographic change, and wellbeing” programme can be broadly classified into three areas.

1) Personalised healthcare

Create opportunities for breakthrough research and ground-breaking inventions that will help ageing people continue to live healthy and socially active lives.

2) Joint health-related activities

Promote activities related to the coordination of research performed at the national or regional level in EU member states and associated countries (ERANET system) and activities related to cooperative programmes such as the Joint Programming Initiative (JPI).^{note 6)}

3) Other health-related actions

Conduct other activities outside the first two areas, such as accepting subscription payments and programme evaluation bids and working on stem cell research implementation.

Personalised healthcare has been classified into seven categories:

- 1) Understanding health, aging, and disease
- 2) Effective health promotion, disease prevention, preparedness and screening
- 3) Improved diagnosis
- 4) Revolutionary treatments and technologies
- 5) Advances in active and healthy aging
- 6) Integrated, sustainable, people-centred care
- 7) Improving the provision of evidence and the extraction of health information and data in compliance with health policies and regulations

These categories indicate that, in addition to cutting-edge medical care, there are many opportunities for the use of ICT, such as to support new diagnostic support methods, to integrate care systems with self-support, and to enable self-management by the elderly.

There are specific keywords related to cutting-edge medicine and medical equipment for the first four categories: 1) systems medicine, 2) omics, 3) devices and images, and 4) regenerative medicine. The keywords associated with the last three categories are related to ICT: 5) using ICT for independent support services and dementia solutions, early risk detection, and intervention,

note 6) A long-term public-private partnership to strengthen technology in specific areas.

Excellent Science	Industrial Leadership	Societal Challenges
European Research Council	Leadership in Enabling and Industrial Technologies	Health, Demographic Change and Wellbeing
Future and Emerging Technologies	Access to risk finance	Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy
Marie Skłodowska-Curie actions	Innovation in SMEs	Secure, Clean and Efficient Energy
European Research Infrastructures, including e-Infrastructures		Smart, Green and Integrated Transport
		Climate Action, Environment, Resource Efficiency and Raw Materials
		Europe in a changing world – Inclusive, innovative and reflective societies
		Secure societies – Protecting freedom and security of Europe and its citizens
Science with and for Society		
Spreading Excellence and Widening Participation		
European Institute of Innovation and Technology (EIT)		
Euratom		

SMEs: Small and medium-size enterprises
Preparation based on reference 4)

Figure 4
Horizon 2020 strategy.

6) integrated care systems, patient empowerment, and illness self-management linked with mobile health (mHealth)^{note 7)} and electronic health records (EHR), decision support systems for patients based on predictive models, and eHealth services, and 7) digital representations of health data for improved diagnosis and treatment. In each case, specific solutions have been sought by using ICT to ascertain, share, and predict the patient's health condition.

Therefore, the EU's long-term healthcare strategy involves tackling major unresolved social issues in Europe 2020 and systematically organizing a framework whereby individual specific issues can be represented by Horizon 2020. By investing heavily in R&D, Europe is looking for a way to show how things should be done in the pursuit of a framework for changing social structures in order to resolve issues. At the same time, to promote the implementation of these principles, basic research and market-oriented demonstrations are being performed in a single mechanism involving various member states and businesses with

note 7) Health and medical services that use mobile devices.

the aim of using innovation to transcend the confines of existing industries and fields.

4. Activities in Ireland

Finally, we present the current research efforts of Fujitsu Laboratories related to the EU's healthcare growth strategy. We define ICT in the field of healthcare as "data medicine," and our objective is to identify ways to applying daily health information to help with disease prevention and illness management,⁹⁾ in addition to genetic information and conventional data obtained from medical testing and diagnosis.

As part of this research, Fujitsu Laboratories and Fujitsu Ireland have been working together since July 2013 in partnership with two Irish research organisations (INSIGHT^{note 8)} and CASALA^{note 9)}) to develop sensing and analysis techniques for the detection of

note 8) A research center established by the Science Foundation Ireland (SFI) primarily for the purpose of data analysis.

note 9) Established and operated in the Great North Haven, an experimental smart house equipped with a sensing environment.

abnormalities in people's behaviour and health. The aim is to find ways to implement the data medicine so that medical care can be extended into the everyday lives of patients.

We are monitoring the daily activities of elderly patients living in smart houses through the use of wearable sensors and various types of sensors embedded in the home environment. In particular, we are working on ways to combine human health condition evaluation techniques with data collection tools that can be used in the home for long periods of time in order to obtain data that can be used to measure the therapeutic effects of a certain treatment, which have hitherto been difficult to measure. So far, we have collected approximately 1350 hours of data from a total of 14 patients. Our analysis of this data has shown that it is possible to detect abnormal movements in everyday activities and that sensing and monitoring people's everyday activities can help in the provision of healthcare. We believe that the technology we developed may promote the speedy recovery of patients by enabling them to visualise and grasp the improvements they have made during convalescence. Furthermore, this technology should help reduce medical costs, thereby providing one approach to solving social issues associated with medical care in the EU.

5. Conclusion

We have presented an overview of two healthcare growth strategies implemented by the EU: the Europe 2020 growth strategy (2007–2013) and the Horizon 2020 research framework programme (started in January 2014). Under the aim of the Horizon 2020 programme to increase the average life expectancy of EU citizens by two years by 2020, the use of ICT is expected to facilitate advanced, individually targeted medical care based on collected data, enabling the delivery of medical care at the patient's home and other such revolutionary solutions that reduce medical costs. We also introduced a joint research project that we are conducting in Ireland with the aim of actualizing "data medicine."

Finally, we would like to thank Rodd Bond, director of the Netwell Centre at the Dundalk Institute of Technology, who advised us on healthcare-related research systems in the EU during the writing of this paper.

References

- 1) Ministry of Internal Affairs and Communications: The use of ICT in a super-aging society (in Japanese). <http://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h25/pdf/n2300000.pdf>
- 2) Y. Matsuoka: Denmark's policies on housing and care for the elderly (in Japanese). <http://www.ipss.go.jp/syoushika/bunken/data/pdf/18879306.pdf>
- 3) European Commission: Europe 2020. http://ec.europa.eu/europe2020/index_en.htm
- 4) JETRO: EU innovation policy trends (in Japanese). <http://www.jetro.go.jp/jfile/report/07001720/07001720.pdf>
- 5) European Commission: INNOVATION UNION, A Europe 2020 Initiative. http://ec.europa.eu/research/innovation-union/index_en.cfm?section=active-healthy-ageing
- 6) L. Gatzoulis: The European Innovation Partnership on Active and Healthy Ageing & the KICs. The European Commission. <http://errinetwork.eu/sites/default/files/AHA%20Loukianos%20Gatzoulis%20CION.pdf>
- 7) I. Iakovidis: ICT for Health and Ageing Well. The European Commission. http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=3714
- 8) European Commission: EUROPE 2020 TARGETS: EMPLOYMENT RATE. http://ec.europa.eu/europe2020/pdf/themes/18_employment_target.pdf
- 9) A. Inomata and Y. Yaginuma: Hassle-free Sensing Technologies for Monitoring Daily Health Changes. *FUJITSU Sci. Tech. J.*, Vol. 50, No. 1, pp. 78–83 (2014). <http://www.fujitsu.com/global/documents/about/resources/publications/fstj/archives/vol50-1/paper13.pdf>



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