eHealth portfolio of projects

SIXTH RESEARCH AND DEVELOPMENT FRAMEWORK PROGRAMME 2002-2006

September 2007

European Commission
Information Society and Media

ICT for Health

Portfolio of the eHealth Projects in the FP6

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Project coordinators

The projects kindly provided the material needed for the intention of this portfolio. Every project contains detailed information on each project consortia and the project coordinators. The list of projects as well as the list of participants can be found in the annexes (page 151).

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Introduction

The aim of Information and Communication Technologies (ICT) for Health (also known as eHealth) is to significantly improve the quality, access and efficacy of healthcare. ICT for Health describes the application of information and communication technologies across the whole range of functions that affect the health sector. The European Commission has been supporting research activities in ICT for Health for almost two decades. This has placed Europe in a leading position in the use of regional health networks, electronic health records in primary care and deployment of health cards. These developments have contributed to the emergence of an eHealth industry.

This booklet presents a compilation of the research projects managed by the ICT for Health Unit of the Information Society and Media Directorate General. The projects are funded under the Sixth Framework Programme for Research Development and Demonstration (FP6). It also explores in brief detail the proposed and potential future directions of the ICT for Health Unit, particularly under the umbrella of the Seventh Framework Programme (FP7).

The projects are grouped in three broad thematic areas, Personal health management systems and services based on biosensors, Tools for health professionals and Biomedical Informatics. The projects are listed in alphabetical order and each thematic area is identifiable by a colour.

The Information Society and Media Directorate General

The Information Society and Media Directorate General (DG) of the European Commission is playing a key role in implementing the vision outlined by Europe's heads of state in Lisbon, 2000: to make Europe the world's most competitive and dynamic economy, characterised by sustainable growth, more and better jobs and greater social cohesion, by 2010.

For the period 2003-2006, policy initiatives undertaken by Information Society and Media DG were underpinned by the eEurope 2005[1] Action Plan. The Action Plan is a high-level policy accelerator that focused attention on and pushed forward progress in seven eEurope policy priorities: Broadband services, eBusiness, eGovernment, eHealth, eInclusion, eLearning, and Security provision for information systems and services.

It aimed to develop modern public services and a dynamic environment for electronic business through widespread availability of broadband access at competitive prices and a secure information infrastructure.

eEurope 2005 Action Plan was replaced by the i2010 initiative, announced by the Commission on June 1, 2005. It was the first Commission initiative to be adopted under the renewed Lisbon strategy following the mid term review. i2010 is a comprehensive strategy for modernising and deploying all European Union (EU) policy instruments to encourage the development of the digital economy including regulatory instruments, research and partnerships with industry.

i2010 provides an integrated approach to information society and audio-visual policies in the EU, covering regulation, research, and deployment and promoting cultural diversity. It will look for fast and visible results, building on an optimistic outlook for ICT industries and markets. It encourages fast growth around convergence of networks, services and devices. Its objective is to ensure that Europe's citizens, businesses and governments make the most effective use of ICT to improve industrial competitiveness, support growth and the creation of jobs and to help address key societal challenges. Under i2010, the Commission outlines three policy priorities:

- to create an open and competitive single market for information society and media services within the EU.

[1] The eEurope 2005 Action Plan was launched at the Seville European Council in June 2002 and endorsed by the Council of Ministers in the eEurope Resolution of January 2003

To support technological convergence with "policy convergence", the Commission will propose: an efficient spectrum management policy in Europe (2005); a modernisation of the rules on audiovisual media services (end 2005); an updating of the regulatory framework for electronic communications (2006); a strategy for a secure information society (2006); and a comprehensive approach for effective and interoperable digital rights management (2006/2007).

- to increase EU investment in research on ICT by 80%. Europe lags behind in ICT research, investing only €80 per head as compared to €350 in Japan and €400 in the US. i2010 identifies steps to put more into ICT research and get more out of it, e.g. by trans-European demonstrator projects to test out promising research results and by integrating small and medium sized enterprises better in EU research projects.
- to promote an inclusive European information society. To close the gap between the information society "haves and have nots", the Commission will propose an Action Plan on e-Government for citizen-centred services (2006); three "quality of life" ICT flagship initiatives (technologies for an ageing society, intelligent vehicles that are smarter, safer and cleaner, and digital libraries) making multimedia and multilingual European culture available to all (2007); and actions to overcome the geographic and social "digital divide", culminating in a European Initiative on eInclusion (2008).

Sixth Framework Programme Research and Development

European research activities are structured around consecutive multi annual programmes, or so-called Framework Programmes for Research, Technological Development and Demonstration (RTD). The Sixth Framework Programme (FP6) sets out a number of priorities – (which includes the Information Society Technology (IST) Priority) for the EU's research, technological development and demonstration activities for the period 2003-2006. This booklet describes co-financed projects that are falling within the domain of ICT for Health during this timeframe.

These priorities have been identified on the basis of a set of common criteria reflecting the major concerns of increasing industrial competitiveness and the quality of life for European citizens in a global information society.

The IST thematic priority of the FP6 research and development programme has contributed directly to realising European policies for the knowledge society as reflected in the eEurope 2005 Action Plan, the immediate forerunner of the i2010 initiative.

The strategy adopted in Lisbon 2000 was for an accelerated transition to a competitive and dynamic knowledge economy capable of sustainable growth, with more and better jobs and greater social cohesion. This required wider adoption, broader availability and an extension of IST applications and services in all economic and public sectors and in society as a whole. Information Society Technologies are the key underlying technologies for easier and more efficient knowledge creation, sharing and exploitation.

The objectives of IST in FP6 are to ensure European leadership in generic and applied technologies at the heart of the knowledge economy. It aims to increase innovation and competitiveness in European businesses and industry and to contribute to greater benefits for all European citizens.

Overall, the focus of IST in FP6 is on the future generation of technologies in which computers and networks will be integrated into an everyday environment, rendering accessible a multitude of services and applications through easy-to-use human interfaces. This vision of ambient intelligence places individual users at the centre of future developments for an inclusive knowledge-based society for all.

This research effort reinforces and complements the eEurope 2005 objectives and looks beyond them to the i2010 goals of the EU of bringing IST applications and services to everyone, in every home and every school, and to every business.

The Community support for IST in FP6 has helped mobilise the industrial and research community around high-risk long term goals. It has facilitated the aggregation of public and private research efforts on a European scale and enabled the development of a European Research Area (ERA) in IST.

ICT for Health participation in FP6

The mission of the ICT for Health Unit is to contribute to the better health status and well-being of all European citizens, to bring economic and productivity benefits to the health systems of all Member States, and to stimulate growth and competitiveness of the eHealth industry in Europe.

The driving vision of the Unit is the concept of an ICT-enabled citizen centred health delivery system, with special emphasis on prevention of diseases and personalisation of care.

The ICT for Health Unit has been directly involved in calls one and four. Those calls included a dedicated so-called "strategic objective" relevant to eHealth.

The Unit was also involved in co-operation with the Directorate General for Research (DG RTD) in the second Call on Nano-technologies and nanosciences, knowledge-based multifunctional materials, and new production processes and devices (NMP). Finally, the Unit participated in setting strategic objectives in both the third and the sixth Calls.

FP6, Call 1 - eHealth

This Call covered two topics which represent a continuity with the Fifth Framework Programme (FP5), and a new topic of growing interest called Biomedical Informatics. The focus of the Call was:

Personal Health Systems:

• to develop smart and wearable biosensor technology (intelligent clothing and textiles) and implants that interact and communicate with other systems and patient's points of healthcare for the constant monitoring of health concerns resulting in better management of health problems and improved disease prevention and treatment of patients,

Decision Support Systems:

• to develop ICT systems to support health knowledge management, interoperability of health information sources; medical ontologies; clinical guidelines development; methods for decision support and risk analysis evidence based medicine, and risk management,

Biomedical Informatics:

• to develop and promote knowledge in the areas of medical informatics and bioinformatics that enable disease prevention and therapy, and the development of tools enabling the individualisation of diagnoses and treatment.

The enormous interest in and the growing maturity of the sector was reflected in the huge number of proposals received in response to the publication of Call 1.

A total of 175 proposals were received for a total cost of over €1.2 billion and requesting a total grant of €915.1 million. Twenty proposals were subsequently selected, negotiated and awarded a contract. Four of them – two integrated projects: CLINICIP and MYHEART, and two specific targeted research projects: INTREPID and AUBADE were in the field of Personal Health Systems. Three networks of excellence were funded with the objective of structuring the research community in the field of Biomedical Informatics. The remainder addressed tools for health professionals for risk management and patient safety.

The table below lists the funded projects.

Project Acronym	Project n°	Instru-ment	EC funding
ALLADIN	507424	STREP	3.300.000
AMICA	507048	STREP	2.649.996
ARTEMIS	002103	STREP	1.989.000
AUBADE	507605	STREP	2.000.000
BIOPATTERN	508803	NoE	6.400.000
CARDITIS	507170	STREP	2.200.000
CARE-PATHS	507017	STREP	2.200.000
CLINICIP	506965	IP	7.500.000
COCOON	507126	IP	6.700.000
DICOEMS	507760	STREP	2.000.000
DOC @ HAND	508015	STREP	2.999.850
INFOBIOMED	507585	NoE	4.850.000
INTREPID	507464	STREP	2.000.000
MYHEART	507816	IP	16.000.000
NOESIS	507960	IP	4.400.000
PALLIANET	507863	STREP	2.350.000
PIPS	507019	IP	9.847.255
SEMANTIC MINING	507505	NoE	5.000.000
TACIT	507691	STREP	2.500.000
TMA-BRIDGE	507871	SSA	550.000
Total 20			€ 87.436.101

FP6, Call 2 - IST/NMP Joint Call - Bio-sensors for Diagnosis and Healthcare

This call, which was jointly managed by the Directorate General for Research and the Directorate General for Information Society and Media, involved 3 Units.

The long-term objective was the development of new medical instruments and/or intelligent diagnosis equipment for healthcare of the future, using advanced biosensors. Innovative biomedical sensing systems can, in combination with information technologies, offer both a reliable and easy-to-use basis for cost effective healthcare systems. The focus of the Call was on:

- Research to support the development of technological demonstrators that offer enhanced diagnostic capabilities meeting requirements of cost and disposability. Proposals were required to take into account all aspects of the development life cycle of biomedical sensors and health monitoring systems including clinical validation, networking and communication capabilities.
- Radical improvement of sensitivity, accuracy, precision, stability, selectivity, reproducibility, reliability, cost and where necessary sterilisation and biocompatibility of bio-sensing systems.
- Integration activities aiming at exploring recent advances in the fields of NMP, IST and molecular biology for increasing molecular recognition and cellular recognition capacities, thus supporting the development of the next generation of molecular recognition and cellular recognition devices.

[5] Associated Candidate Countries of the EU: Bulgaria, Romania and Turkey.

- Activities addressing health issues in a holistic manner using and/or including the development of bio-sensor-based integrated systems (non-invasive or minimally invasive, with embedded data treatment and networking/communication capabilities) allowing interactions with their environment and implementing the vision of ambient intelligence.

19 proposals were awarded a contract of which the ICT for Health Unit was attributed one Integrated Project (IP) – SMARTHEALTH and one Specific Targeted Research Project (STREP) – MicroActive.

Project Acronym	Project n°	Instrument	EC funding
MicroActive	017319	STREP	1.600.000
SMARTHEALTH	016817	IP	12.298.211
Total 2			€ 13.898.211

FP6, Call 3

The objective of the third Call were to launch complementary accompanying actions (a) to improve the participation of organisations from the New Member States and the Associated Candidate Countries[5], (b) to prepare for future international co-operations, and (c) to improve the networking and co-ordination of national, regional and European research activities.

(a) The focus was on (i) the establishment and reinforcement of networks of research organisations from the New Member States and the Associated Candidate Countries with organisations from the other Member States, (ii) information and awareness events, and (iii) the promotion of research competencies in the New Member States and the Associated Candidate Countries. Activities were expected to have a pan-European focus on thematic issues related to one or several IST strategic objectives, including eHealth.

(b) The focus was (i) to enable European researchers to access knowledge, skills, technology and facilities available outside the EU, (ii) to strengthen Europe's participation in international research and development activities and accompanying measures, and (iii) to exploit research and development and policy complementarities so as to explore mutual benefits of the co-operation and increase access to market opportunities. Again, activities were expected to focus on thematic issues related to one or several IST strategic objectives, including eHealth.

(c) Support was provided for the improved networking and co-ordination of national, regional and European research policies, programmes and funding schemes related to one or several IST strategic objectives, aiming at improved integration of European IST research.

Three projects from the first and second objectives were selected and attributed to the ICT for Health Unit.

A fourth project, called EPIST, was attributed to the eInclusion Unit. It is a Specific Support Action (SSA) which encourages the organisation of brokering events for New Member States and Associated Candidate Countries in order to stimulate interest of eventual partners from these countries in involvement in FP6 and Seventh Framework Programme (FP7) projects in both eHealth (to which half of its resources are allotted) and eInclusion.

Project Acronym	Project n°	Instrument	EC funding
@Health	015886	SSA	344.000
eHealth ERA	015854	CA	950.000
Symbiomatics	015862	SSA	550.000
Total 3			€ 1.844.000

FP6, Call 4 - Integrated biomedical information for better health

This call for proposals provided continuity with the research investment in Biomedical Informatics started in Call 1 of FP6.

Its main objective was to support research and development on innovative ICT systems and services that process, integrate and use all relevant biomedical information aimed for improving health knowledge and processes related to prevention, diagnosis, treatment, and personalisation of health care. The focus of the Call was on

- Methods and systems for improved medical knowledge discovery and understanding through integration of biomedical information (e.g. using modelling, visualisation, data mining and grid technologies). For the purpose of the call, biomedical information include not only clinical information relating to tissues, organs or personal health-related information but also information at the level of molecules and cells, such as that acquired from genomics and proteomics research.
- Innovative systems and services for disease prevention, diagnosis and treatment based on integrated biomedical data and information on several levels (molecular, cellular, tissue, organ and person levels). The work is supposed to exploit advances in cognitive modelling, grid, mobile, imaging and micro- and nanotechnologies (such as wearable health monitoring technologies) and should lead to new approaches in disease prevention, early diagnosis, pharmaceutical research (e.g. drug development, use of information from clinical trials), enhancement of patient safety (e.g. prevention of adverse drug events), and support the personalisation of healthcare and improve / enhance / benefit to lifestyle management. The proposed systems and services should demonstrate measurable benefits, respect all aspects of confidentiality and privacy and be user friendly.

In addition, the Call focused on specific support actions and coordination actions. These should focus on developing roadmaps for research and developments in ICT for health, leading to recommendations for actions and to preparatory actions at European level.

The Call asked for research and development roadmaps in the following areas:

- Interoperability of eHealth systems,
- Development of an *in silico* model of a human being (virtual human),
- Beneficial uptake of HealthGrid technologies and applications for health research and health care services.

Finally, proposals were also called to co-ordinate and support the implementation to the Action Plan of the eHealth Communication COM(2004)356, including setting up of expert groups of Member States representatives, related to their relevant national authority, to support the coordination and development of national roadmaps for the take-up of eHealth systems and services.

A total of 147 proposals were received for this strategic objective, requesting a total grant of M€522.5. 16 specific targeted research projects, 3 specific support actions, 2 coordination actions and 3 integrated projects proposals were successful in the evaluation.

After the usual negotiations, the 24 contracts were awarded.

Project Acronym	Project n°	Instrument	EC funding
@neurIST	027703	IP	12.605.239
ACGT	026996	IP	11.887.000
ASSIST	027510	STREP	2.630.000
DESSOS	027252	STREP	3.981.216
EuResist	027173	STREP	2.143.000
HealthAgents	027214	STREP	3.791.270
Health-e-Child	027749	IP	12.186.270
HEARTFAID	027107	STREP	2.089.759
I-KNOW	027294	STREP	3.092.810
ImmunoGrid	028069	STREP	1.951.042
LHDL	026932	STREP	2.250.520
MATCH	027266	STREP	2.015.033
MULTI-KNOWLEDGE	027106	STREP	2.440.000
NEUROWEB	518513	STREP	1.883.500
OFSETH	027869	STREP	2.324.353
Q-REC	027370	SSA	1.299.000
RIDE	027065	CA	1.156.266
SeaLife	027269	STREP	2.228.043
SemanticHEALTH	027328	SSA	968.860
SHARE	027694	SSA	980.000
SIMAP	027265	STREP	3.126.662
STEP	027642	CA	1.185.360
ViroLab	027446	STREP	3.334.840
WOUNDMONITOR	027859	STREP	1.665.687
Total 24			€ 83.215.730

FP6, Call 4 - Integrated Strengthening the Integration of the ICT research effort in an Enlarged Europe

The objective of this Call was to develop and validate innovative and efficient ICT-based systems and services in key application areas for the social and economic development of an enlarged Europe, with a view to strengthening the integration of the IST European Research Area.

eHealth was one of the application areas. Proposals were called for on research and development on advanced ICT-based eHealth systems and services focusing on: integrated health information systems; intelligent environment for health professionals, and online health services for patients and citizens. Proposed applications were expected to exploit advances in networking and mobile communications and ensure interoperability with existing networks. Moreover, eHealth applications were supposed to build on best practices established throughout Europe and ensure that all aspects of patient confidentiality and privacy were properly addressed.

29 proposals were received in the eHealth application area. Four proposals were successful in the evaluation and were awarded a contract.

An additional project (iWeb care) is supported by the eGovernment Unit. It focuses on preventing monetary mismanagement in the administrative application of several public services, one of which is eHealth.

Project Acronym	Project n°	Instrument	EC funding
HEALTH-PLUS	027126	STREP	2.200.000
RIGHT	027299	STREP	1.942.000
K4CARE	026968	STREP	3.133.785
SAPHIRE	027074	STREP	2.040.775

Total 4 € 9.316.560

FP6, Call 6 - Ambient Assisted Living for the Ageing Society

The ICT for Health Unit is involved in the Ambient Assisted Living strategic objective of Call 6 of FP6.

The aim of the Call was to extend the length of time for which elderly people can live independently in their preferred environment using the support offered by ICT solutions. It targeted the needs of individual elderly persons, their families and caretakers, rather than the health care institutions. This includes assistance to carry out daily activities, the monitoring of health and day to day activities and enhancing patient safety and security. It also covered means to improve access to social, medical and emergency services, and to facilitate social contacts as well as access to context based infotainment and entertainment.

Research will aim at highly innovative ICT-based solutions that are cost effective, reliable and user-friendly for assisted living. They will take into account design-for-all principles, where applicable. It will lead to integrated environments that bring together progress in various ICT building blocks and respond to key user requirements.

22 proposals were received in the eHealth application area. Three proposals were successful in the evaluation and were awarded a contract.

Project Acronym	Project n°	Instrument	EC funding
Caalyx	045215	STREP	1.850.000
Emerge	045056	STREP	2.449.964
Oldes	045282	STREP	2.500.000

Total 3 € 6.799.964

Future Activities of the ICT for Health

Working towards the Seventh Framework Programme

During FP6, ICT for Health began supporting research on systems for improving our understanding of diseases and enabling greater involvement of citizens in healthcare delivery.

These efforts have been the stepping stones to the support of ICT for Health activities under the Seventh Framework Programme (FP7). FP7 aims to support the change in the way healthcare is delivered and the way medical knowledge is managed and transferred to clinical practice.
This change entails a two-fold paradigm shift:

a) from **symptom-based** to **preventive healthcare** and
b) from **hospital-centred** to **person-centred** health systems.

Realising this paradigm shift will ensure continuity of care at all levels, from prevention to rehabilitation, and at all places where citizens/patients may need care, whether inside clinical settings or in their ordinary living and working environments. It will also enable the provision of personalised care, from lifestyle and health management to customised medicines and treatment.

As healthcare is an information-intensive domain, ICT for Health can be instrumental in supporting this paradigm shift by developing systems and services to:

- ***accelerate the advancement*** of medical knowledge and ***improve the understanding*** of disease related processes;
- ***empower citizens*** to become actively involved in managing their own health;
- ***improve*** the ***prevention*** and ***early diagnosis*** of many diseases, thus reducing overall healthcare costs and improving citizens' quality of life;
- ***enhance patient safety***;
- ***enable cost-effective management of chronic diseases***; and
- ***facilitate active ageing*** and ***independent living*** for the ageing population. The proposed research activities focus on three main areas:

Personal Health Systems
for preventive healthcare and patient empowerment…

Support to Personal Health Systems continues in FP7. In the first call of FP7, the focus is on two main areas:

a) **Personalised Monitoring:** This entails solutions based on wearable or portable ICT systems, which empower citizens to participate in healthcare processes and facilitate remote monitoring and care. These solutions are targeted at persons at risk (preventive monitoring) or with chronic health conditions (chronic disease management). The emphasis is on non-invasive or minimally-invasive, multi-parametric monitoring, which is combined with expert feedback and care, in closed-loop systems.
b) **Point-of-Care diagnostics:** This area refers to systems for multi-analyte screening applications at primary care level. These are based on portable or handheld devices, capable of carrying out multiple tests at e.g. genome and proteome levels. The aim is to: identify predisposition to diseases; enable early diagnosis of a disease or its recurrence; and provide detailed information to aid treatment, such as dosage advice or indications when an individual should not be treated by a particular drug.

Management of Health Risks
to enhance patient safety…

The importance of managing health risks and improving patient safety is fast becoming a priority issue on the health agenda. Health risk and patient safety should therefore be taken into account by all eHealth solutions. Data mining techniques, adverse event reporting systems, risk assessment algorithms and decision support algorithms applied to data in electronic health records can save lives by preventing adverse events and risky procedures. Virtual clinical trials should also reduce the risk for patients participating in such trials. Furthermore, health pathway models, encompassing citizen/patient passage through clinical pathways, would improve the prior identification of all risks to citizens's future health. Modelling and simulation of health pathways and patient profiles can determine quantitatively

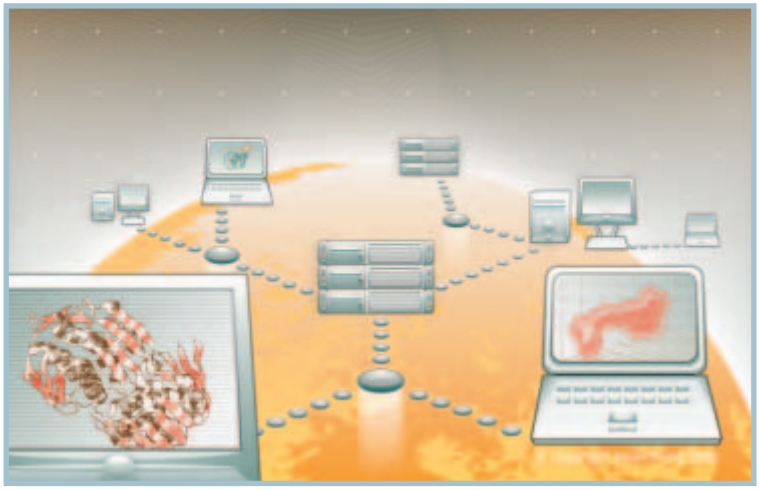
the risk associated to each treatment or operation and optimise the patient recovery. Research on ICT tools for monitoring and risk management of large scale events, like the spread of pandemic diseases or bio-terrorist attacks, is also crucial.

Virtual Physiological Human for disease understanding and simulation…

The flagship activity for FP7 in the area of Biomedical Informatics is the development of a computational framework for multilevel modelling and simulation of human anatomy and physiology, the Virtual Physiological Human. This is seen as the "grand challenge" for several disciplines at the crossroads of ICT and biosciences. Its ultimate goal is to let scientists and medical practitioners know as much as possible about the "real physiological human" by tackling all areas of human anatomy and physiology and integrating data from all levels (molecule, cell, tissue, organ, etc). It also aims to enable the transition to personalised healthcare, based on the use of models, simulation and visualisation techniques for predicting the outcome of interventions (surgical and pharmacological) on the individual. The concept of the Virtual Physiological Human can also assist the design of targeted implants and artificial organs for the individual, as well as the discovery of innovative personalised drugs.

An example of a cross cutting theme to be addressed in FP7 includes **HealthGrid**, an **infrastructure for biomedical research and applications**. HealthGrid is concerned with the use of Grid technologies in the biomedical field. HealthGrid represents not only access to and sharing of large distributed data sources, but also a high performance/high throughput infrastructure for computationally demanding applications and a problem solving environment for biomedical research and patient care. From the perspective of healthcare provision, HealthGrid promises to support the deployment of health information networks and play a role in interoperability standardisation activities.

The vision of HealthGrid requires close collaboration between projects developing Grid middleware, deploying Grid infrastructures and developing end-user biomedical Grid applications. In the FP7, HealthGrid will represent an enabling technology for many research fields in eHealth. This is particularly true for the domains of the Virtual Physiological Human and the technical and semantic integration of data.



THEME 1

Personal health management systems and services based on biosensors

THEME 2

Tools for health professionals

THEME 3

Biomedical Informatics

FP6 Projects

@HEALTH

EU-LAM community to foster international cooperation on eHealth applications and technologies

The @HEALTH project facilitates European and Latin-American research organizations, industries, professionals and public bodies to realize technology transfer actions, through an on-line web platform and services stimulating the access and exchange of knowledge, skills, and technologies in the e-health sector.

Objectives of the project

Problem or Context:

The potential contributions of IT in the health sector is becoming one of the most relevant target, for European and Latin-American Countries, to increase healthcare management, delivery and education quality. In such framework, fostering international cooperation is essential to get access to world-wide knowledge, and create technology transfer and market opportunities for European organisations operating in the e-health sector.

Project:

@HEALTH project aims to support and stimulate international cooperation in the e-Health sector among European and Latin American organisations. The project provides web-based and off-line support services to facilitate communication, exchange of knowledge, and to practically sustain technology transfer actions and joint RTD projects.

@HEALTH supports scientific and technical cooperation in the eHealth sector among European and Latin American research organisations

The specific objectives of the **@HEALTH** project are:

- To promote scientific cooperation in the field of eHealth application and technologies, through web-based and off-line matchmaking actions
- To stimulate and sustain technology transfer actions and joint RTD projects, supported by public and/or private funding programmes
- To act as an open forum to foster dialogue between eHealth users, technology developers and researchers from different European and Latin American countries
- To provide an exhaustive Data-Base of relevant organisations and competences related to eHealth in Europe and Latin America
- To facilitate sharing of best practices and needs in eHealth, and to support exchange of researchers between Latin American and European organisations.

The **@HEALTH** project allows European and Latin American organisations to increase international collaboration, improving the quantity and quality of international opportunities in Research, Market, and Technology Transfer.

Project Description

The **@HEALTH** project develops a community of European and Latin American research organisations, industries and public administrations interested in the e-Health technologies and applications.

The project intends to pave the way for international scientific cooperation in IST, achieving the following main objectives:

- Setting up a proactive network where researchers

Scenario

The **@HEALTH** project contributes to the development of international co-operation in the eHealth sector between European and Latin American organisations, facilitating the identification of organisations and competences, and the sharing of best practices and knowledge, creating a nurturing environment for technology transfer actions.

from different countries, culture and technical background exchange skills, thoughts, needs and knowledge on e-Health

- Linking health sector players with ICT research organisations and industries, stimulating technology transfer actions tailored towards end users needs
- Sharing best practices and knowledge at international level to address problems and challenges of the different environmental and cultural situations of the countries involved
- Promoting joint R&D actions with European and LAM organisations, thus creating a nurturing environment for transfer of knowledge and technologies.

To achieve such goals, the following services and actions are realised:

a) The development of the **@HEALTH Virtual Community platform**, a web portal where players will be able to share knowledge, encouraging cooperation and driving R&D and economical growth in e-health sector

b) A comprehensive **database of European and Latin American organisations** operating in the e-Health sector, accessible through the @HEALTH web platform.

c) A detailed and updated **database of eHealth projects realised in Europe and Latin America**, available at the @HEALTH web platforms

d) Access to **high-quality documents on best practices and know-how** in the following areas:
   - ➢ Education for Healthcare professionals
   - ➢ Health management services
   - ➢ Healthcare services
   - ➢ Patient and citizen empowerment

e) Direct **support to technology transfer actions**, including partner search, eligibility check for funding proposals, identification of funding instruments.

All the information and services provided through the @HEALTH community are available in English and Spanish.

The final aim of the project is to foster international cooperation in the eHealth sector, stimulating jointRTD actions, technology transfer, and creating market opportunities.

Expected Results & Impacts

@HEALTH project encourage the realisation of specific technology transfer actions between Europe and Latin-American in the field of eHealth technologies and applications, specifically offering information and support on funding opportunities available to perform international projects.

The @HEALTH community promotes the dissemination and application of existing eHealth EU and/or LAM solutions tailored to local needs and standards, as well as specific research actions that will lead to the development of scalable, flexible and usable technologies.

This will in turn lead to long-term benefits for the overall research sector in e-Health and consequently for users (medical sector and citizens).

@HEALTH

EU-LAM community to foster international cooperation on eHealth applications and technologies

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- Centro Nacional de Tecnologías de Información (Venezuela)
- Federación Panamericana de Asociaciones de Facultades (Escuelas) de Medicina (Venezuela)
- Centro de Telemedicina de Colombia Ltda. (Colombia)

Timetable: from 05/05 – to 04/07

Total cost: € 389.937,15

EC funding: € 344.000,00

Instrument: SSA

Project Identifier:
IST-2004-015886

Keywords:

eHealth, virtual community, health, IT, eHealth networks and architectures

@neurIST

Integrated Biomedical Informatics for the Management of Cerebral Aneurysms

Towards integrative decision support systems for personalised brain aneurysm rupture risk assessment and treatment

Objectives of the project

When considered separately from other cardiovascular diseases, stroke ranks third among all causes of death, after heart disease and cancer. Worldwide, 3 million women and 2.5 million men die each year from stroke. Hemorrhagic stroke occurs when a blood vessel, typically an aneurysm, ruptures inside the brain. This often leads to severe disability or death. Despite considerable advances in treatment, rupture is associated with exceptionally high levels of morbidity and mortality - about 33% in each case.

Currently, invasive or minimally invasive treatment is offered to almost all patients because there is insufficient evidence to support a decision of nonintervention. It is the primary thesis of **@neurIST** that the process of cerebral aneurysm diagnosis, treatment planning and development is significantly compromised by the fragmentation of relevant data. To address this issue, @neurIST is developing a complete IT infrastructure for the management and processing of heterogeneous data associated with the diagnosis and treatment of cerebral aneurysms.

@neurIST will transform the management of cerebral aneurysms by providing new insight, personalised risk assessment and methods for the design of improved medical devices and treatment protocols.

Project Description

@neurIST is a European initiative within the Sixth Framework Programme Priority 2 of the Information Society Technologies IST. This 4 year multidisciplinary project started on January 1st 2006 and involves 28 public and private institutions from 12 European countries.

The **@neurIST** project will:

- Develop a new procedure and IT-support system for cerebral aneurysm management.
- Identify and collect all publicly-available, relevant and strategically important data from scientific studies.
- Deliver a rich, multiscale information processing chain that will provide new diagnostic indexes and insight into the process of aneurysm development and rupture.
- Develop a set of scalable and reusable integrative suites and demonstrate their value for revolutionizing the understanding and management of cerebral aneurysms.

@neuLink will create an IT environment for the identification of genes associated with the disease and for the integrated analysis of genetic epidemiology and clinical data.

@neuFuse will provide an open source environment to fuse diagnostic and modelling data (using state of

Scenario

As a result of a car accident, a 40 year old man is examined for possible lesions. An unrelated and asymptomatic cerebral aneurysm is discovered. Subsequent angiography provides improved image data for characterisation of aneurysm morphology. Blood samples are taken and the patient is screened **@neurIST** associated genes, by data mining. A rupture risk assessment is also carried out. The clinician verifies its presence in the patient by querying the patients' EHR and retrieving the results of her biochip analysis that discloses a positive test . The patient is informed about the risks/benefits of surgical intervention. On the basis of all available information, a personalised treatment guideline which suggests that endovascular treatment would be beneficial in this case.

the art segmentation techniques, multimodal registration and advanced visualisation techniques) into a coherent representation of the patient's condition.

@neuRisk will produce a personalised risk assessment and treatment guidelines by integrating all available information.

@neuEndo will deliver an innovative IT system for supporting the design of implantable devices (such as coils and stents) and intervention planning by simulation of the structural, haemodynamic and biological response to intervention. This will include advanced numerical-simulation tools to predict the occurrence of device-related thrombosis and drug elution.

The **@neurIST** infrastructure will not only support computationally demanding tasks such as complex modelling and simulation (@neuCompute) but also enable access to health data distributed in public and protected databases distributed all over the world (@neuInfo).

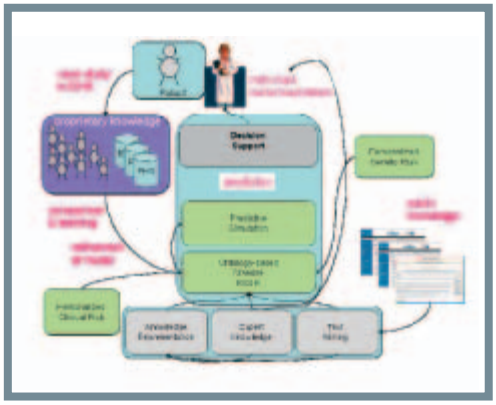
Expected Results & Impacts

@neurIST will reduce health care cost by optimally targeting the relevant patient population, thus avoiding unnecessary and potentially risky interventions, and improving methods of minimally invasive treatment.

Measurable benefits of @neurIST will include the quantification of risk, including that of intervention and non-intervention, and the application of the data to improve the personalized design of endovascular devices.

By providing an objective measure of risk to the decision making project, based on all available data, @neurIST will reduce patient anxiety and unnecessary treatment by identifying aneurysms that do not have a high risk of rupture.

The potential economic benefit of this system in Europe is enormous: taking into account the prevalence of this disease [1-5%], the annual rupture rate [0.2-1%], and the average treatment and 1st-year follow-up care costs of patients [50kEuro], it is estimated that, in Europe alone, unnecessary interventional or surgical procedures costs are in the order of thousands million Euros per annum.



@neurIST

Integrated Biomedical Informatics for the management of Cerebral Aneurysms

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Timetable: from 01/06 – to 12/09

Total cost: € 17.356.730,92

EC funding: € 12.605.239

Instrument: IP

Project Identifier:
IST-2004-027703

Keywords:
Decision support systems, eHealth networks and architectures, health promotion, patient safety, risk assessment

ACGT

Advancing Clinico-Genomic Clinical Trials on Cancer

***ACGT* aims to present the 'next-step' in cancer research and fill-in the technological gaps of clinical trials targeting two forms of cancer: breast cancer and *paediatric nephroblastoma*. ACGT will develop a Biomedical GRID infrastructure supporting seamless mediation services for sharing clinical and genomic expertise. It will help to identify quicker and more efficiently the characteristics that determine what form of treatment best suits which patient.**

Objectives of the project

ACGT aims to provide researchers and patients with the best means and resources to fight cancer.

ACGT is working towards the rapid identification of cancer profiles and best treatments.

The **ACGT** project will:

- Define common standards of data storage at each level of investigation.
- Develop new ontologies for cross-referencing terms and their biological contexts.
- Implement a bio-medical GRID infrastructure offering seamless mediation services for sharing data and data-processing.

"ACGT hopes to trigger the emergence of latent clinico-genomic synergies to ensure faster diagnosis and more efficient therapy"

ACGT will therefore deliver a unifying infrastructure allowing cancer researchers to share their data and to benefit from the innovative informatics tools that are being developed by other researchers.

Project Description

The **ACGT** work plan relies on 3 core activities:

- INTEGRATION. Creation of advanced databases that combine clinical history; symptoms and signs; laboratory and histopathology; medical imaging; procedural and surgery results; and genetic data, taking into account standard clinical and genomic ontologies.
- KNOWLEDGE GRID. Development of Knowledge Grid infrastructures for the distributed mining and extraction of knowledge from data repositories offering information services in the domain of biomedical informatics and creating a highperforming computational environment to: (a) cope with the huge-amount of both clinical and genomic data; and (b) meet the computationally costly data processing needs.
- CLINICAL TRIALS. Design and implementation of specific clinico-genomic trials based on: (a) clear-cut research objectives for cancerrelated clinical and genomic inquiries; (b) incorporation of the clinical-trials in an integrated GRID environment enriched with knowledge-discovery capabilities; and (c) interpretation of results into standardised clinical guidelines and protocols.

Scenario

Imagine that for selected cancer patients, biopsies are taken before, during and after treatment, made anonymous and the analyses stored promptly in an accessible fashion. Imagine also that the patient's data can readily be compared with those from other trials. And imagine that one can search clinical and other databases in hours rather than months.

Expected Results & Impacts

The completion of the Human Genome Project sparked the development of many new tools for current biomedical research.

The combination of clinical and genetic information to cure paediatric nephroblastoma cancer has resulted in up to 85% treatment success rate.

The **ACGT** project aims to develop a GRID platform to support and stimulate further exchanges of both clinic and genetic information, with a particular focus on breast cancer treatment. **ACGT** hopes to trigger the emergence of latent clinico-genomic synergies to ensure faster diagnosis and more efficient therapy.

In this perspective, the **ACGT** project will:

- Provide the advanced tools needed by biomedical scientific researchers in their daily lab or clinical work, so that they are properly equipped to "innovate".
- Facilitate exchanges and interactions among clinical and genetic cancer researchers so they pool their expertise in identifying the best treatment for each and every patient.
- Allow discoveries made in laboratories to be quickly transferred to clinical management and treatment of patients. In former times, the discovery of diseases such as tuberculosis or diabetes did not immediately lead to therapies. In some cases, it took more than 60 years to improve treatment. New technologies such as insilico experimentation, Grid or data and text mining are contributing to reducing these periods of time.
- Contribute to the scientific development of new biomedical informatics approaches, where Europe is already leading the initiatives in the field, but strengthening the competitive efforts of industry to reach economic success.

Keywords:

Rapid Identification;
Integration Knowledge Grid;
Clinical Trials

A C G T

Advancing Clinico-Genomic Clinical Trials on Cancer

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- University van Amsterdam - Philips Electronics Nederland B.V. (NL)
- Association Hospitaliere de Bruxelles – Centre Hospitalier Universitaire Bordet – Custodix - Facultes Universitaires Notre-Dame de la Paix (BE)
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- Lunds Universitet (SE)
- Universidad de Malaga - Universidad Politechnica de Madrid (ES)
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- Instytut Chemii Biooganicznej pan w Poznaniu (PL)
- S.C. SIVECO ROMANIA SA (RO)
- The Chancellor, Masters and Scholars of the University of Oxford (UK)
- Hokkaido University (JP)
- Istituto Europeo di Oncologia s.r.l (IT)

Timetable: from 02/06 – to 01/10

Total cost: € 16. 747.206

EC funding: € 11. 887.000

Instrument: Integrated Project

Project Identifier:
IST-2004-026996

ALLADIN

Natural language based decision support in neurorehabilitation

A helping hand for making the right decision in neurorehabilitation: ALLADIN provides the solution to a worldwide need to tailor the rehabilitation of stroke patients, so that it meets both their functional and societal needs, and restores their independence.

Objectives of the project

A stroke occurs when a blood clot blocks the blood circulation in the brain or when a blood vessel ruptures. The cells in the affected brain area are destroyed and the patient loses the use of one side of the body.

Every year there are about 20 million new stroke incidents in the world. This means that approximately one in every thousand people will get a stroke.

Today we know that physical and functional training are of paramount importance in stroke rehabilitation in enabling patients to regain a good level of independency. Despite this, we are still unable to answer the questions every patient has: *"Will I be able to walk again; will I be able to drink tea with my friends…."*

The **ALLADIN** project:

- Offers a reliable standard for **calculating and predicting** the functional recovery of stroke patients.
- Creates conformity in the communication and understanding of **neurorehabilitation data**.
- Makes **clinical reasoning** and quantitative measurements exchangeable in a user friendly way.
- Outputs a numerical code attached to an operational definition of a milestone, or marker for functional recovery, very similar to the International Classification of Functions (ICF).

Project Description

The **ALLADIN** project focuses on the development of a user-friendly, natural language based decision support software for neurorehabilitation, in particular for strokes. **ALLADIN** provides an adequate and fast solution for a client centred practice, for discharge planning and for the utilization of rehabilitation resources. It fulfils the social and political expectations by substantially reducing costs, by measuring therapeutic efficiency in terms of mean quality-adjusted duration.

The **ALLADIN** project studies daily activities from a new perspective. A completely new diagnostic device was designed together with software to evaluate stroke patients. Modern sensors measure 'drinking',

Scenario

Jorunn is physiotherapist at the Maria Middelares Hospital in Gent. She treats Maria, group leader of a local seniors citizens' club in London, who got a stroke and was hospitalised, while on holiday in Belgium. After 4 weeks Maria preferred to go home and continue rehabilitation in a specialized centre in London. Jorunn uses ALLADIN to assess Maria and talks frequently about Maria's performance to her portable digital assistant, connected through a wireless LAN with the hospital information system. Every time she does this, ALLADIN automatically produces an updated marker or milestone for recovery. When Maria arrived back in London, her neurologist there already knew what Maria's prognosis for a successful outcome was and could plan her rehabilitation programme

'turning a key', 'lifting a bag' etc and forces and torques exerted by the patient are graphically represented.

"...We take everyday life situations into the laboratory and the patients enjoy it..!"

The values patients receive during the assessments are compared to 'models' of normal functional behaviour, also developed during the **ALLADIN** project. Data mining technology charts the patients according to their remaining capabilities and gives the neurologist and therapist an instrument to refine future decisions.

ALLADIN listened to the wishes of physicians and therapists working in small practices, who cannot afford to buy such expensive diagnostic tools. Consequently a cheap application was built with a speech recognition module imbedded in a PDA. It extracts clinically relevant information from 'natural language descriptions' recorded by the physician or therapist about his/her patient.

Achievements & Results

As a result of this project, doctors will be able to give stroke patients reliable predictions on the level of functional independence they can expect to regain. The therapy is no longer focusing on symptoms instead therapy recommendations will guide patients to regaining independence and their day to day lifestyle.

ALLADIN will become an indispensable health information technology. It supports honest medical decision making about whether an investment in a therapeutic intervention for a European citizen is going to provide value for money in a social context.

ALLADIN addresses an important new market: decision support at bedside. Bedside decision support for rehabilitation is an emerging market with no competition. The use of the **ALLADIN** system can efficiently discharge the clinical staff of repetitive tasks such as filling out evaluation reports, which, in practice, often are not performed but importantly, help the hospital staff to make the right decisions about the further follow up of stroke patients.

Rehabilitation services using **ALLADIN** will not only become more attractive for patients opting for a personalised approach but they will attract and engage the attention of rehabilitation professionals, educate them about the possibilities of this new technology and train them in its use. In this way, **ALLADIN** triggers a process by which the clinical users will drive the refinement of the technology.

ALLADIN

Natural language based decision support in neurorehabilitation

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- Zenon SA, Robotics and Informatics (EL)
- Cardiff University (UK)
- Multitel ASBL (BE)
- The Provost Fellows and Scholars of the College of the Holy and Undivided Trinity of Queen Elizabeth near Dublin (IE)
- Országos Orvosi Rehabilitációs Intézet (HU)
- Scuola superiore di studi universitari e di perfezionamento Sant'Anna (IT)
- Universita' Campus Bio-Medico (IT)

Timetable: from 01/04 – to 12/06

Total cost: € 4.030.347

EC funding: € 3.300.000

Instrument: STREP

Project Identifier:
IST-2002-507424

Keywords:

Biomedical sensors, electronic health record, decision support systems, ontology, speech

ARTEMIS

A Semantic Web Service-based P2P Infrastructure for the Interoperability of Medical Information Systems

ARTEMIS develops a semantic web services based interoperability framework for the health care domain. This project provides the healthcare industry with an ideal platform to exchange meaningful clinical information among healthcare institutes through semantic mediation.

Objectives of the project

One of the key problems in healthcare informatics is the inability to share patient records across enterprises. There are several standardization efforts to digitally represent clinical data such as HL7 CDA, EHRcom and openEHR. These EHR standards, which are currently under development, aim to structure and mark-up the clinical content for the purpose of exchange.

However, since there are more than one standard, it is still difficult to achieve interoperability and today the clinical data is mostly stored in proprietary formats. **ARTEMIS** message exchange framework is developed to provide the exchange of meaningful clinical information among healthcare institutes through semantic mediation. The framework involves first providing the mapping of source ontology into target message ontology.

"ARTEMIS addresses the interoperability problem in the healthcare domain where organizations have proprietary application systems"

This mapping is used to automatically transform the source ontology message instances into target message instances. The framework proposed is generic enough to mediate between any incompatible healthcare standards that are currently in use.

Project Description

The **ARTEMIS** project addresses the interoperability problem in the healthcare domain where organizations have proprietary application systems to access data. To exchange healthcare information there are different standards (HL7, GEHR or CEN's) ARTEMIS project provides an interoperability platform where organizations keep their proprietary systems, but expose the functionality through Web services. Furthermore, an ontology based description of these data exchange standards is proposed within the scope of Artemis infrastructure. One of the goals of using ontologies is to semantically mediate data among the healthcare data exchange standards through semantic mediation.

The interoperability problems of medical information systems are two fold: First there are multiple, incompatible, proprietary approaches to connecting disparate applications. Secondly, there are more than one standard to represent the same information, which in turn creates an interoperability problem. **ARTEMIS** enables medical practitioners to access patient records securely, seamlessly through a low-cost peer-to-peer infrastructure, regardless of where their patients or their records might be.

Scenario

ARTEMIS Project has a prototype that realises a scenario where, after an accident, a patient is admitted to a nearby hospital from the ambulance via a mobile device. The hospital admission service then automatically seeks out any relevant healthcare records of the patient in the ARTEMIS P2P network, and presents them to the doctor. Different hospital information systems with different messaging and coding standards are used in the scenario in order to demonstrate the semantic-based interoperability platform. In the prototype the mediation between HL7 Version 2 and HL7 Version 3 messages is also demonstrated.

ARTEMIS project provides the healthcare industry with an ideal platform to achieve difficult integration problems. **ARTEMIS** Web service model encapsulates already existing applications and access to documents in a standard way and incorporates service providers, service consumers and service registries. Currently most prominent Web service registries are Universal Description, Discovery, Integration (UDDI) and electronic business XML (ebXML). There are also very recent efforts to use Peer-to-peer networks based on Web services. However both service registries and P2P architectures available do not provide semantically enriched search capabilities. In the **ARTEMIS** project it is provided extensions to these architectures to enable discovery of the Web services based on their semantic descriptions.

Medicine is one of the few domains to have some domain knowledge in a computable form which it is exploited in defining the semantics of medical Web services.

Achievements & Results

In the **ARTEMIS** Project the following results are achieved:

- An OWL Mapping tool (OWLmt) and engine have been developed which enable to semantic mediation of the healthcare messages complying to different healthcare standards.
- **ARTEMIS** ARTEMIS P2P architecture enables semantic discovery of healthcare organizations, and their services.
- Comprehensive security and privacy infrastructure is developed.
- The Patient Identification Protocol has been developed, which utilizes the discovery and retrieval clinical information about a particular patient from different healthcare organizations where concrete sources are unknown.
- **ARTEMIS** final integrated prototype is completed successfully, and two pilot applications have been developed one in SEBT, Ireland and one in TEPE, Turkey.

A R T E M I S

A Semantic Web Service-based P2P Infrastructure for the Interoperability of Medical Information

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- Altec Information and Communications Systems S.A., ALTEC (GR)
- Tepe Teknolojik Servisler AS, Tepe Technology (TR)
- IT Innovation Center, Southampton University, IT Innovation (UK)

Timetable: from 01/04 – to 06/06

Total cost: € 2.957.604

EC funding: € 1.989.000

Instrument: STREP

Project Identifier:
IST-2002-002103

Keywords:

eHealth networks and architectures, Interoperability of Medical Information Systems, Web services for medical domain, P2P Technologies

ASSIST

Association Studies Assisted by Inference and Semantic Technologies

ASSIST aims to provide medical researchers of cervical cancer with an integrated environment that will virtually unify multiple patient record repositories, physically located at different laboratories, clinics and/or hospitals. Researchers will be able to combine phenotypic and genotypic data and perform association studies on larger sets of patient records from several clinics.

Objectives of the project

Cervical cancer is the second most common cancer worldwide with 60,000 new cases and 30,000 deaths each year in Europe alone, despite a significant progress in early diagnosis and treatment. Infection by the human papillomavirus (HPV) is accepted as the central risk factor for cervical cancer. However, it is unlikely to be the sole cause for developing cancer. Ongoing research investigates the role of specific genetic, environmental factors in determining HPV-persistence and subsequent progression of disease.

Association studies among genetic characteristics and environmental agents and virus characteristics can suggest pathogenetic mechanisms that will provide new markers of risk, diagnosis and prognosis, and possibly treatment.

The main objectives of **ASSIST** are to:

- Unify multiple patient records repositories
- Automate the process of evaluating medical hypotheses (association studies type)
- Allow researchers to combine phenotypic and genotypic data
- Provide an inference engine capable of statistically evaluating medical.
- Offer expressive, graphical tools for medical researchers to post their queries.

Project Description

In order to facilitate association studies on genotypic and phenotypic factors related to cervical cancer, **ASSIST** resorts to medical inferencing applied on real patient data. Following the semantic approach, **ASSIST** will rely on available standards and recent research achievements in the area of semantics and soft computing in order to build its Medical Knowledge Base. The targeted virtual unification of the participating archives and interpretation of their content relies upon the semantic indexing of their records. Unlike the conventional way of treating stored medical information as alphanumeric data structures whose interpretation is carried out by the human user, **ASSIST**'s inference engine will:

"ASSIST will offer virtual unification of participating medical archives and interpretation of their content"

Scenario

Suppose that three gynaecology clinics (A, B, C) join ASSIST mutually allowing access to their patient data. Researcher X from clinic A decides to contact a cross sectional study to test her hypothesis that "MTHFR gene polymorphism increases the risk of developing high-grade squamous intraepithelial lesions or invasive cancer". Dr. X is able to find only 35 suitable cases in clinic A but, using ASSIST, she manages to locate a total of 240 cases that were tested against MTHFR polymorphism in all three clinics. 130 of them were positive. She feels much more confident now. Through ASSIST's graphical query language she requests a "certainty degree" regarding her hypothesis. ASSIST translates the initial hypothesis into a set of queries issued to all the participating medical repositories. Statistical analysis of the retrieved data results in the requested "certainty degree".

- support the virtual unification of the participating archives by translating medical concepts into syntactic values that the legacy systems of the participating archives may perceive and
- undertake the whole process of statistically evaluating medical hypotheses and producing medically important associations based on the collected data.

In addition to the inference engine, **ASSIST** will incorporate two important interfacing modules:

a) The first is the interface to its users, mainly medical researchers and geneticists. This graphical interface will be medical knowledge aware in the sense that it will allow expression of domain specific queries and particular hypotheses by referring to medical ontologies contained in the Medical Knowledge Base.

b) The second type includes the interfaces to the participating medical archives and will support exchange of data between them and **ASSIST**'s core engine and in a way transparent to the end user.

ASSIST will respect and promote the ethical principles that guide current medical research activities and will be designed in full compliance to the legal and ethical national and EU requirements and code of practice. Special care will be taken so as to avoid violation of any form of patient privacy during system operation. To this end, only anonymised patient information will be handled by the **ASSIST** system, produced by state-of-the art anonymisation techniques and standards.

Expected Results & Impacts

Upon successful completion, the **ASSIST** platform aspires to function as an important technology enabler for cervical cancer research by allowing any medical group active in this area to use its facilities and/or contribute their own results. Therefore, **ASSIST** will address the need of large sample sizes and will help to promote collaborative international biomedical research in the area of cervical cancer.

ASSIST will enable the cervical cancer medical researcher to use various HPV data, environmental, lifestyle and medical history items from diverse medical records, with minimal effort and cost. The investigation of associations among all these factors and genetic data will identify risk factors that can then be used at the point of care by gynecologists to identify women, who are at high risk of developing cervical cancer. Consequently, low-risk women can avoid costly and potentially morbid diagnostic and therapeutic procedures while high-risk women will receive appropriate treatment.

Through **ASSIST**, clinical researchers will be able to ask complex questions in order to extract the subset of data they need. As a result, old examination results and past findings will be easily reusable. This feature is expected to be of particular benefit for cervical cancer, whose evaluation requires long-term studies including also referral to patients' antecedents and descendants.

ASSIST

A S S I S T

Association Studies Assisted by Semantic and Inference Technologies

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- National Technical University of Athens (GR)
- EbioIntel (ES)
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Timetable: 01/06 – 12/08

Total cost: € 4,190,946

EC funding: € 2,630,000

Instrument: STREP

Project Identifier:
IST-2002-027510

Keywords:

biomedical informatics, electronic health records, eHealth networks and architectures, association studies, health professionals' knowledge, semantic inference

AUBADE

A wearable EMG AUgmentation system for roBust emotionAl unDErstanding

AUBADE project provides an innovative tool that will lead professionals to a deep study, analysis, understanding, and comprehension of neurological diseases and human emotions.

Objectives of the project

AUBADE project has developed an intelligent, multi-sensor and wearable system for the assessment of the emotional state of humans under special conditions. The project has involved the utilization of innovative technologies such as the recognition of the emotions after the processing of the following biomedical signals: EMG, obtained from the face of the users, ECG, skin conductivity and respiration rate.

AUBADE results in a modular and multifunctional system to be applicable in different areas. Initially it is being be utilized in the health sector, primarily in the neurology and psychology areas, and also in the car racing sector.

AUBADE objective is the implementation of an intelligent, multisensorial wearable system that can ubiquitously monitor and classify the emotional state of users in near time using signals mainly obtained from their faces.

AUBADE platform incorporates a wearable system that obtains signals from multiple appropriate biosensors mainly placed on the face of the user (EMG, ECG, skin conductivity and respiration rate). The system is being used in a variety of healthcare applications mainly in the neurology and psychology field. Additionally, there are other areas of application, as the racing car sector.

AUBADE has been designed to be highly modular and can be easily adapted or break-up in stand alone modules, in order to accommodate a wide variety of neurological and psychological conditions.

Project Description

AUBADE has developed the next generation of the remote human emotions' monitoring systems, which is safe, easy-to-use, cost-effective and provides quality and accuracy at measurements.

AUBADE uses bio signals as an innovative method for determining the emotional state of subjects, instead of other traditional techniques, such as image processing. More specifically, EMG signals are measured as they constitute the basic information for classifying human emotions. Additionally other parameters are considered (ECG, respiration rate, skin conductivity) to obtain a more accurate emotional classification.

These signals are collected and transmitted to a centralised system. **AUBADE** has developed new and efficient methods for processing multisensorial signals based on sensor management and data fusion techniques.

In the centralized system, an Intelligent Emotion Recognition module, through its classification summodule, combines data from the user's health record along with the features extracted from the various sensors and with the aid of various intelligent classification techniques detects the psychological state of the user. In addition,

AUBADE implements a near real-time 3-D facial representation module, which animates a generic face model with the specific user muscle movements.

"AUBADE has developed the next generation of the remote human emotions' monitoring systems"

The final system is being integrated, tested and validated in two differentiated pilots. First, the system is being applied to a medical pilot covering three neurological diseases (Huntington's disease, Epilepsy and Parkinson disease). In a posterior phase, the system will be adapted, tested and validated in a racing car pilot.

Achievements & Results

AUBADE is being used in a variety of healthcare applications mainly in the neurology and psychology field. More specifically, the system assesses the emotional state of patients suffering Parkinson's disease, Epilepsy or Huntington's disease. Preliminary results demonstrate that the system contributes to improve the diagnosis and treatment procedures, as well as to get a better comprehension of the psychological status of the patients.

AUBADE will help healthcare professionals to understand their patient's physiological state and also to provide them with alternative treatments plans, and with further instructions and guidance. Additionally, the system will allow establishing relationships between facial signals and diseases, and it will help to increase efficiency and save time.

AUBADE system will also offer a considerable benefit to the car racing sector. The system will help them to gain parametric knowledge about car racing driver's fatigue limits in a wide range of severe environmental conditions, to reduce accidents that may occur due to mistakes of drivers when operating under extreme stress conditions and to contribute to the whole health monitoring of drivers.

A U B A D E

A wearable EMG AUgmentation system for roBust emotionAl unDErstanding

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- University of Ioannina (GR)
- MASERATI S.P.A. (IT)

Timetable: from 01/04 – to 07/06

Total cost: € 3.567.434,98

EC funding: € 2.000.000

Instrument: STREP

Project Identifier:
IST-2002-507605

Keywords:

wearables, biosensors, sensors management, emotional recognition, data fusion, 3-D animations

BIOPATTERN

Computational Intelligence for Biopattern Analysis in Support of eHealthcare

BIOPATTERN is a groundbreaking project that integrates key elements of European research to underpin eHealth. The goal is to develop a pan-European, intelligent analysis of a citizen's bioprofile; to make the analysis of this bioprofile remotely accessible to patients and clinicians; and to exploit bioprofile to combat major diseases such as cancer and brain diseases.

Objectives of the project

Today, the ability to produce vast amounts of bio-data has vastly outstripped our ability to sensibly make use of the data for decision making.

A key objective of **BIOPATTERN** is to address the problem of fragmentation in this key area by bringing together key researchers to create a critical mass of specialists to promote the development of computational intelligence methods underpinning e-Healthcare. The idea is to move away from local solutions to local problems and towards European wide solutions to European problems.

"BIOPATTERN— basic information which provides clues about underlying clinical evidence for diagnosis and treatment. Often used for diagnosis"

The main objectives are:

- Integration - to tackle and reduce fragmentation of existing research capacities in this area
- Virtual Research Institute - to create a new research community
- New opportunities - to identify how bioprofile could be exploited for healthcare, such as disease prevention, diagnosis and treatment
- Roadmap - to identify gaps in knowledge, key challenges and to initiate joint activities to address them.
- Standards - To identify technical and ethical issues on which guidelines and standards should be based with regard to the acquisition, transmission and analysis of a bioprofile
- Societal challenges - To contribute to finding solutions to some of the demanding societal challenges in healthcare.

Project Description

BIOPATTERN is a Network of Excellence (NoE) project within the ICT for Health. It integrates key elements of European research to enable Europe to become a world leader in eHealth.

BIOPATTERN proposes to provide novel computational intelligent techniques for biopattern vanalysis and a pan-European integrated, intelligent analysis of an individual's bioprofile. Information from distributed databases will be made available, securely, over the Internet and bioprofiles analysed using on-line algorithms, libraries and processing facilities.

BIOPATTERN integrates the research efforts of 30 institutions across Europe to tackle and reduce fragmentation in the new field of biopattern and bioprofile

Scenario

We have developed a prototype test bed, the BIOPATTERN Grid, to illustrate the concepts of bioprofiling and how grid computing could be used to support individualisation of healthcare. A scenario is to provide support for early diagnosis and care for dementia. Appropriate biomarkers of dementia are computed continually during health checks and over time represents the subject's bioprofile. For diagnosis, a clinician (anywhere in Europe) supplies the necessary information, an **appropriate set of algorithms is then used to analyse the bioprofile to look for onset of disease. The figure illustrates the life journey of Mike, a fictitious individual, who at 60 is showing the earliest signs of dementia**. Grid provides seamless access to computational resources and the distributed databases in different countries.

analysis. It brings together leading researchers in medical informatics and bioinformatics from academia, the healthcare sector and industry in a new way, harnessing expertise and information to put Europe at the forefront of eHealth.

BIOPATTERN aims to identify how bioprofile could be exploited for individualised healthcare such as disease prevention, diagnosis and treatment. Its ultimate goal is to become a Virtual Research Institute recognised as a world-leading scientific resource.

Expected Results & Impacts

- Identifying how bioprofile could be exploited for healthcare, such as disease prevention, diagnosis and treatment on an individual basis.
- Integration of the research expertise of 30 partners. This would reduce fragmentation of existing research capacities in this area and strengthen European excellence in this field.
- Creation of a new research community. **BIOPATTERN** will provide a dynamic platform for academics, healthcare professionals and industrialists to network in the area of biomedical informatics (medical informatics + bioinformatics) to advance knowledge in biopattern and bioprofile analysis to underpin new generation of eHealth systems.
- Contribution to finding solutions to some of the demanding societal challenges: target clinical areas are cancer and brain diseases.
- Contribution to the development of new standards and guidelines in areas such as acquisition of bio-data, bio-data representation, evaluation and benchmarking techniques and interfaces for biomedical informatics web services and tools.
- Identification of technical, ethical and legal issues and principles on which guidelines and standards should be structured and based with regard to the acquisition, transmission and analysis of a bioprofile.
- Development of commercially exploitable prototype eServices to support early clinical diagnosis and care of subjects at risk of major diseases such as cancer and dementia and brain injury early in life.
- Spreading excellence within and beyond the partners. **BIOPATTERN** will regularly organise workshops, training events to spread excellence and to raise public awareness.
- Using and disseminating knowledge widely and providing SMEs access to new knowledge to increase innovation and competitiveness and by making resources (techniques, software tools, data, reports, best practice etc) accessible to the academic, scientific and industrial communities.

Keywords:

Biomedical informatics, medical informatics, bioinformatics, neuroinformatics, computational intelligence, biopattern.

BIOPATTERN

Computational Intelligence for Biopattern Analysis In Support of eHealthcare

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- Universita Degli Studi Di Firenze - Universita Degli Studi Di Pisa - Instituto Nazionale Per Lo Studio Cura Dei Tumori, Milano - Universita Degli Studi Di Milano - Synapsis S. R. L (IT)
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- Neoventor Medicinsk Innovation AB - University College Boras (SE)
- Katholieke Universiteit Leuven Research & Development (BE)
- Stichting Katholieke Universiteit (NL)
- Instituto De Desenvolvimento De Novas Tecnologias - (UNINOVA) (PT)
- Ecological University of Bucharest (FI)
- University of Malta (MT)

Timetable: from 01/04 — 12/07

Total cost: € 12.800.000

EC funding: € 6.400.000

Instrument: NoE

Project Identifier:
IST-2002-508803

CAALYX
Complete Ambient Assisted Living Experiment

Older people's autonomy and self-confidence can be greatly increased by wearing a light device that measure vital signs, detect falls, and automatically raise an alert to their care centre in case of an emergency.

Objectives of the project

Europe is about to face a significant social change, brought about by an unprecedented demographic change: the ratio of elderly people to the entire population is steadily growing, while the ratio of younger age groups, especially the working population is shrinking.

CAALYX's main objective is to develop a wearable light device able to measure specific vital signs of the elderly, to detect falls and to communicate automatically in real time with his/her care provider in case of an emergency, wherever the elderly person happens to be, at home or outside.

Specifically, CAALYX' objectives are:

- To identify which vital signs and patterns are more relevant to determine probable critical states of an elder's health.
- To develop an electronic device able to measure vital signs and to detect falls of the aged person at the domestic environment and outside. This gadget will have a geolocation system so that the monitoring system may be able to know the elder's position in case of emergency (especially outdoors).
- To allow for the secure monitoring of individuals organised into groups managed by a caretaker who will decide whether to promote raised events to the emergency service (112).
- To create social tele-assistance services that can be easily operated by users.

Project Description

CAALYX' system considers three main areas of contribution: the Roaming Monitoring System, the Home Monitoring System and the Central Care Service and Monitoring System.

The Roaming Monitoring System intends to monitor unobtrusively the older person when carrying out his/her daily activities in an independent way, both in his home and outdoors. Several vital signs besides falls will be measured and automatically communicated together with his/her geographic position to the Central Care Service in case of emergency, so that a rescue unit can be dispatched in a timely manner.

Caalyx aims at increasing older people's autonomy and self-confidence by helping them in case of emergency

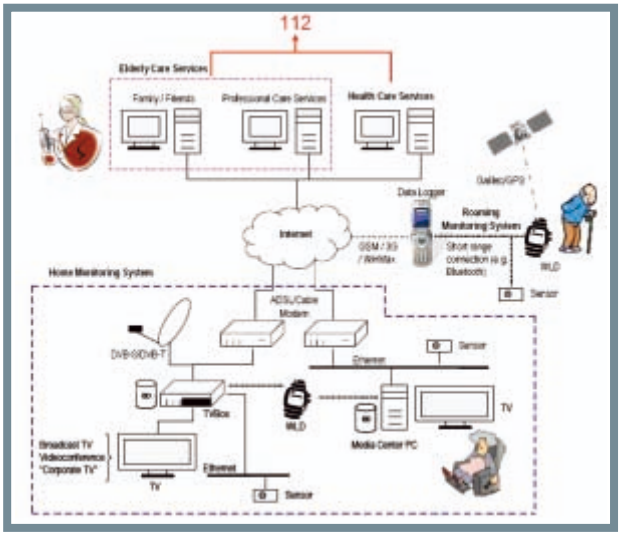
The Home Monitoring System intends to provide a video communication channel for monitoring and service-providing. This communication link can be used to provide on-demand services like grocery shopping, cleaning, housekeeping or gardening, and periodic consultation with the doctor or personal caretaker.

The Central Care Service and Monitoring System will receive alerts from subscribed older persons. The caretaker will evaluate whether received alerts need to be promoted to the emergency service (112), in which case the geographic position and data about the likely type of emergency (fall, stroke, etc.) will be disclosed to the emergency service, so that a suitably equipped emergency team may be dispatched in a timely manner to the patient's location. Besides this service, videocommunication with the home environment will be held to attend the older person's

Scenario

Peter is 65, lives alone, in a sheltered accommodation managed by social services. He values his independence but suffers from memory loss and uses a system of notes and reminders to keep track of his activities. His son lives nearby and visits him occasionally. His friend Barry lives next door and takes the responsibility for looking after him. After getting ready for the day at 7:30, Peter fits his well-being sensors and mobile phone when getting dressed. At 8:00, his TV automatically reminds him to take his medication. At 10:00, He goes for a walk. If his well-being sensors detected unusual conditions, a voice channel would be opened with his caretaker, and if there were an emergency, his location would be disclosed (the fall sensor is equipped with a Geographic Positioning System device) so that the emergency services would perform a quick rescue. If the problem arises at home, a similar alert procedure is adopted. Falls are registered by the system and a weekly log is sent to Peter's General Practitioner who monitors his progress and evaluates his medication.

Terry monitors his dad's progress via his TV. On Friday nights, Peter plays bingo (from his TV) with his other friends while they chat about what they have done during the week. This is conducted through an audio/video system which connects several sheltered accommodations together.



demands. Other possible services include reminders of pills, visits, activities, etc.

End users' needs will be fully considered in CAALYX by studying how older persons live. The study will include interviews with people interacting with them: family, neighbours, friends, caretakers, social services, representatives of National Health Services, etc. Besides, a small sample of older persons will be involved in a real test of the system at the end of the project. A report will assess system performance and strengths, contrasting them against identified success criteria.

Expected Results & Impacts

The aging European society is placing an added burden on future generations, as the 'elderly-toworking-age-people' ratio is set to steadily increase in the future. Nowadays, quality of life and fitness allows for older persons to have an active life well into their eighties. Furthermore, many older persons prefer to live in their own house and choose their own lifestyle. This project will have a clear impact in increasing older persons' autonomy by ensuring that they do not need to leave their preferred environment in order to be properly taken care of and monitored.

The impact on society will revolve around the following issues:

- **Individualisation** - Today traditionally denser and firm social networks like family and friends have become scarcer. Single households are becoming a mainstream way of living in urban centres. Older people living alone who are unable to leave their homes and care for themselves after having accidents or rapidly deteriorating health conditions can go unnoticed for long times.
- **Population migration** – By reducing the need for the older person to relocate (e.g., to live in an elder care institution or with family members at another location), the current elder living environment is not depleted of its people. This is especially important in rural areas with a preponderance of older persons, whose desertification (of people) has a clear ecological impact.
- **Manpower** – The current demographic trend makes it difficult to foresee how Europe will find enough people to take care of its older population, without a major change in traditional elderly care methods. Elder care will compete with other economic activities for resources.
- **Europe wide impact** – The migration of north European retirees to areas with a milder weather is a well known phenomenon. The care network will be distance independent, with several entities collaborating in care delivery.

CAALYX

CAALYX

Complete Ambient Assisted Living Experiment

Project co-ordinator:
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- Synkronix Incorporation Limited (UK)
- University of Plymouth (UK)
- University of Limerick (Ireland)
- Fundació Hospital Comarcal Sant Antoni Abat (SP)
- Corscience Gmbh & Co KG (Germany)

Timetable:
01/01/2007 - 31/12/2008

Total cost: € 2.962.087,23

EC funding: € 1.850.000,00

Instrument: STREP

Project Identifier:
IST-2005-045215

Keywords:

Tele-assistance,
well-being monitoring,
fall monitoring,
elderly people,
independent living

CARDITIS

Simulation based automated DIagnosis, Treatment and prognosis of CARdiovascular dISeases

CARDITIS addresses cardiologists and cardio surgeons needs for innovative solutions supporting the diagnosis and treatment of Cardiovascular diseases. The efficient method of multi-modal imaging, reconstruction and knowledge representation used by the project introduces new methods for simulations, decision making and risk analysis.

Objectives of the project

Today, cardiac care of patients is a major medical problem and a lot of research and effort has gone into to reduce the incidence of cardiovascular diseases.

CARDITIS plans to develop a user-friendly, fast and reliable tool that will provide access to heterogeneous health information sources (MRI, IVUS, CT, Biplane angiography) and will introduce new methods for decision support and risk analysis.

CARDITIS' primary objective is to improve understanding of the human cardiovascular system.

The objectives of the **CARDITIS** system are:

- The introduction of a surgery planning system based on the construction of a 3D patient-specific geometric model of the cardiovascular system;
- The development of innovative and efficient methods for multimodal imaging, reconstruction and knowledge representation;
- To provide cardio surgeons and cardiologists with a tool for handling realistic simulations of medical procedures, an interactive virtual environment to design surgical plans and alter the geometry of the 3D individualized model.

Project Description

The basis assumption followed in CARDITIS is that proper medical treatment begins with a correct diagnosis. **CARDITIS** project will support cardiologists and cardio surgeons in their diagnosis of coronary and vascular (check my edit is correct) artery diseases and the correlation with myocardial disease.

"CARDITIS aims to offer a solution to one of the main health problems in the EU: cardio-vascular diseases"

CARDITIS provides an intelligent assistant to recognise the problematic areas in specific cardiac region of interests and the application of doctors procedures on the models of their patients. These procedures will increase their skills and help them to choose the best treatment for each individual.

One major contribution of the **CARDITIS** project is the use of digital data, already gathered from patients in a form that is as refined and processed as possible.

Accuracy of diagnosis determines the success of interventions. **CARDITIS** will be a valuable tool for health professionals to improve their diagnosis, and resulting surgical plans. Hospitals, clinics, cardiology centres and other health units can use **CARDITIS**

Scenario

In order to develop a surgical plan for a specific patient, the doctor has to enter some patient data (blood pressure, heart rate, ECG, etc.). All the data is rapidly transmitted to the user's device. The data is displayed on the doctor's monitor where he can consult them. The module uses a priori knowledge and patient's data to proceed in the development and simulation of a virtual patient model. The model, then, appears on the doctor's monitor, where he can make any necessary changes in the measurements or in the virtual cardiac system of the patient.

for medical care and accurate diagnosis, improving the treatment of their patients, and ultimately the prognosis for the patient.

During the validation phase several experiments will be performed in patients and in vitro models (quantitative validation). In the quantitative validation several metrics will be used such as linear regression analysis, correlation, coefficient etc.

In a second step, after the verification of the reliability of the system, the platform will be distributed to several doctors. Data from patients will be inserted in the system in order for the doctors to examine its usability. In addition, the questionnaires will be distributed to the doctors and a qualitative validation will be performed.

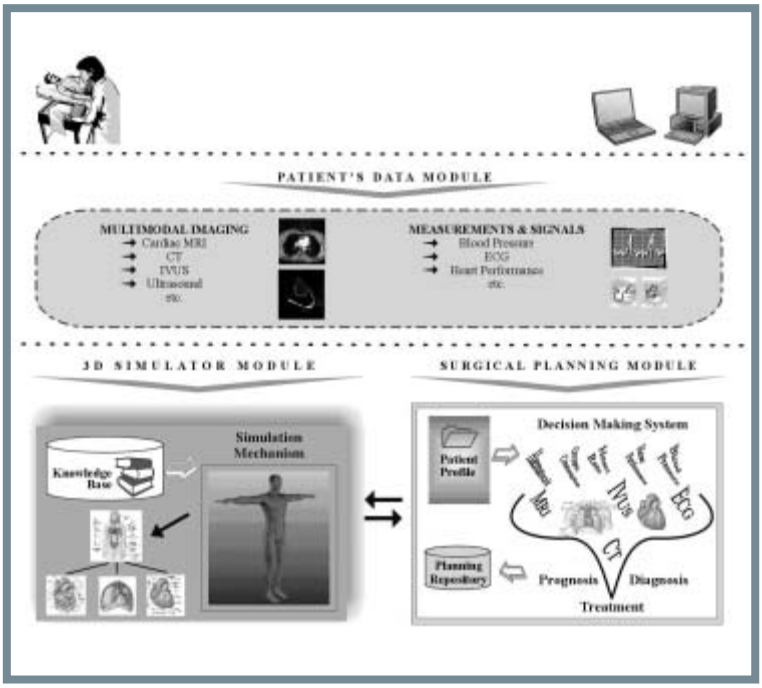
Achievements & Results

CARDITIS offers a solution to one of the main health concerns in Europe: cardiovascular diseases. With **CARDITIS**, doctors will better able to assess the outcome of surgery, in advance, and to plan the appropriate post operative treatment required.

The system should also improve patients' confidence in proposed treatment, since doctors will be better able to tailor treatments to the needs of each patient.

CARDITIS consortium also aims to collect all the essential information needed to adapt the system to doctors' needs. The reaction of health professionals, as end users, in such systems is crucial as they must have the capacity and confidence to use the system with ease.

Finally, **CARDITIS** will offer an innovative assistant to new cardio professionals and students in helping build up their experience in surgery and critical situations



CARDITIS

Simulation based automated DIagnosis, Treatment and prognosis of CARdiovascular dISeases

Website: http://www.carditis.info

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- DAP Noesis - Apollonion Hospital (CY)

Timetable: from 04/04 – to 09/06

Total cost: € 3.644.650

EC funding: € 2.200.000

Instrument: STREP

Project Identifier:
IST-2002-507170

Keywords:

Cardiology Image processing;
Simulation engineering;
virtual cardiac system;
diagnosis;
multi-modal imaging;
reconstruction;
risk analysis

CARE-PATHS

An intelligent support environment to improve the quality of decision processes in health communities

The goal of CARE-PATHS is to set up an intelligent operational environment for making Clinical Governance effective, to support Health Professionals, Clinicians and Care Operators in continually improving the quality of care, by enabling the methodology of "Clinical Pathways" to function, to be effective and to succeed.

Objectives of the project

CARE-PATHS addresses key implementation barriers to the methodology of Clinical Pathways. The project leans upon the concept of Clinical Pathways. A clinical pathway is a plan of care that is applied to patients with a known diagnosis and a predictable clinical outcome.

The implementation of Clinical Pathways is impeded for a series of reasons:

- Defining Clinical Pathways requires a great deal of skill for finding and analyzing the "highest quality available evidence".
- Clinical pathways must be brought up to date regularly. Even the best clinical pathways do not contain all the answers that will be needed. It is therefore necessary to maintain the care giver´s knowledge up to date to be able to respond to any of the unanswered situations in a reasonable time.
- Indicators must be set up to allow an analysis of how closely the pathway is being followed, of its results, of deviations. Once the results and deviations have been analyzed, and the latest scientific data has been studied, the clinical pathway should be modified and brought up to date.
- Implementing clinical pathways might also face cultural and/or organizational challenges, such as resistance from doctors, lack of group work, and lack of interdisciplinary collaboration.

"CAREPATHS addresses key omplementation barriers of the methodology of Clinical Pathways"

The approach adopted by **CARE-PATHS** is to exploit emerging technologies in knowledge management and semantic web for enabling the methodology of "Clinical Pathways" to function, to be effective and to succeed.

Project Description

The goal of **CARE-PATHS** is to set up an intelligent operational environment for making Clinical Governance effective, to support Health Professionals, Clinicians and Care Operators, in continually improving the quality of their services and safeguarding high standards of care.

Starting from the requirements of the Users involved in the project, in Italy and in Spain, the project will focus in the integration of the Clinical Pathways into the daily job offering a real continuity of care in the hospital and out-hospital environments in a coherent way with the workflow of clinical documents on the pilot sites.

The aim of a Clinical Pathway is to coordinate and define the extent and quality of care that is provided. Clinical Pathways are in fact strategies for handling complex treatment procedures. These strategies define the essential steps so the strategy itself is carried out

Scenario

The benefits of CARE-PATHS are demonstrated through 2 "good practice" projects:the first one is located in Parma in the domain of Cardiology/Cardiosurgery and Peripheral Vascular Surgery; the second one is located in Valencia and involves the domain of Pneumology (Hospital La Fè).Parma and La Fè have concentrated their efforts towards the aim of reaching a common approach and a consolidated perspective to the clinical pathways implementation scenario. The common approach had to adjust to requirements coming from emergency care, acute care and long term care, thus resulting in a standardized conceptual design, which serves as basis for technical development.

in a detailed manner. Their objective is to improve the quality and/or reduce the cost of a given product or service, while ensuring its timely execution.

The output of the project will be a set of intelligent tools for supporting Health Professionals in authoring conceptual Clinical Pathways for selected group of pathologies in specific contexts, putting them in practice in the everyday treatment of individual patients, monitoring and managing the variances.

From the technological point of view, the objectives are concentrated primarily, in the following technologies of the knowledge management and distribution domains:

- Middle-ware enriching the semantic web for clinical governance;
- Access to databases from the medical, nursing, and health services literature fully referenced and individually graded, based upon clearly defined research methodology and that address aspects of care thought to be the key drivers of quality and cost in health services delivery.
- Referential tools that focuses on studies from the peer-reviewed medical literature pertaining to clinical and operational efficiency, utilization of resources, cost of care, and processes of care and other factors that influence complications, length of stay, and readmissions.
- Semantic based agents to "broker" between information sources on clinical guidelines, evidence based medicine and the actual ambient (technology and services available, socio/economical constraints, organizational constraints, …)
- Integration with Electronic Health Records system and in general with the workflow of clinical documents at the specific site, on the basis of messaging using XML and HL7/CDA.

Achievements & Results

The **CARE-PATHS** project will lead to two major results:

- A Web-based software solution enabling healthcare institutions to implement and manage clinical pathways, thus covering the whole cycle of:
  - o Pathway authoring
  - o Putting pathways in practice
  - o Monitoring and managing patients' variance
- 2 "Good Practice" projects demonstrating the feasibility and benefits for an healthcare institution of setting up a methodology for managing clinical pathways

The impact of **CARE-PATHS**, enabled by the Web-based software solution and demonstrated through 2 pilots, will thus be the set up in healthcare institutions of a generic method for continuous improvement of the quality of healthcare services.

CARE-PATHS

An intelligent support environment to improve the quality of decision processes in health communities

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- Hitech SNT (GR)
- GL2006 Europe (UK)
- Patmos (IT)
- AZIENDA OSPEDALIERA DI PARMA (IT)
- FUNDACION PARA LA INVESTIGACION DEL HOSPITAL UNIVERSITARIO LA FE (ES)

Timetable: from 06/04 – to 11/06

Total cost: 3.776.000 €

EC funding: 2.200.000 €

Instrument: STREP

Project Identifier:
IST-2002-507017

Keywords:

Clinical Pathways, Health Professionals' Knowledge

CLINICIP

Closed Loop Insulin Infusion for Critically Ill Patients

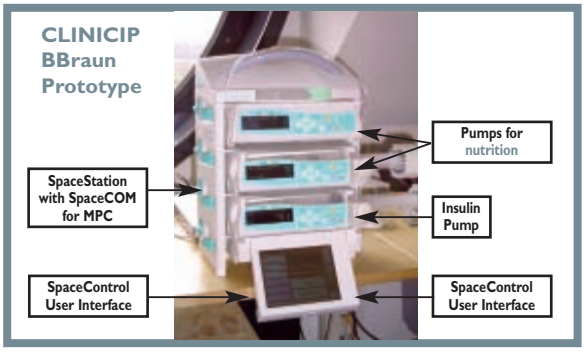
Improved survival chances for critically ill patients and increased efficiency and safety in clinical practice: CLINICIP clinicians and scientists have joined forces in order to develop an intelligent glucose monitoring and control system for critically ill patients. The CLINICIP system will help to improve the survival chances in intensive care units and to increase efficiency and safety in clinical practice.

Objectives of the project

Hyperglycaemia and insulin resistance are common in critically ill patients, even when glucose homeostasis has previously been normal. Recent medical studies brought evidence that treatment of high glucose levels with insulin will dramatically improve survival chances in these patients. However, treatment of glycaemia with target glucose levels close to physiological range is labour-intensive and although the cause/effect is well-known, the unmanageable workload and the prevalent fear of hypoglycaemiae among critical care physicians still prevent the general implementation of glycaemic control in the intensive care unit.

"Improving survival chances in intensive care units"

Therefore, the overall goal of **CLINICIP** is to establish **glycaemic control on an automated basis** in order to improve survival chances in intensive care units.



Project Description

- **Clinical research:**

Clinical research follows a two-pronged approach, including basic physiology and clinical implementation. Physiological research focuses on the investigation of the properties and behaviour of adipose tissue under traumatic conditions and its suitability as a possible route for automated glucose measurement. To test components, subsystems, and finally the complete system as developed within the project, clinical studies are performed in a range of different intensive care units.

"Close co-operation of medicine and engineering"

- **System development:**
  - **Sensor system**: Different sensor technologies are developed to measure the glucose concentration in blood and in interstitial fluid as delivered by the body interface. Additional metabolite sensors measuring carbon dioxide, oxygen and pH are developed and tested for the characterisation of adipose tissue.
  - **Body interface**: The body interface plays a key role to connect the sensor technology with the critically ill patients. Different routes are investigated: The minimally invasive interstitial route as well as extravascular & intravascular approaches are being developed and clinically tested for continuous measurement of glucose and other metabolites.

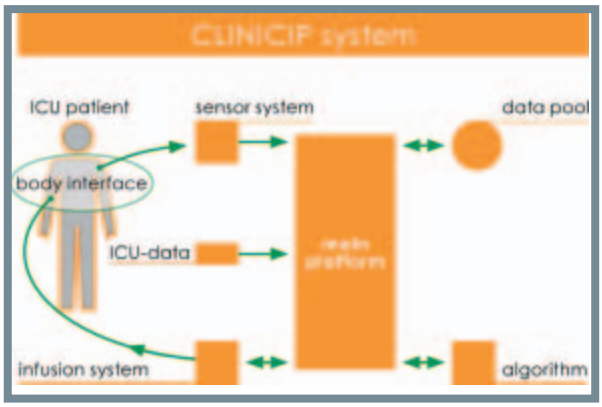
Scenario

Peter is 67 years old. He is overweight and has type 2 diabetes for 10 years. He suffered from a severe heart attack and needed cardiac surgical operation to repair the obstructed coronary artery that supplies blood to his heart muscle. The CLINICIP system will enable that Peter`s blood glucose concentration after the operation will remain stable within normal limits. This will substantially decrease his risk of mortality, postoperational complications such as infections, impaired wound healing and might also reduce his length of stay in postoperational intensive care unit and overall stay in hospital.

- **Main platform**: Data as provided by the sensor system is transmitted to the main platform, which acts as the brain of the **CLINICIP** system. The platform interacts with the control algorithm, which calculates the insulin infusion rate. The main platform is developed in a stepwise approach - first as a decision support system still requiring manual glucose measurements and second as a control system with automated glucose measurement and insulin administration to facilitate tight glucose control.
- **Infusion system**: The infusion system acts as a second body interface of the **CLINICIP** system. In order to establish tight glycaemic control, the main platform communicates with the infusion system and actively regulates the intravenous insulin infusion.

- **Data Management**

Data from clinical studies are entered into a knowledge pool where the participating medical institutions can store and share their findings. Data and treatment recommendations may also be made available to hospitals outside the consortium in order to raise awareness about the importance of glycaemic control for critically ill patients. These centres will be invited to use the **CLINICIP** system to adapt their clinical work to the newly developed evidence-based practice and to expand the established knowledge pool.



Expected Results & Impacts

The overall goal of **CLINICIP** is the implementation of tight glycaemic control for critically ill patients on an automated basis in order to:

- reduce hospital mortality and morbidity,
- increase efficiency and safety in intensive care units,
- reduce workload of healthcare personnel and
- reduce health care costs.

Keywords:
Intensive care medicine,
Glucose monitoring,
Tight glycaemic contol,
Health care system

C L I N I C I P

Closed Loop Insulin Infusion for Critically Ill Patients

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- Katholieke Universiteit Leuven (BE)
- The Chancellor, Masters and Scholars of the University of Cambridge (UK)
- B.Braun Melsungen AG (DE)

Timetable: from 01/04 – to 12/07

Total cost: € 11.256.588

EC funding: € 7.500.000

Instrument: IP

Project Identifier:
IST-2002-506965

COCOON

Building knowledge driven and dynamically networked communities within European healthcare systems

COCOON aims to improve healthcare by reducing medical errors and helping diagnostic and therapeutic risk management. The project is developing a semantic-based healthcare information infrastructure capable of integrating medical information and eHealth services.

Objectives of the project

A national health information infrastructure is needed to provide immediate access to complete patient information and decision support tools for healthcare professionals to design even safer healthcare delivery

systems. Better management of health information is a prerequisite to improving patient safety and care standards. This is the basis of the research to be carried out by the **COCOON** system.

Project Description

The starting point of the research is a multi-directional technical investigation aimed at setting up a semantics-based healthcare information infrastructure to reduce medical errors. The result will be a set of interoperable, scalable and reusable Web Services supporting "Community & Knowledge Management" practices in a wide range of networks of healthcare professionals. The semantics-based healthcare information infrastructure is able to seamlessly integrate information and services. Such an infrastructure can provide general practitioners with the necessary information from the health records for each patient, the appropriate clinical guidelines, relevant and updated research evidence, information on available medical services, technologies and medication -efficiency and side effects-, and possibly even the experience from other similar cases, as well as advice from a specialist.

The architectural design will be defined together with the two main types of tool services: Semantic Information Retrieval, which employs concept-based indexing, and decision support, which is based on selected clinical guidelines. Semantic Web Service technologies serve to glue these services into existing healthcare information systems.

"The result to minimize diagnosis and treatment errors"

The architecture (see figure 1) is designed to provide two main functionalities: Semantic Information Retrieval (SIR), which enables the end-users to query (at a Semantic Level) multiple heterogeneous unstructured content sources, and a Decision Support System (DSS), which operates Clinical Guidelines into a concurrent set of rules that

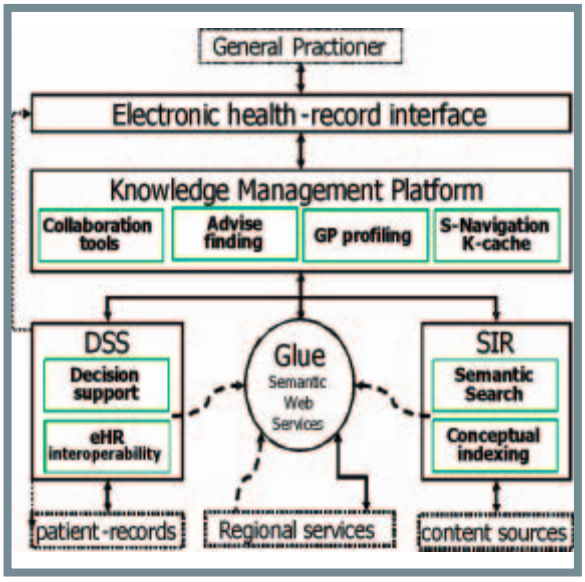

Figure 1 : The architecture

are run against the data stored in the patient records and include both diagnostic and treatment activities. Since this complex information must be provided to a General Practitioner in real time, during his/her interaction with a patient, the eHealth services must be presented via the standard health record interface that GPs are already accustomed to. However, a hidden Knowledge Management platform provides the integrated set of services that interconnects and completes the two main functionalities. It contains a tool for navigating the semantic information infrastructure in a personalised way and a tool for consulting other colleagues for advice.

Achievements & Results

- **Supporting diagnosis and treatment using computer interpretable guidelines**: the possibility to transform a clinical guideline into series of steps that may include diagnostic and treatment activities and its integration with the patient's electronic health record, offers a set of recommendations regarding the next step(s) to be taken. The Decision Support System accomplishes systematically compares personal background information with medical profiles and employs complex heuristics in order to determine the most suitable treatment for the patient being treated.
- **Continuous personal medical education**: the developed system provides general practitioners with a Knowledge Management platform which gives access to heterogonous and dispersed medical information. The Knowledge Management platform allows the General Practitioner to navigate results, deepen or generalise the search and bookmark valuable information. The system also offers the possibility of storing the query so that the system can forward new relevant documents to the GP
- **Advice support**: The system helps healthcare professionals to identify the most appropriate group of experts to consult for specific questions. Once the group has been identified, they can exchange information and share data via the multi-channel collaborative work platform. Moreover the results of the work sessions could be indexed using the system ontology and stored for a future use. *In this way a part of the tacit knowledge exchanged in the collaborative work sessions can be made explicit*

Keywords:

Risk Management,
Decision support system for diagnosis and treatment,
semantic information retrieval,
ehealthcare,
semantic based infrastructure

C O C O O N

Building knowledge driven and dynamically networked communities within European healthcare systems

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- GL2006 Europe (UK)
- L&C (BE)
- Technion University (ISR)
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- The Regional Health System Of Epirus (GR)
- European Medical Association (INT)
- Association Regionale Europeenne Sur La Societe De L'information (BE)
- Infermed (UK)
- Centre D'informatique Region Bruxelloixe (BE)
- Spirit S.A.E-Business Andcommunications Engineering (GR)
- Ids Scheer Cr s.r.o. (CZ)

Timetable: from 01/04 – to 04/07

Total cost: € 10.402.274

EC funding: € 5.995.615

Instrument: IP

Project Identifier:
IST-2002-507126

DESSOS

Decision Support Software for Orthopaedic Surgery

The objective of the DESSOS is to develop decision support software for orthopaedic surgery so as to reduce variability in surgical outcome and maximise the longevity of orthopaedic devices and in particular, total knee replacements.

Objectives of the project

Across the EU there are approximately 540,000 knee replacement operations per year. 5-10% of these will require re-operation after 10 years. A significant proportion of implanted knees have abnormal kinematics and this may accelerate the failure process. Variability in patient outcome is highly dependent upon the experience and skill of the individual surgeon, and there are at present no knowledge-based systems available to assist during the planning of an operation that take patient-specific data into account.

The main objective of **DESSOS** is to develop both knowledge, and the software tools that encapsulate that knowledge, in order to provide orthopaedic surgeons with appropriate information to make informed choices related to implant orientation and placement.

"There are at present no knowledge based systems available to assist during the planning of an operation that take patient specific data into account"

Specifically, **DESSOS** aims to:

- Develop rapid methods for generating patient-specific models of the lower limb.
- Develop rapid musculo-skeletal models capable of predicting forces for everyday activities.
- Develop rapid numerical models capable of predicting the kinematics and stresses experienced by the knee replacement.
- Determine the likely envelope of performance for a particular patient.
- Develop optimisation strategies to identify the implant orientation which would maximise the longevity of the device.

Project Description

This project combines both fundamental and applied research to support the development of knowledge-based software capable of providing the surgeon with recommendations for both appropriate size, and orientation, of prosthetic implants within the joint, based on patient-specific anatomical data provided either pre- or intra-operatively, in order to achieve desirable, pre-determined kinematics of the replaced joint. The recommendations will be based on predictions using advanced modelling and optimisation techniques.

In order to achieve this goal, there are a number of significant technological challenges that need to be addressed.

- To develop methodologies through which key metrics and parameters associated with patient data can be extracted automatically from disparate data sources (CT scans, MRI scans, IGS systems). Extracting data from these sources is underway, along with a fluoroscopic study. A complete reconstruction of the human lower limb with particular focus on the knee will serve as an anatomical reference to describe the complex relations in the knee joint, and enable the description of the statistical variation of the anatomical shape.
- To develop methodologies by which patient-specific data (ankle centre, knee flexion axis, etc) can be integrated with, and used to modify ("morph") musculo-skeletal and finite element models of the human lower limb so as to predict the forces and kinematics respectively. A model morpher has been developed using the reconstruction of the lower limb. This has allowed initial lower limb simulations to be carried out and investigation into the type of anatomical and geometric landmarks required.

- To develop methods through which point cloud information pertaining to soft tissues such as ligaments can be automatically converted to meshed structures, appropriate for deployment within finite element modelling tools (so-called "meshless" FEA) with the aim of enhancing the fidelity of the lower limb model. The reconstruction of the lower limb has enabled the creation of high quality meshes for the initial testing of meshless ligaments.

"With DESSOS, patients can expect longer implant life times, reducing the risk of revision surgery"

- To develop mechanisms and systems through which the likely performance of the replaced knee can be supplied automatically to the surgeon in a time frame suitable for use both within the pre-operative and intra-operative phases. Performance envelopes have been identified for a total knee replacement in a gait simulator, and these techniques will be transferred to the lower limb system.
- To develop appropriate optimisation tools that will determine the size and orientation of the prosthetic components in a time frame suitable for pre- and intra-operative use.

Expected Results and Impacts

By developing these models, techniques and methodologies, and applying them through a suite of software tools, we aim to deliver a surgical planning tool that is appropriate for use in knee replacement procedures, of which there are currently an average of 540,000/annum expected to rise to 750,000/annum by 2010 within the European Union.

The beneficiaries of **DESSOS** will be the health providers and patients. Optimising the placement of the artificial joint will lead to better function and reduced risk of failure, in both short and long term. Hence, patients can expect longer implant life times, reducing the risk of revision surgery. This benefit will be passed on to the health service as revision rates will be lower thus producing significant savings.

D E S S O S

Decision support software for orthopaedic surgery

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- Leiden University Medical Centre (NL)
- University of Zaragoza (ES)
- ESI (FR)
- Finsbury Orthopeadics (UK)
- PERA (UK)
- DePuy International (UK)
- Zuse Institute Berlin (DE)

Timetable: from 01/06 – to 12/08

Total cost: € 4.617.143

EC funding: € 3.981.216

Instrument: STREP

Project Identifier:
IST-2004-27252

Keywords:

Orthopaedic surgery;
decision support software;
musculoskeletal modeling;
optimization;
reliability theory;
finite element analysis

DICOEMS

A DIAGNOSIS COLLABORATIVE ENVIRONMENT for MEDICAL relevant SITUATIONS

DICOEMS is a portable system to support the management of medical emergencies. It aims to bring together on-the-spot care providers and networks of experts, enabling more effective decision support and risk management in primary diagnosis, pre-transfer arrangements and treatment of critical situations.

Objectives of the project

The need for remote management of medical emergencies arises in a number of situations. **DICOEMS** focuses its efforts on accidents and natural disasters. Under such stressed and time critical conditions,

"Contributing significantly to reducing risk and making informed decisions promptly"

the care provider (a medical doctor, nurse, paramedical personnel etc.) who is in charge of the patient needs a userfriendly utility to:

- acquire critical medical data (such as vital signs) to assess the medical condition
- offer appropriate first-aid
- communicate the findings and patient status to a network of health experts -no matter where they are physically locatedand closely cooperate under their guidance for the effective management of the emergency
- provide information about the geographic location of the emergency.

Project Description

DICOEMS allows the care provider to request on-demand, real-time, accurate information and receive precious guidance in the management of the incident Health experts are offered a valuable set of tools and resources enabling their early participation in the handling of medical emergencies, thus contributing significantly to reducing risk and making informed decisions promptly.

The **DICOEMS** collaboration environment is scientifically and technologically powered by the strong synergy of Grid computing, XML, Web services and intelligent agents.

As far as the collaboration grid is concerned, the project deals with:

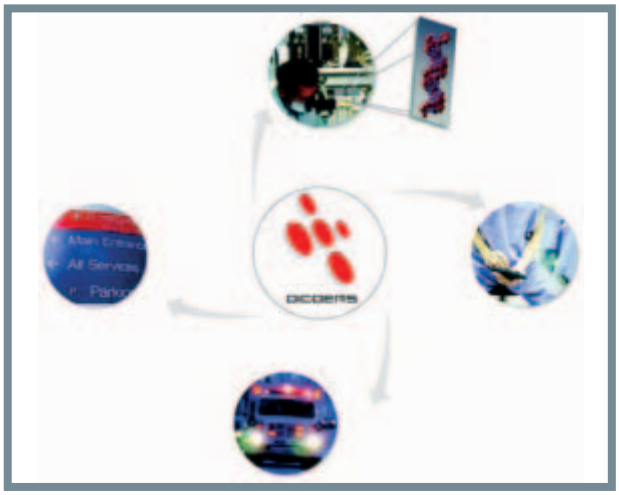
- Planning and developing an effective methodology for routing and managing collaboration requests among the peer grid nodes (i.e. the mobile workstations).
- Hosting a collaboration session between the involved peers, with focus on shared care.
- Provision of synchronous and asynchronous multimedia-based interactive services over the collaborative session.
- Selection of the most appropriate health experts available, depending on the nature of the incident,

Scenario

At the scene of an accident or emergency, the DICOEMS services are delivered to the care providers by means of a portable workstation serving as a mobile laboratory for taking vital measurements, running appropriate medical tests in the field and recording and sending (?) videos of the event. The clinical data is captured and stored on the specific Emergency Episode Record forms, which will automatically update the patient EHR available in the destination hospital or distributed in the personal treatment process.

based on their professional profile and expertise as well as other aspects, such as proximity, on-duty schedules and duty range.

- Design and integration of GPS functionality, to enrich the collaboration grid with precise geographic information about the incident location and the proximity of appropriate medical support and resources.
- Provision of critical information concerning the availability of compatible blood resources and specialised medication and equipment.
- Support of a policy-based collaboration environment that integrates roles, relationships, user privileges, access-control policies, coordination of user actions, sharing of data, delegation of responsibility and enforcement of security, with focus on the actual roles of peers.
- Implementation of a mechanism for delivering alerts to health experts, based on the severity of the medical incident.



- Capacity to communicate directly with an administration and operations centre for instruction (crucial in emergency situations) and 'top-down' management and coordination of care provider teams that are dispersed across a disaster zone or an accident field.
- Implementation of a secure infrastructure and associated management processes that engender trust among participants.

Achievements & Results

Particular attention will be paid to addressing the needs of all involved users as well as usability and accessibility issues. **DICOEMS** will focus its research activities on the delivery of a fast and reliable collaboration platform, using Grid technology and open standards. A significant effort will be placed on the management of medical knowledge (such as life-support protocols) to support decisions and help in the treatment of patients or casualties in emergencies. The **DICOEMS** initiative is expected to further enhance eHealth decision support and risk management software, which at the moment is considered quite experimental and under-developed. **DICOEMS** aims to contribute to the reinforcement of European industrial and business competitiveness in the area of applied eHealth.

D I C O E M S

A DIAGNOSIS COLLABORATIVE ENVIRONMENT for MEDICAL relevant SITUATIONS

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- Fraternita di misericordia milano (IT)
- SSM computer systems limited (CY)
- Guy' s and st. Thomas' hospital national health service trust (UK)
- Information management group (UK)
- Azienda ospedaliera ospedale san Gerardo (IT)

Timetable: from 01/04 – to 06/06

Total cost: € 3.492.874

EC funding: € 2.000.000

Instrument: STREP

Project Identifier:
IST-2002-507760

Keywords:

usability and accessibility issues;
life-support protocols;
Medical Emergency
Collaboration tool;
Peer to Peer

Doc@Hand

Knowledge Sharing and Decision Support for Healthcare Professionals

Doc@Hand is an advanced platform aiming to easily access a wide set of data such as clinical records, clinical cases and diseases correlated information, supporting Healthcare professionals in their day by day activities providing an transparent access to heterogeneous and geographically dispersed information, allowing to query the system using natural language.

Objectives of the project

In a scenario where Healthcare organizations tend to rapid decentralization, with multiple actors involved in the care delivery processes, the importance for professionals to collaborate, access and share data and knowledge becomes more and more stringent.

Information security and availability is then the first requisite; Healthcare systems and networks protecting information both in written, spoken, electronically recorded, or printed form from accidental or malicious modification, destruction or disclosure is a preliminary system requirements. Security and authorization guarantee that information are accessible and distributed to all interested actors, at the same time meeting the strictest requirements for data security and privacy. **Doc@Hand** provides a set of tools that help healthcare professionals in reducing time and associated costs to collect the information and knowledge required, optimising the decision making processes and also preserving security and privacy.

Doc@Hand intends to:

- allow a transparent access to different and wide dispersed information;
- allow a proactive search using push technologies for relevant information
- provide an intuitive interfaces to easily filter and navigate through the information;
- integrate existing decision support systems;
- provide virtual communities for opinions' exchanges around patients or other issues;
- protect patient's sensible data from possible unauthorized accesses

Project Description

The project aims to bridge the gap between patient's related data and unstructured information and knowledge, and to dramatically enhance the ability of doctors to exploit this integrated information for more effective and costeffective decision-making.

"Reducing time and associated costs to collect the information, optimising the decision making processes and also preserving security and privacy"

Doc@Hand is a tool that assists the Healthcare professional in his day-byday activity, supporting his mobility needs coupled with autonomous capabilities when offline, providing a comprehensive view of documents and

Scenario

The platform will be validated in two real world applications (consortium End User partners):
HCPB (Hospital Clinic de Barcelona, Spain) will use it to support the screening and management of the colon cancer screening.
GST (Guy and St.Thomas Hospital, UK) will use it to suggest to the doctor all the available multiple myeloma trials suitable for a given patient, to maximise the chances for each patient to be matched to all available trials without requiring encyclopaedic knowledge by the Healthcare professional.

knowledge located in different and heterogeneous repositories, and "anticipating" his information needs and making it available at hand without the need for an explicit search/retrieve request.

Natural language queries can also be submitted thanks to an advanced text parser based on Ontology. This intelligent system also takes into account the user profile and modifies it accordingly the search criteria. It will be validated through an extensive set of trials at two major hospital sites, Corporaciò Sanitaria Clinic in Barcelona and Guy's and St. Thomas Hospital in London, that will be the centres of two information providers networks.

Achievements & Results

The project is proposing the development of an intelligent system aimed at supporting health professionals in their day-by-day activities; they can use these information anytime, anywhere as a starting point to retrieve, with the assistance of the server, the key information about the job being faced by the doctor being equipped with a broad range of networking interfaces (Bluetooth, WLAN, cellular).

Doc@Hand adds the capability to exploit computing and storage resources which are distributed in geographically dispersed locations and for making them accessible, in a seamless way, for complex problem solving: the ontology based search engine and the CBR tools at server side help meeting this objective. It also foster the creation of communities around this project workgroup concept and facilitate collaboration and, thanks to an user interface that completely hides to the user the physical location of the data, it provides concrete learning opportunities through comprehensive knowledge access, and motivate healthcare professionals in using these resources for improve their skills.

The successful implementation of the system will be measured by the following quantified objectives:

- **Reduced time** needed to search for information and knowledge and organize results by 60% in at least 80% of the working situations
- **Relevance of the search** results of at least 80% (meaning that only once in five times the doctor will have to manually search for additional data)
- **Reduction of noise** (results not relevant to the current context) by 50%
- **Reduction of costs** associated to duplication of activities (i.e. laboratory tests) due to the lack of available information by 80%

Doc@Hand

Knowledge Sharing and Decision Support for Healthcare Professionals

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- British Maritime Technology (UK)
- SSM (CY)
- ANCO (GR)
- Hospital Clinic Public Barcelona (ES)
- Guy and St.Thomas Hospital (UK)

Timetable: from 01/04 – to 12/06

Total cost: € 4.132.800

EC funding: € 2.299.850

Instrument: STREP

Project Identifier:
IST-200-508015

Keywords:

networking interfaces;
natural language;
virtual communities;
patient's data protection

eHealth ERA

Towards the Establishment of a European eHealth Research Area

The vision of transparent European healthcare systems which deliver high quality healthcare to all citizens independent of their location when in need of care is coming closer to reality. A European eHealth space facilitates this development.

Objectives of the project

The overall goal of the **eHealth ERA** project is to contribute to greater transparency of national eHealth strategies and implementation activities as well as innovation-oriented research and technology development (RTD) initiatives. Thereby the project aimed at fostering an effective European Research and innovation Area (ERA) in eHealth.

"eHealth ERA fosters the establishment of an effective European Research and Innovation Area (ERA) in eHealth"

Towards these ends, the project has contributed to:

- creating greater transparency with regard to national eHealth strategies and measures to achieve national eHealth visions,
- identifying and analysing priority deployment goals and resulting RTD needs,
- exchanging experience in developing and managing eHealth strategies and programmes,
- recommending sustainable mechanisms for effective trans-national cooperation between several of the participating states for mutual benefit.

Project Description

The analysis of national eHealth priorities led to the definition of two priority topic clusters for which more in-depth knowledge is urgently required by Member States to support further policy development and the implementation of appropriate actions. These topics are closely related to the European Commission's eHealth Action Plan: patient summaries and patient empowerment. eHealth ERA also surveyed RTD programme structures, actors, stakeholders and co-operation processes.

The development of project approaches and topics took place with the guidance of a Coordination Committee, which – in the framework of the European Union i2010 Subgroup on eHealth – brings together representatives of national health and other ministries as well as competent authorities in Member States and other participating countries.

Results & Impacts

This is the message of an **eHealth-ERA** based European Commission report entitled "eHealth priorities and strategies in European countries"*. It provides eHealth fact sheets on national activities not only for the 27 EU Member States but also five other European countries. It is a milestone in the development of eHealth in the European Union.

"On-going eHealth strategy development and implementation activities across European countries are now more transparent"

A key finding from the **eHealth ERA** project is that all European countries are undertaking great efforts to improve access, quality and efficiency of their health services through innovative information technology-based solutions. Together they are moving towards a common eHealth agenda in Europe.

* http://ec.europa.eu/information_society/activities/health/docs/policy/ehealth-era-full-report.pdf

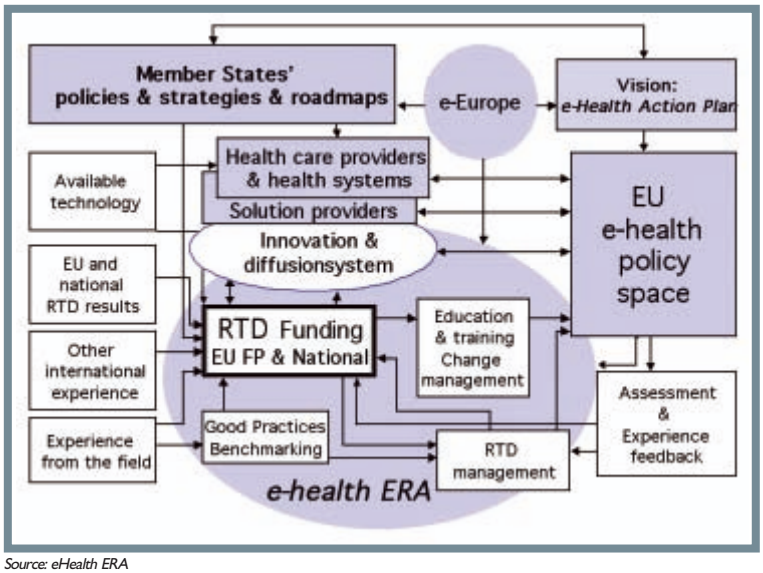
The key output of the eHealth ERA project is greater transparency of ongoing eHealth strategy development and implementation activities across European countries. eHealth ERA made the complex European eHealth policy context, as outlined in the figure, somewhat more transparent.

These somewhat intangible outputs are expected to translate into an in-depth understanding of common priorities and lessons learned, into improved co-ordination among Member States, and into increased coherence in European eHealth planning. Furthermore, the project may support the initiation of joint eHealth projects and RTD ventures.

Specific outputs include the following:

- A public eHealth website that includes a database with more than 200 documents about national eHealth strategies, implementation activities, and RTD programmes.
- Reports on two topic clusters – patient summaries and patient empowerment – detailing priority strategic opportunities for joint activities of Member States.
- A comprehensive European eHealth policy report, presenting a structured overview of programmes, initiatives and roadmaps, synthesising policy topics with priorities in many Member States.
- Functional description of national institutional eHealth RTD structures, programmes and relationships essential to achieve a high degree of eHealth RTD planning and co-operation across the European Union.

European eHealth policy context



Source: eHealth ERA

eHealth ERA

contributes to greater transparency of national eHealth strategies, roadmaps and implementation activities.

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- Consiglio Nazionale delle Ricerche (CNR), Rome, Italy
- Centre of Innovation, Technology Transfer and University Development (CITTRU), Jagiellonian University, Krakow, Poland
- Ministerio de Sanidad y Consumo, Instituto de Salud Carlos III (ISCIII), Madrid, Spain
- Engineering and Physical Sciences Research Council (EPSRC), Swindon, United Kingdom
- Imperial College, London, United Kingdom

Timetable: 27 months (4/05 - 6/07)

Total cost: € 1.065.233

Programme: € 950.000

Instrument: Coordination action

Project Identifier:
IST-2004-015854

Keywords:
eHealth,
national strategies,
roadmaps,
international coordination,
European Research Area,
action plan

EMERGE

Emergency Monitoring and Prevention

EMERGE intends to model the typical behavior of elderly people with medical risks following an integrated approach that uses ambient and unobtrusive sensors, in order to detect deviations from typical behavior, reason on acute disorders, and prevent emergencies.

Objectives of the project

Ongoing demographical and social changes in most European countries will result in a dramatic increase in emergency situations and missions within the next years. Already today, 44 % of emergency medical services (EMS) system resources are dedicated to patients over 70 years.

On the downside, this will result in higher costs for the EMS, which already have to cope with cost restrictions today, in substantially diminished service quality, or, in all probability, in both of these. Unfortunately, a high quality and affordable EMS in case of an emergency is an essential prerequisite for the independent life of elderly people in their preferred environment.

EMERGE tries to improve emergency assistance through early detection and proactive prevention. Ambient and unobtrusive sensing is used to enhance user acceptance. As a consequence, the quality of life for elderly people can increase. Costs for EMS can be leveraged for the elderly as well as for public health and society.

The main goal of EMERGE is to develop and implement a model for recurring behaviors and experiences of elderly people following an integrated approach in order to detect deviations from their typical behavior and to reason on acute disorders in their health condition.

The project's objectives are, therefore, to

- identify and model the most promising application scenarios for integrated emergency assistance,
- transfer the emergency model into an application design,
- identify and engineer suitable ambient information technology,
- engineer an adequate system architecture and platform, and
- validate the models and the engineered system in laboratory and field trials.

"Ambient and unobtrusive sensing is a major user requirement for high acceptance of emergency monitoring in everyday life"

Project Description

The approach in EMERGE is to reason about situations based on information collected from ambient, unobtrusive, and non-invasive sensors in the home environment of elderly people. This raises the challenge to cope with inherently unreliable and imprecise data, as well as the need to adapt the system to the specific conditions and demands of the assisted persons.

In EMERGE, we will tackle this problem with an intelligent sensor fusion approach in combination with a sound emergency model, describing the environment, individual diseases, parameters to monitor, potential emergency situations, and corresponding treatment options.

In order to reach the goal of EMERGE we will do the following work:

- Use ambient intelligence technology for unobtrusive monitoring of elderly people's situations at home. EMERGE uses non-body-mounted sensors for environment and activity tracking, building automation facilities, and location tracking. Body-mounted sen-

Practical Example

The impact of the prototypical solution will be measured with tests in a controlled environment in an Assisted Living Laboratory and two real-life evaluations.

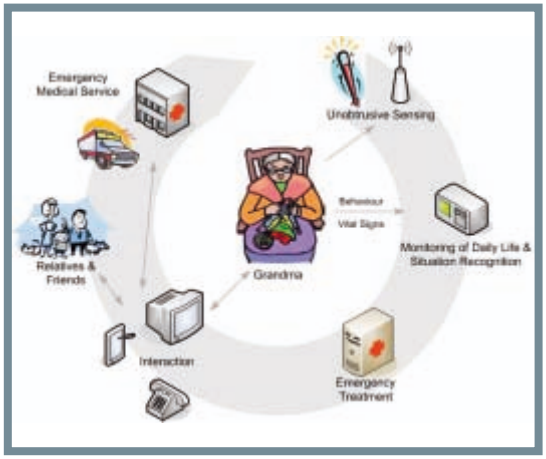
We will evaluate from the professional point of view, the technological point of view, and the user point of view in a two-step evaluation:

1. The solution will be tested with small case scenarios in the Assisted Living Laboratory of Fraunhofer IESE, which represents a close-to-real life environment of elderly people.
2. A real-life evaluation will then be conducted with case studies at two partner sites.

sors to monitor vital functions are used only if this cannot be done in an ambient way.

- Sensor fusion combines sensor data from different sources in an intelligent way in order to cope with the inherent imprecision and unreliability of the environmental data.
- Situations and upcoming emergencies will be detected in a reasoning process by
- detecting situations based on fused sensor information, and
- identifying conspicuous situations based on the knowledge in the emergency model.
- Anticipated emergency situations are resolved with a stepwise approach:
  1. Natural interaction with the affected person by means of appropriate ambient intelligent devices.
  2. Integration of relatives and caregivers.
  3. Notification of a public EMS system providing a) acute medical care, b) telemedical counseling, or c) activation of social or rescue services depending on the specific emergency situation.
- A systematic validation of the models and the engineered prototype will be performed in a two-step evaluation: a lab test and two field trials. The goal is to receive feedback on chronic diseases, useful environmental sensors, and helpful interaction to resolve upcoming or acute emergency situations.

Expected Results & Impacts



The outcome of EMERGE will be the emergency model, the validation of its feasibility and usability in a lab test and field trials, and finally, if our approach is successful, medical and technological guidelines for emergency monitoring and prevention for elderly people with ambient and unobtrusive sensors.

We expect that our work will have an impact on standard operating procedures in medical science, where medical guidelines for diagnostics and therapeutical treatments are provided.

E M E R G E

Emergency Monitoring and Prevention

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Timetable:
from 01/02/2007 - 31/10/2009

Total cost: € 4.012.690

EC funding: € 2.449.964

Instrument: STREP

Project Identifier:
IST-2005-045056

Keywords:
Emergency monitoring
Ambient, unobtrusive sensors
Situation recognition and reasoning
Emergency assistance at home
Software engineering methodology

EuResist

Integration of viral genomics with clinical data to predict response to anti-HIV treatment

The EuResist project aims to develop a European integrated system for the clinical management of antiretroviral drug resistance. The system will predict patient reactions to antiretroviral treatments for HIV, thus helping clinicians to select the most appropriate drugs and drug combinations for any given HIV genetic variant. To this end a huge European integrated data set will be created, linking three of the largest existing resistance databases: ARCA, AREVIR and Karolinska.

Objectives of the project

While combination antiretroviral treatment has made HIV a treatable condition, eradication of the infection has not yet been achieved. Treatment needs to be administered as a prolonged, possibly lifelong treatment. Long-term toxicity, difficulty in adhering to complex regimes, possible pharmacokinetics problems, and intrinsically limited potency are all factors favouring the selection of drug-resistant viral strains. The development of drug resistance is now a major cause for treatment failure.

EuResist aims to:

- integrate biomedical information from three large and expanding databases in different European countries collecting the required critical mass of historical and prospective data;
- develop and validate models for the effective prediction of responses to treatment based on HIV genotype and additional clinical information;
- make the prediction system available on the web for the optimisation of antiretroviral treatment.

"The EuResist integrated data set will be the largest in the world"

Project Description

The **EuResist** novel approach is based on using viral genotype data integrated with treatment response data from clinical practice to predict the resistances of a given HIV genotype. This strategy bypasses the genotype-phenotype correlation step and points directly to the most effective drugs and drug combinations on the basis of the available genotype data integrated with clinical data.

The **EuResist** integrated data set will be the largest in the world. It will result from the merging of three of the largest existing resistance databases: ARCA (I), AREVIR (D) and Karolinska one (S).

The **EuResist** integrated prediction system will use an array of predictors, each of them based on novel or state of the art method. The vastness of genetic and clinical data will lead to new approaches in the analysis of qualitative data:

1. Case Based Reasoning is a state-of-the-art method in Artificial Intelligence but has never been applied to HIV due to the lack of large data sets and difficulty to define an appropriate method.

2. Machine learning algorithms. The **EuResist** project will use hybrid algorithm merging the state-of-the-art generative and discriminative techniques (Bayesian networks) and support vector machine (SVM).

Scenario

A doctor connects via Internet to **EuResist** web page. He will input the HIV genotype data and possibly CD4 and HIV RNA levels as well as information on past exposure to antiretroviral. He could indicate the treatment regime he would like to use. The web server sends this data to the Prediction System that runs some sets of equations. It returns with an ordered list of the most effective drug combinations and also of the effectiveness of treatment using a single drug. If the user did input CD4 and HIV RNA values, the system will return the trajectory and variations between these two parameters. Depending on the amount of information input, and of the available driving data, a measure of the confidence of the output data will be provided.

3. Graph-theoretical methods. **EuResist** adopts a statistical approach to analyse the organisation of genetic material. Graph-theoretical methods will be used to reveal the organisational and functional structures of genetic material, possibly identifying new lines in medical treatment.

4. Evolutionary Models. Better understanding of viral evolution under the selective pressure exerted by specific drug combinations will form an important basis for the rational design of therapies and therapy sequencing. An improved understanding of the fitness landscape of HIV under HAART will be beneficial in an evolutionary model or as features for a statistical learning method.

5. Fuzzy Logic. The existing fuzzy logic based predictor will be enhanced by incorporating the new standard data and training into the large database.

The predictive System will be validated through a comparative study testing the prediction tools developed, together with the reference rules-based algorithms most commonly used for HIV genotype interpretation.

Expected Results & Impacts

The **EuResist** project, conceived to significantly improve the treatment of HIV patients in Europe will enhance the most sophisticated predictive models, by combining, in a unique and efficient way, the latest techniques or, promising techniques which have yet to be applied.

- Innovation aspects:
  - o Expanded geographical representativeness of HIV variants.
  - o Statistical and bioinformatics techniques used to develop the predictive engines.
- Expected advantages:

Expected advantages of the **EuResist** system include not only more effective care for patients but also decreased cost of therapy through reduced improper use of antiretroviral drugs and the resulting fall in the occurrence of infections combined with an improvement of the patient's immune status.

The project can also be considered as a pilot for HCV and HBV since a large antiviral treatment intervention have been started and the chronic nature of both of these viruses will lead to increased resistance to existing drugs. In Europe HBV and HCV are in fact more common than HIV.

EuResist
Integration of viral genomics with clinical data to predict response to anti-HIV treatment

E u R e s i s t

Integration of viral genomics with clinical data to predict response to anti-HIV treatment

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Timetable: from 01/06 – to 06/08

Total cost: € 2.973.355

EC funding: € 2.143.000

Instrument: STREP

Project Identifier:
IST-2004-027173

Keywords:
biomedical informatics,
decision support systems,
HIV,
drug resistance,
artificial intelligence

HealthAgents

Agent-based Distributed Decision Support System for Brain Tumour Diagnosis and Prognosis

HealthAgents is creating an agent-based distributed decision support system (DSS) for the diagnosis and prognosis of brain tumours. The HealthAgents system implements novel pattern recognition discrimination methods in order to analyse in vivo MRS and ex vivo/in vitro HR-MAS and DNA data. HealthAgents is not only applying advanced agent technology to the biomedical field, but also nurturing the HealthAgents network, a globally distributed information repository for brain tumour diagnosis and prognosis.

Background

Brain tumours remain an important cause of morbidity and mortality and afflict an increasing percentage of aging adults with a crude incidence rate of 8 per 100,000 inhabitants in Europe. Diagnosis using Magnetic Resonance Imaging (MRI) is non-invasive, but only achieves 60-90 % accuracy, depending on the tumour type and grade. The current gold standard classification of a brain tumour by histopathological analysis of biopsy is an invasive surgical procedure and incurs a risk of 2.4-3.5% morbidity and 0.2-0.8% mortality, in addition to healthcare costs and stress to patients. There is a need to improve brain tumour classification, and to provide non-invasive methods for brain tumour diagnosis and prognosis, to aid patient management and treatment.

The HealthAgents Network: A globally distributed information repository for brain tumour diagnosis and prognosis

The **HealthAgents** project will deliver an open-source web-based DSS which provides hospitals and organisations with a reliable tool to aid in the diagnosis of brain tumours and their prognosis and avoid invasive surgical procedures.

The main **objectives** of the project are:

- Improve the classification of brain tumours through multi-agent decision support over a distributed network of local databases.
- Develop new pattern recognition methods for a distributed classification and analysis of high-resolution magic angle spinning (HR-MAS) and DNA data.
- Define a method to assess the quality and usability of a new candidate local database containing a set of new cases, based on a quality score.
- Compile, evaluate and use parameters to audit clas¬sifiers and improve them periodically.
- Create the **HealthAgents** network, a globally distributed brain tumour information and knowledge repository comprising some of the leading European centres of excellence in neuro-oncology.

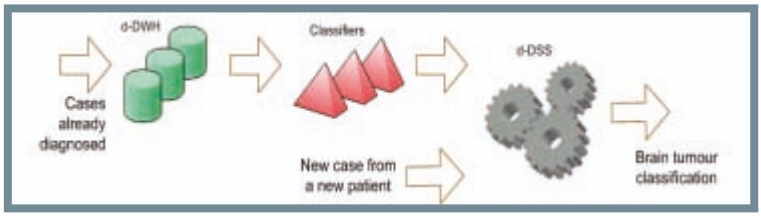
The **HealthAgents** project is engaged in the development of a distributed, agent-based decision support system (DSS), which implements a series of automated classifiers based on pattern recognition methodologies for the diagnosis and prognosis of brain tumours.

Our approach builds upon previous experiences in biomedical informatics, particularly in image processing and computer-aided diagnosis, where physiological and molecular level tumour discrimination are becoming increasingly used for the early detection of tumours; in machine learning for brain tumour classification using Magnetic Resonance Spectroscopy (MRS) where high classification accuracies have been achieved by various methodologies; and in agents where meaningfully codified descriptions of service capabilities have facilitated the development of protocols for pipelining them in dynamic ways for genome analysis and medical decision support systems.

Impact

Given that there are several brain tumour types and grades, the development of robust classifiers with a dozen samples of each tumour and (sub)type is per se an daunting task. According to analysts, there are some 15,000 MRI/MRS centres worldwide and, assuming, 100 cases per centre, there is a potential requirement for storage and classification of 1.5 million cases. By delivering an industrial-grade system, HealthAgents wants to set the standard for geographically-distributed computer-assisted diagnosis and prognosis of brain tumour.

The users of this system will include clinicians, histopathologists, epide¬miologists, radiologists, neurosurgeons and statisticians within hospitals and cancer research institutions; pharmaceutical companies; and organi¬sations with particular interest in data mining.



Agent technology and multi-agent systems will distribute and transfer data automatically and securely from and to any site through the network; upgrade and update the classification schemes; and invoke local and global classifiers from the local databases as well as from the virtual unified database.

HealthAgents intends to lead the area of classification and non-invasive diagnosis and prognosis for patients with brain tumours. We envision the steady development of the HealthAgents network, which will encompass individuals and organisations committed to improving brain tumour diagnosis, enabling them to share resources, architecture, clinical data, and information systems. This visionary network will enable cooperation among researchers and clinicians across Europe. **HealthAgents** is being developed by a multidisciplinary European consortium. We are not aware of the availability of a similar system or a similar consortium anywhere else worldwide.

Expected Results & Impact

The lifespan of the European population is increasing and accordingly, diseases that become prevalent in old age, such as brain tumours, will afflict a larger percentage of this population. In addition to this, within the younger population, cancer still remains the most common cause of death from disease in children over 1 year of age, and childhood brain tumours are the most common solid malignancies. As primary brain tumours are not known to have a lifestyle-associated aetiology, preventive strategies are not possible.

HealthAgents is intended to supply:

- Clinicians, histopathologists, epidemiologists, radiologists, and neurosurgeons with an efficient computer-based neuro-oncological diagnosis tool
- Researcher and academics with a research tool to study brain tumours
- Patients with the possibility of avoiding a costly biopsy

As early and accurate diagnosis may avoid a biopsy, costly in terms of morbidity and mortality, HealthAgents will enable a better treatment and planning, as well as facilitate the development of accurate methods to monitor prognosis. It is therefore arguable that HealthAgents may help to minimise healthcare costs and ultimately improve the quality of life of the European citizen.

The HealthAgents project will create an open-source web-based distributed DSS for to provide easy access to the expert skills needed to analyse, display and interpret single tumour MRS, genomic and molecular imaging data from tumours. Particular attention will be paid to child brain tumours, which have a different aetiology and social impact when compared to adult brain tumours.

HealthAgents

Agent-based Distributed Decision Support System for Brain Tumour Diagnosis and Prognosis.

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Timetable: from 01/06 – to 12/08

Total cost: € 4.106.879

EC funding: € 3.791.270

Instrument: STREP

Project Identifier:
IST-2004-27214

Best IST Project Website
Helsinki November 2006
Digital Innovation awards (finalist)
Internet Global Congress
Barcelona June 2006

Keywords:

Agent technology, human brain tumours, magnetic resonance, Decision Support System, eHealth networks and architectures

Health-e-Child

The Health-e-Child project aims at developing an integrated healthcare platform for European paediatrics, providing seamless integration of traditional and emerging sources of biomedical information.

Objectives of the project

The **goal** of **Health-e-Child** is **to become** the **universal biomedical knowledge repository and communication conduit for the future**, a common vehicle by which all clinicians will access, analyse, evaluate, enhance and exchange biomedical data of all forms. It will be an indispensable tool in their daily clinical practice, decision making and research. It will be **accessible at any time and from anywhere**, and will offer a friendly, multi-modal, efficient and **effective interaction** and exploration environment. Pivotal to this outlook are Health-e-Child's breakthroughs in personalised medicine through integrated disease modelling, knowledge discovery and decision support.

> ***"The core of Health-e-Child revolves around biomedical information analysis for the advancement of personalised medicine"***

Fashioned around three paediatric diseases with at least partly unknown causes, classification and/or treatment outcomes - heart diseases (right ventricular overload [RVO], cardiomyopathies), inflammatory diseases (juvenile idiopathic arthritis [JIA]), and brain tumours (gliomas), Health-e-Child is building the **enabling tools and services** that **improve** the **quality of care** and **reduce** its **cost** by **increasing efficiency**, through:

- *Integrated disease models*,
- Database-guided *decision support systems*,
- Cross modality information fusion and data mining for *knowledge discovery.*

Key to the Health-e-Child system is the establishment of *multi-site, vertical, and longitudinal integration* of biomedical data, information and knowledge delivered via a Gridbased platform, supported by robust tools for search, optimisation and matching processes.

The core of Health-e-Child revolves around its efforts dedicated to meeting the challenges entailed in *biomedical information* analysis for the advancement of personalised medicine.

Project Description

The following are a few examples of Health-e-Child's ongoing research activity.

Disease Modelling in Cardiology

Health-e-Child's research goals are:

- identifying significant parameters for subtypes of cardiomyopaties that could lead to indications for additional genetic tests,
- adapting generic models to clinical data to extract patient-specific high level discriminative features for decision support and knowledge discovery, and
- validating new measurements for diagnosis.

Decision Support in Cardiology

The project is currently developing tools for:

- monitoring RVO and decision support based on similarity search on specified features and association rules extraction.
- The prediction of whether atrial septal defect (ASD) will close by itself or will become larger, thereby precluding trans-catheterisation.

Knowledge Discovery in Rheumatology

Applied to JIA, Health-e-Child focuses on:

- identifying gene variant combinations (haplotypes) correlated with particular diseases (bones/joints erosion)
- comparing the presence of different proteins in fluid at different stages of the disease to discover behaviour of cells close to fluid.

Scenario

A child is born in a family in which there was an occurrence of idiopathic Dilated Cardiomyopathy (DCM). Her biomedical record is cohesively integrated. It is shared through a coherent view at different clinical sites. An intelligent classification algorithm combines the generative and the discriminative models in an optimal way and confirms an increased risk of DCM. Imaging data show left ventricle enlargement. An intelligent retrieval system for examining similar cases helps the doctor. A prevention/treatment plan especially fitted for her genomic or proteomic profile and existing symptoms is suggested.

- improving current classification of JIA subtypes, and identifying homogeneous groups of clinical features elaborating explicit criteria for the early prediction of disease outcome/evolution
- developing image-based methods which rapidly indicate the capacity of drugs to stop/slow down disease evolution (automatic suggestion of drug prescriptions)
- analysing correlation between genomic, proteomic, clinical and image data, establishing a candidate gene set (responsible for bone remodelling) for study.

Knowledge Discovery in Brain Tumours

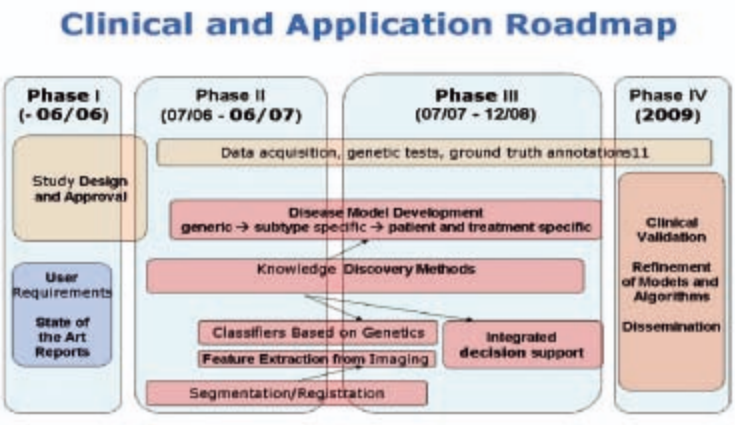
The priority research goals of Health-e-Child in this area are:

- verifying the diagnosis/categorization of low-grade gliomas
- correlating clinical, imaging, and genomic data
- correlating prognosis with tumour origin site
- defining prognosis (e.g., correlations with spectroscopy)
- suggesting treatment strategies
- predicting outcome
- providing more precise classification of diseases
- detecting correlations between age and outcome and between genetics and outcome
- elaborating meta-analyses of published findings.

Expected Results & Impacts

Health-e-Child will have substantial impact on:

- **Strategy**: Enhancing level and quality of medical services offered in Europe, advancing medical research, improving competitiveness in the area of medical service provision, facilitating the adoption of new policies in member state.
- **Technology**: Bringing forward information-based medical technology and integrating mostly separate areas, i.e., vertical information integration, advanced medical querying, Grid infrastructures, disease modelling, medical imaging, knowledge discovery and data mining, and decision support.
- **Society and economy**: Improving the success rate in resolving difficult medical cases, saving children's lives. Furthermore, such improved medical decision making will often result in lowering medical cost and/or treatment duration.



Health-e-Child

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Timetable: from 01/06 to 12/09

Total cost: € 16.701.753

EC funding: € 12.186.270

Instrument: IP

Project Identifier:
IST-2004-027749

Keywords:

integrated healthcare platform; decision support; data mining.

HEALTH PLUS

Improving Knowledge and Decision Support for Healthy Lifestyles

The HEALTH PLUS project intends to design, develop and validate a HEALTH PLUS system to become a leading web-based weight control, food intake monitor, lifestyle assistant and certified information provider positioned on the European market of ICT- based e-Health systems and services.

Objectives of the project

Overweight and obesity are increasing at an alarming rate in Europe and become a major public health problem:

- In EU nearly 200 million citizens are affected.
- Obesity involves an important economic cost estimated to 2 % to 8 % of the healthcare expenses.
- All EU countries face a growing need for effective therapeutic management of weight control and healthy lifestyle.

The **HEALTH PLUS** project is aiming at filling this gap through the active support to healthcare and nutritional professionals involved in weight control and lifestyle management and in prevention initiatives by providing:

- Assessment of nutritional habits of target citizens' / patients' groups.
- Certified and localized scientific information on food composition and lifestyle management.
- Support to examine the patient's clinical profile, and matching clinical data with nutritional and lifestyle habits.
- Support to healthcare and nutritional professionals producing tailored nutritional plans, providing specialized counselling for efficient weight control and lifestyle management.

Project Description

- The platform will provide the target users with a tool, based on personalized information on nutritional plans, to assist a complete process of changing their lifestyle.

The **HEALTH PLUS** platform includes:

- **A trustworthy context for information** connecting nutrition, health, lifestyle;
- **A knowledge management system** for clinical and scientific information sharing among health professionals and researchers;
- **Nutritional plan builder** for healthcare and nutritional professionals to support the user in defining and implementing a personal nutrition plan;
- **Feedback to healthcare and nutritional professionals and other users** about the effectiveness of undertaken actions
- **Tools for non-healthcare stakeholders** involved in industries, education and lifestyle change support.

User Scenarios

- Research scenario: serves researchers in defining and implementing dietary intake surveys among different population groups to evaluate dietary habits and their current trends in a territory.
- Operative scenario: supports health professionals in their treatment of patients from the nutritional point of view. Based on data collection (clinical data, dietary, psychological and physical activity data) individual nutrition support is defined.
- Promotional scenario: provides functionality dedicated to the general public to collect information about healthy lifestyle and nutrition, analyze personal nutritional behaviour and receive relevant nutritional feedback.
- Knowledge scenario: is intended to be used by researchers, nutritional specialists to search, store and share information on nutritional topics.

The added value of system creates several innovative software functions:

- A **sophisticated advisor** for healthy lifestyle and **physical activity plan builder**
- A **semi-automatic nutrition plan builder**
- **Psychosocial support tools** and **self-assessment tools**
- **PDA** and **mobile device support**
- A **smart search tool**

There are three pilots in **HEALTH PLUS** project to validate the final system platform:

Charles University in Prague, performing research of CVD diseases accompanying overweight and obesity for all age groups, plans to validate the **HEALTH PLUS** platform on a population of obese and overweight patients in cooperation with the MediSpo centre serving to patients in the prevention and treatment of metabolic diseases.

Agricultural University of Krakow, performing research in the area of human nutrition, will focus on Polish young people aged from 10 to 18 aiming at evaluation of nutritional status, theoretical nutritional knowledge, actual food intake, nutritional habits and lifestyles, average energy and nutrient intake of the subjects. They will analyze relationships between dietary patterns & lifestyles and overweight / obesity incidence and contribute to integrated national prevention strategies in Poland.

University of Parma, active in human nutrition research, will validate the **HEALTH PLUS** concept and platform among children aged from 6 to 12 by assessing children eating and lifestyle habits, implementing corrective measures targeting all children in a given environment in general and overweight children in particular and assessing the results of the corrective measures implemented.

Expected Results & Impacts

The **HEALTH PLUS** project potential impact lies in contributing to the fight against overweight, obesity and unhealthy lifestyle through the establishment of a knowledge and decision support systems especially targeted for patient-focused weight prevention and healthy lifestyle information and counselling.

In this way the system aims to offer a solution to one of the main societal and economic problems of the EU, to improve the level of health care systems by the provision of advanced services and to boost the research in the field of human nutrition and lifestyle management.

The project especially refers to the chance of creating a new strategy for better healthcare treatment and to promote the centrality of patient in medical care; it also grants best practices for state, regional and local authorities in dealing and modernising the healthcare system.

HEALTH PLUS

Improving knowledge and Decision support for Healthy Lifestyles

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- University of Parma (Italy)
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- R&S Info s.r.l. (Italy)
- ISH Ltd. (Hungary)
- Quality & Reliability S.A. (Greece)
- Professional Clinical Software GmbH (Austria)

Timetable: from 01/06 – to 02/08

Total cost: € 3.772.331

EC funding: € 2.200.000

Instrument: STREP

Project Identifier:
IST-2004-027126

Keywords:

knowledge technology,
information management,
agent technology,
weight control,
lifestyle management

HEARTFAID

A Knowledge Based Platform of Services for Supporting Medical-Clinical Management of Heart Failure within Elderly Population

HEARTFAID is a Research and Development project aimed at devising, developing and validating an innovative knowledge based platform of services, able to improve early diagnosis and to make more effective the clinical management of heart failure diseases within elderly population.

Objectives of the project

Chronic Heart Failure is one of the most remarkable health problems for prevalence and morbidity, especially in the developed western countries, with a strong impact in terms of social and economic effects.

All these aspects are typically emphasized within the elderly population, with very frequent hospital admissions and a significant increase of medical costs.

HEARTFAID aims to make more effective and efficient all the processes related to diagnosis, prognosis and treatment of the Heart Failure within elderly population.

'Make more effective and efficient all the processes related to diagnosis, prognosis and treatment of the Heart Failure within elderly population'

This general goal will be achieved by developing and providing an innovative technological platform that:

- integrates biomedical data within electronic health record systems, for easy and ubiquitous access to heterogeneous patients data;
- provides services for healthcare professionals, including patient telemonitoring, signal and image processing, alert and alarm system;
- supports clinical decision in the heart failure domain, based on pattern recognition in historical data, knowledge discovery analysis and inferences on patients' clinical data.

Project Description

An international consortium, involving academic researchers, health care organizations and companies are developing and implementing the knowledge-based platform of services proposed in the **HEARTFAID** project.

The core of **HEARTFAID** platform is the Knowledge Level, formalizing all the pre-existing clinical knowledge about Heart Failure.

Novel, useful and non-trivial knowledge is extracted from the Knowledge Base and the data collected during the project, by using innovative knowledge discovery processes.

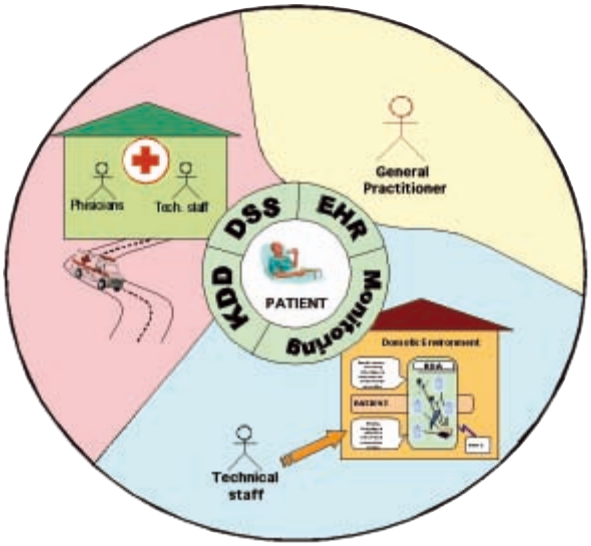
If the Knowledge Base represents the hearth of **HEARTFAID** platform, the "brain" of the platform is the Clinical Decision Support Systems (CDSS).

The CDSS has the main goal to provide a valid support to the health care operators and the decision makers operating in the field of Heart Failure diseases.

To ensure the reliability and the correctness of the whole system, the clinical partners will carry out an intensive validation of the platform functionalities.

Scenario

With the aid of **HEARTFAID** platform, all the health care operators will be able to collect and visualize present and historical data of the heart failure patients. No delays due to transfer of paper clinical notes among different institutes, no uncertainty about the reliability of past data. Physicians will have only to click on their notebook (or PDA, or Desktop PC) to access to the complete profile of the patient, and to ask the decision support services about the best treatment policy for the specified patient.



The patient-centric architecture of the HEARTFAID platform of services

Expected Results & Impacts

HEARTFAID's strategic impact concerns mainly the improvement of the quality of life of Heart Failure patients and the reduction of social and economic costs.

HEARTFAID applications will bring an important increase in the treatment quality of the individual patient, by ensuring the possibility to personalize the therapy and have a real-time monitoring and assistance of the patient.

On the other hand, the optimization of the therapy processes will assure the control and reduction of the overall economic and social costs of medical care, by decreasing the frequency of hospital admissions.

Moreover, the results of **HEARTFAID** and the technical solutions created inside the project will be used in order to:

- innovate biomedical data communication standards;
- improve the Heart Failure clinical guide lines and protocols;
- develop new models and procedures for better organisation of the health care delivery;
- suggest new directives and research policies to policy makers.

HEARTFAID System Functionalities and Services

HEARTFAID

A knowledge based platform of services for supporting medical – clinical management of the heart failure within the elderly population

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- Jagiellonian University – Medical College (PL)
- VMW Solutions LTD (UK)
- Hellenic Communications and Telematic Applications Company S.A.- FORTHNET (GR)
- SYNAPSIS Srl (IT)
- Consiglio Nazionale delle Ricerche (IT)
- Foundation for Research and Technology- Hellas (GR)
- Rudjer Boskovic Institute (HR)
- Instituto Auxologico Italiano (IT)

Timetable: from 02/06 – to 01/09

Total cost: € 3.220.115

EC funding: € 2.089.759

Instrument: STREP

Project Identifier:
IST-2005-027107

Keywords:
health professionals' knowledge;
decision support systems;
telemedicine;
biomedical data integration;
Heart Failure

I-Know

Integrating Information from Molecule to Man: Knowledge Discovery Accelerates Drug Development and Personalized Treatment in Acute Stroke.

I-Know is a knowledge discovery IT -based tool designed to aid early stroke diagnosis, stroke treatment, drug development and identification of risk factors as targets in disease prevention for the benefit of European industry and citizens.

Objectives of the project

Acute stroke is a major socioeconomic burden in EU. The disabilities following the disease develop rapidly and prompt treatment of patients is imperative. Currently a drug dissolving the blood clot (rtPA – thrombolysis) is the only established treatment, but this is only implemented at highly specialised centres. There is consequently a strong geographical inequality in the availability of this treatment - nationally and internationally within EU.

"I-KNOW meets the challenges of an ageing population by improving care for the parallel increase in stroke victims"

At the same time there is an intense search by pharmaceutical industry and academic biomedical research to identify drugs that will stop the tissue damage progressing after acute stroke.

The knowledge discovery tool, ***I-Know*** will:

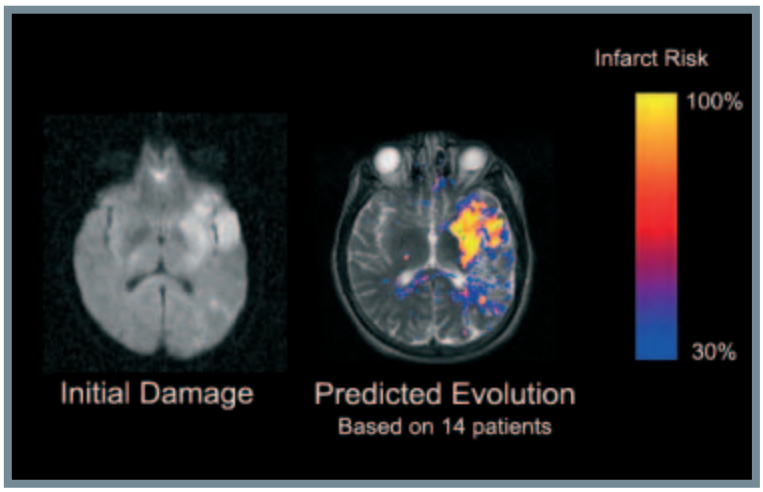
- Provide instant, user-friendly ITbased diagnosis and therapeutic guidance, reducing the infrastructural, economic and educational barriers currently hindering advanced stroke treatment at less specialised units.
- Use advanced data mining techniques to model disease progression based on large multinational databases providing state-of-theart diagnosis of every EU citizen irrespective of knowledge barriers.
- Provide a platform for modeling beneficial or adverse effects recorded during clinical trials, allowing optimal use of preclinical data in subsequent individualized patient management.
- Be designed to integrate data across descriptive levels to devise disease models that will bring scientific progress to stroke research.

Project Description

Currently, Computerized Tomography (CT) is the most widely used imaging modality in the clinical management of acute stroke. CT is very sensitive to haemorrhagic stroke and is therefore important in minimizing adverse effects in thrombolytic treatment.

Magnetic Resonance Imaging (MRI), is a growing image modality in acute stroke, and recent research has shown that MRI may delineate micro-structural damage after acute stroke by Diffusion Weighted Imaging (DWI – showing regions of cellular damage), and measure the extent of reduction of blood supply by so-called perfusion weighted imaging - PWI. More importantly MRI has high specificity in terms of predicting final outcome in acute stroke patients, lending confidence to the development of powerful systems for the support of patient management and in the study of drug efficacy.

Currently, the logistics of performing acute MRI and the lack of access to advanced processing tools and expertise for these advanced imaging data limit health care professionals in fully exploiting the benefits of acute MRI images. Through computerized stroke disease progression models (DPMs), ***I-Know*** will provide an accurate diagnosis in individual. Interacting with the physician, ***I-Know*** will produce images, predicting the course of the disease given available therapeutic options and their specific actions recorded in other patients (DPMs from clinical trials). In a system seamlessly integrated with eHealth systems, this allows physicians to diagnose and treat the patient on the basis of a wealth of information otherwise impossible to integrate by the human mind.



Expected Results & Impacts

The ***I-Know*** system is believed to result in improved diagnostic and therapeutic capability for treatment of ischemic diseases within EU.

This is anticipated to lower mortality and degree of disability of the victims, thereby improving their quality of life after an ischemic disease.

The ***I-Know*** system:

- Meets the challenges of an ageing population by improving care for the parallel increase in stroke victims.
- Reduces geographical inequality in access to care by facilitating advanced diagnostics and treatment locally.
- Allows full utilization of the investment placed by society in advanced diagnostic technology.
- Manages and integrates huge amounts of health information.
- Assists health professionals by providing 'best-practice' and expert advice in stroke treatment.
- Provides detailed accounts of adverse effects and outcome, providing excellent tools for bench-marking to support health managers in quality assurance in stroke care.
- Addresses the issues of interoperability and user friendliness by developing automated algorithms and separately analyze the products integration into an eHealth environment with electronic health records.

The resulting, lower socio-economic burden of cerebral ischemic diseases will allow for reallocation of resources to other measures, improving the quality of life of EU citizens as a whole.

I – K n o w

Integrating Information from Molecule to Man: Knowledge Discovery Accelerates Drug Development and Personalized Treatment in Acute Stroke

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- Systematic Software Engineering A/S (DK)
- Dimac A/S (DK)

Timetable: from 05/06 – to 04/09

Total cost: € 3.876.347

EC funding: € 3.092.810

Instrument: STREP

Project Identifier:
IST-2004-027294

Keywords:

Biomedical informatics;
Personalized health;
Medical imaging; Early diagnosis;
Pharmaceutical research

ImmunoGrid

The European Virtual Human Immune System Project

The project will focus on establishing an infrastructure for the simulation of the immune system that integrates processes at molecular, cellular, and organ levels. It will be designed for applications that support clinical outcomes such as design of vaccines and immunotherapies and optimization of immunization protocols.

Objectives of the project

The **immune system** is a complex and adaptive learning system which has evolved to defend the individual. It has multiple levels (molecular, cellular, organ and tissue, organism, and organism-toorganism) and is also combinatorial in nature with a large number of products.

Immune intervention, such as **vaccination**, is the most effective method for the control of disease and the greatest achievements include eradication of smallpox, near-elimination of polio, and savings of some 170 million person-years. Vaccination has been used in the control of over two dozen diseases by the 50 or so successful vaccines which have been developed to date.

Large-scale studies of the immune system, also known as **immunomics**, is the key factor driving the current wave in vaccine development. The main objectives of **ImmunoGrid** are to:

- Create computational models for the real-size human immune system (the Virtual Human Immune System Simulator).
- Standardize immune system concepts, bioinformatics tools and information resources to enhance the computational models for preclinical and clinical applications.
- Validate these models with experimental data and disseminate the tools developed to users such as vaccine and immunotherapy researchers and developers.

Project Description

Computational models are becoming increasingly important in immunomics:

- Experimental approaches are expensive and it is impossible to perform systematic experimental studies of immune processes in humans.
- Because of ethical issues, there are stringent limitations as to what experiments can be performed in humans.

"Grid computing will allows us to approach the known complexity of the immune system"

The main problems that prevented the use of these models in practical applications, such as design of vaccines and optimisation of immunisation regimens are:

- large combinatorial complexity of the human immune system,
- lack of understanding of specific molecular interactions that resulted in an idealisation of representation of molecular interactions as binary strings, and
- lack of experimental model data and correlation of model parameters to real-life measurements.

Scenario

An important application of **ImmunoGrid** will be in the design of new vaccination protocols. One such protocol is the so-called "Triplex" vaccine which has been extensively studied in cancer immunoprevention. Experiments with mice will both provide input for the improved computational models and be used to validate new protocols resulting from these models, comparing with Triplex. An exciting prospect is the possibility of using **ImmunoGrid** in immunotherapy: it is found that the Triplex vaccine has minimal efficacy against established mammary carcinomas, a feature shared by most cancer vaccines, however some early studies indicate that the Triplex vaccine could be used with success in a therapeutic setup against incipient lung metastases.

Recent developments provide remedies to these problems and we are in the position to address each of these issues.

Grid computing has brought powerful computational infrastructure and capacity that can match the complexity of the real human immune system. Founded on experimental data **models of molecular interactions** have reached high accuracy and we are routinely using prediction methods of antigen processing and presentation to identify the best targets for vaccine constructs. Finally, **experimental models** of immune responses to tumours and infectious diseases have been successfully modelled computationally.

The specific outcome will be a tool (the Virtual Human Immune System Simulator) for use in preclinical/clinical applications, vaccine discovery and optimisation of immunisation protocols.

Scaling-up the model of human immune system to realistic (natural) size will provide an insight into the making of the immune system and help improve interpretations of results from mouse models. Earlier results on mouse models of cancer development indicate the utility of this approach for optimisation of immunisation protocols.

Expected Results & Impacts

Immunology has a significant scientific and economic dimension –understanding the immune function is important for understanding the factors that maintain the organism in a healthy state, and intervention has important repercussions in improving the health of individuals and population through improved disease prevention (diagnostics), protection (vaccines), and effective curing (therapeutics).

At the end of the project we are going to realise a common shared resource with a significant potential for strengthening European cross-disciplinary research by supporting European medical biotechnology and computer science.

The computational models and the set of tools developed will be validated with experimental data and then provided to support clinical applications for the development of immunotherapies in cancer and chronic infections and disseminated to users such as vaccine and immunotherapy researchers and developers.

ImmunoGrid

The European Virtual Human Immune System Project

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- Birkbeck College, Univ. of London (UK),
- University of Bologna (IT),
- University of Catania (IT)

Timetable: from 02/06 – to 01/09

Total cost: € 2.622.274

EC funding: € 1,951,042

Instrument: STREP

Project Identifier:
IST-2004-028069

Keywords:

HealthGrid,
virtual physiological human,
grid computing,
immune system modelling,
immunotherapy

INFOBIOMED

Structuring European Biomedical Informatics to Support Individualised Healthcare

INFOBIOMED aims at enforcing European Biomedical Informatics as an integrative discipline with a view on supporting individualised healthcare. Biomedical Informatics aims to take advantage of synergies derived from a joint consideration of both Bioinformatics and Medical Informatics, facilitating the discovery of novel diagnostic and therapeutic methods.

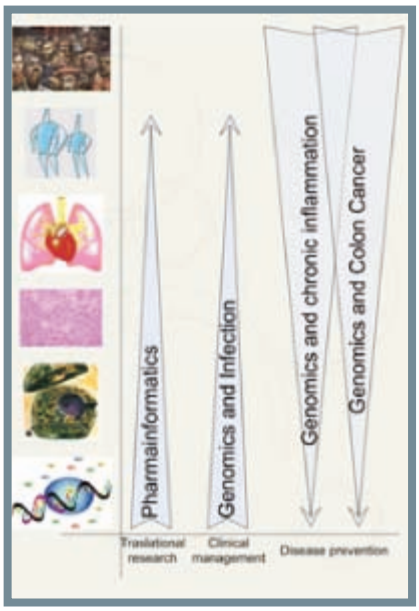
Objectives of the project

The **INFOBIOMED** network aims:

- To enable systematic progress in clinical and genetic data interoperability and integration.
- To advance the development, exchange and interfacing of methods, tools and technologies used in MI and BI.
- To enable pilot applications in particular fields that demonstrate the benefits of a synergetic approach in BMI.
- To create a European BMI community that extends beyond the proposed core network.
- To spread the knowledge acquired and developed in the framework of the network.
- To enable a robust framework for education in BMI, as well as training and mobility of involved researchers.
- To create a long-lasting, self-sustainable structure in the European BMI field.

Project Description

INFOBIOMED has been designed to cover all the significant aspects that are relevant to MI and BI and that have the potential to provide a space for synergy between them. These aspects include consideration of generic research in the fields of data interoperability and management, methods, technologies and tools, including issues such as security and standards development.



The knowledge gathered in these activities is then tested into some 'vertical' pilot applications that aim to cover the whole range of information levels from molecule to population, and which address three important challenges in individualized healthcare: translational research, clinical management and disease prevention.

Scenario

There is a great need to gain more insight in the complexity of periodontitis, to design new treatment strategies and devise preventive measures. Periodontitis is an excellent model to study complex chronic inflammatory diseases because of its multifactorial etiology (genetics, infection and environment), relative high prevalence and broad and easy access to diseased patients and control cases, as well as tissue samples. **INFOBIOMED** aims to build a biomedical informatics platform to assist with understanding and managing the disease. Existing data banks need integration, further genotyping support and modern informatics approaches for data analysis, such as clinical data image analysis tools (including radiological images). Biomedical informatics methods and tools can contribute to the study of the etiology of periodontitis and the development of gene based disease classification schema that may be relevant to differential treatments.

Achievements & Results

INFOBIOMED has successfully promoted synergy and exchange between key European institutions performing research in the BI, MI and/or BMI fields. Besides extensive dissemination results, innovative training activities and active policies for mobility of researchers, the network has developed two state-of-the-art documents on data, methods and technologies in BMI, freely available from the project web site. Additionally, a number of applications have resulted from scientific collaboration, including information retrieval and mining tools (e.g DiseaseCard, OSIRIS), data models and databases (e.g. GenoScore, dbSNP, HGVBaseG2P, the microarray-focused MIND), image analysis tools (DIA for dental x-ray images), tools aimed at specific diseases (e.g. HIV pol gene analysis tools), etc. Beyond these specific, but generically useful BMI applications, the four pilot applications have also achieved important results, resulting in relevant scientific publications that demonstrate the value of synergistic BMI approaches applied to specific problems:

- **Pharmainformatics**: aimed at investigating the impact of BMI on pharmaceutical research, this pilot has followed two lines of action, illustrating the information continuum from Pathology to Pathway to Target to Ligand/Approved Drug, from both ends. In the first one, Nuclear Hormone Receptors have been studied, including the development and analysis of annotated chemical libraries, databases and fingerprinting. In the second, insight into the underlying mechanisms of the Complex Regional Pain Syndrome and its treatment is pursued.

- **Genomics and infection**: aimed at the study of host and pathogen genetic polymorphisms, protein interactions and transcriptional/translational control and how these impacts on microbial virulence and host immune responses to infection, the pilot was centred on the study and analysis of fundamental immune response pathways related to type 1 and 2 interferon. From a pathogen perspective, studies focussed on the interaction of the clinically relevant pathogens Cytomegalovirus and Hepatitis C with the signalling networks. The pilot includes a study to improve treatment strategies, exploiting a pathway-centric approach in the analysis of clinical samples from Hepatitis C virus-infected patients treated with interferon.

- **Genomics and chronic inflammation**: centred on improving the understanding and clinical management of adult periodontitis as a model for complex diseases, this pilot has developed a Periodontal Data Warehouse that integrates phenotype, genotype, microbiology, environment and disease severity data of more than 800 patients/controls, including appropriate consideration of security and privacy. Analysis of the data is expected to provide insight into the complexity of the disease, and help improve disease classification schemes, risk profiling and possibilities for screening.

- **Genomics and colon cancer**: targeted at improving the information management of screening programmes in families with high-risk of developing Hereditary Non-Polyposis Colon Cancer. The pilot has developed an innovative web-based system that integrates heterogeneous information flows among genetic and surgical departments, laboratories and a national registry using XML data models. Interoperability studies using HL7 standards have been performed as well. The benefits could be expanded by easing communication among national cancer registries in different countries and extending BMI solutions to other oncogenetic diseases.

INFOBIOMED

INFOBIOMED

Structuring European Biomedical Informatics to Support Individualised Healthcare

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- Universidad Politécnica de Madrid (ES)
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- Danish Centre for Health Telematics (DK)
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- The Danish HNPCC-Register (DK)
- Academisch Centrum Tandheelkunde Amsterdam (NL)
- AstraZeneca (SE)
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Other Participants:
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- Università degli studi di Siena (IT)

Timetable: from 01/01/2004 – to 30/06/2007

Total cost: € 4.850.000

EC funding: € 4.850.000

Instrument: NoE

Project Identifier:
IST-2004-507585

Keywords:

Biomedical Informatics, Medical Informatics, Bioinformatics, Genomic Medicine, Research networks.

INTREPID

A Virtual Reality Intelligent Multi-sensor Wearable System for Phobias' Treatment

INTREPID project aims at developing a multi-sensor wearable system for the treatment of phobias and situational anxiety. INTREPID project actively contributes to the treatment of phobias in an unobtrusive, personalized and intelligent manner.

Objectives of the project

INTREPID will serve to empower Community citizens in the management of their individual health, to provide health care professionals and facilities with a reliable phobias treatment and decision support tool and to create new opportunities for the medical wearable device industry. **INTREPID** will build upon the well documented increasing demand for "healthy lifestyle" products and services on the consumer side and offer potentially significant returns for those who chose to invest in the project outcome.

• The **INTREPID** project scientific objectives are:

- To effectively exploit the synergy in the information acquired from the various biometric sensors and develop new and efficient data fusion techniques, which will significantly broaden machine perception and enhance awareness of the phobia's states.
- To create an identification system of the physiological and phobia-based emotional state of a patient (phobia's state) that will be based on the association of the information coming from the various biometric sensors.
- To create a decision-making system that will project the current patient's phobia state into the future and draw inferences about the actions that should be taken in order to keep the patient in the desired phobia's state.
- To create a new centralised sensor management system that will use active and selective perception techniques in order to optimize the overall performance of the identification system and the tracking system.
- To create a powerful, intelligent and innovative human-computer interaction environment that will boost the research and work on affective wearable computing and machine emotional intelligence domain.

• The **INTREPID** project technological objectives are:

- To create an advanced tracking system that will optimally monitor the symptoms of phobias. The system will measure heart rate, perspiration rate, breath rate, muscle stiffness and if needed complementary modalities through a set of miniaturized wearable sensors that the patient wears during the treatment session.
- To create a sophisticated environment in a commercial wearable computer that will consist of:
- To create a professional site for psychologists and therapists that will assist them to design the next steps of the patient's therapy taking into account the individualized physiological and emotional state of each patient.

"The therapist, using the Professional Site, will have the ability to interact with the patient and the VR environment during the VR exposure of the patient in order to help him control his fear"

Project Description

Technical Approach: Virtual Reality exposure has potential as a new medium for a well-established treatment, graded exposure therapy. A medium that makes exposure less aversive and more attractive to patients is likely to increase the proportion who seeks treatment. The combination of the above with emotional intelligence based on physiological signals will vastly improve the therapeutic procedure and is worthy of investigation.

Achievements & Results

INTREPID solution & functionalities are:

- A multi-sensor system that includes three different wearable biometric sensors. It will have the ability to monitor simultaneously respiration, skin conductance (GSR), blood volume pulse (BVP) and heart rate (from BVP). The multi-sensor system will be a Bluetooth-enabled and non-invasive system since the above monitored physiological signals can be sensed painlessly from the surface of the skin.
- A control unit with its peripheral devices - a head-mounted display (HMD) and virtual reality (VR) glove - both enabled with wireless communications.
- The clinician's laptop or personal computer (PC) or even personal digital assistant (PDA).

During therapy, the patient will be immersed in a VR environment where VR sceneries will be altered following scenarios that describe phobias situations.

The multi-sensor system will monitor the reactions of the patient during the exposure and measure a number of physiological signals. These data will be forwarded wirelessly into the control unit, which in turn will process the physiological signals. An intelligent mechanism, based on Fuzzy Logic, will undertake the responsibility to perform a feature-based fusion of the sensor information in order to infer - in real time - decisions on patient's physiological and phobia-based emotional state. According to the decisions, the scenarios and the VR sceneries, following a set of rules given by the therapist, will be altered dynamically in order to keep the patient in the desired physical and psychological levels. All the extracted information for the physical and psychological condition of the patient in a time frame during the therapy session will be transmitted wirelessly to the therapist's laptop or PDA (Professional site).

Thanks to the use of the **INTREPID** system, the therapists will be able to taking promptly the best possible decision for diagnosis and treatment of phobias using a number of scenarios in therapeutic session in order to expose the patient in virtual reality phobias situations.

INTREPID will achieve this result by introducing knowledge-based adaptive systems that combine specialised feature-based information with "anytimeanywhere inferencing" in order to support automated diagnosis and decision support.

Major benefits expected by all the end users by the adoption of the **INTREPID** system is to increase the number of patients who are able to better manage their individual health, provide better services through faster patient processing and analyzing, increase the number of correct diagnoses and reduce costs per patient and medical errors .

Thanks to the introduction of user-friendly and ergonomic multi-sensor system, it is estimated that, with the same personnel and the utilization of **INTREPID**, a 15% increase in speed of phobias treatment, thanks to more data available on the patient received.

INTREPID

A Virtual Reality Intelligent Multi-sensor Wearable System for Phobias' Treatment

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Timetable: from 01/04 to 12/06

Total cost: € 3,228,334

EC funding: € 2,000,000

Instrument: STREP

Project Identifier:
IST-2002-507464

Keywords:

multi-sensor wearable system, situational anxiety, virtual reality phobias situations, a feature-based fusion of the sensor information

K4CARE – SDA* (State-Decision-Action)
Knowledge-Based HomeCare eServices for an Ageing Europe

K4CARE combines the healthcare and the ICT experiences of several western and eastern EU countries to create, implement, and validate a knowledge-based health care model for the professional assistance to senior patients at home.

Objectives of the project

In modern societies, the care of chronic disabled patients at home involves life long treatment under continuous expert supervision that saturates European national health services and increase related costs.

K4CARE's main goal has been to design, implement and validate a new ICT knowledge-based Homecare Model by integrating skills, procedures and experiences of several eastern and western European countries as a contribution to the new EU society to manage and respond to the needs of the increasing number of senior population requiring a customised health-care at home. Other more specific objectives:

- Generate a new ICT Homecare Model (HCM).
- Provide an Electronic Health Care Record (EHCR) to organise the information in the HCM.
- Use the EHR to integrate information coming from different EU countries.
- Provide an Actor Profile Ontology (APO) representing the profiles of the subjects involved in the HCM.
- Provide a patient-Case Profile Ontology (CPO) representing related symptoms, diseases, syndromes, and case mix.
- Define Formal Intervention Plans (FIPs) for a number of disease and syndrome treatments.

'improves the efficiency of the care services for senior citizens at home in Europe'

Project Description

In order to facilitate the care of senior patients at home, **K4CARE** is investigating and developing several IST data- and knowledge-based technologies that will be integrated in a CS platform. The HCM provides a description of the actors (i.e. professionals, patients, and citizens) involved in the care of senior citizens at home, the services, procedures and documents a successful home care system must provide, and the actions that each actor is able to perform in the different services. A final HCM has been published that is modular, scalable and adaptable to the particularities of national regulations and norms of the current EU countries. A dissemination process of this model has started in parallel with the design of the document-oriented *K4CARE data model* (i.e. the EHCR) and the development of stable versions of the APO and the CPO ontologies. These ontologies, together with the already published ***SDA**** *model* to represent FIPs, constitute the *K4CARE knowledge model*. Both the K4CARE data model and the K4CARE knowledge model have been made consistent with the HCM.

As far as the data model is concerned 43 sorts of document were identified in the HCM, all of them organised in sections which contain concrete data. The structure of these documents has been formalised as XML Schemas in order to allow the exportation and importation of health care data to and from other systems, and it directs the design of the EHCR which is currently under development.

Scenario

The family doctor, at patient's home, consults a shared EHR (same level and quality of information as in a hospital). During the examination, guidelines are automatically presented, standardized procedures proposed (FIPs); based on the CPO, the individual set of diseases is examined. The physician can immediately modify treatment: the EHR is updated in real time from different sources, following the evolution of the patient. Integration of medical and social information allows comprehensive interventions (e.g. nurse reporting side effects of therapy). APO concepts guide consultation of EHR. Distributed access allows optimization of interventions (e.g. relatives or social worker asking information on management of feeding).

With regard to the **K4CARE** knowledge model, the APO gathers all the relevant concepts and concept relationships to define actor profiles and the CPO comprises the concepts and the relationships describing the most common pathologies in the care system: post-stroke, diabetic, cognitively impaired, and mobility impaired patients. A language to represent know-how knowledge and a software tool (the SDA* Lab) to manage this sort of knowledge has also been developed. This software is being used to define K4CARE health care procedures, FIPs and Individual Intervention Plans (IIPs) as a combination of FIPs personalised to a particular patient.

In the near future, K4CARE will adopt already existing FIPs for those pathologies with agreed treatments, will develop new FIPs for unpublished treatments, and will apply machine learning techniques to generate FIPs from the information in the EHR about past treatments. Finally, a multi-agent platform will be implemented to allow all the actors to interact in the HCM. On one hand, each actor interaction will be constrained though actor profiles that will be adjusted by the combination and adaptation of APO concepts. On the other hand, the CPO and the FIPs will serve to tailor know-what and know-how knowledge on the target pathologies to the particularities of a concrete patient. This platform will be tested by health care professionals, caregivers and patients in order to verify the adherence to their needs and duties, the possibility of use in every day activity, the capability of collecting and integrating information from different sources, and the possibility of use of computer management tools for personalizing FIPs. The test will be performed by staff of health care providers in real home care facilities on western and eastern EU societies. The assessment of a second release of the platform - final product - will be performed in the community of the town of Pollenza (Italy) and will involve the entire home care facility, GPs, the Municipality, Social Assistants, citizens representatives.

Expected Results & Impacts

K4CARE will foster a direct impact in healthcare centres, healthcare national systems, and ultimately in the process of constructing a general homecare model in Europe. Whenever this last occurs, the HCM is expected to act as a reference to inspire the integrated use of the K4CARE proved successful ICT technologies to deal with homecare patients.

From a social and economic point of view, the K4CARE model will reduce homecare complexity and will make healthcare closer to the citizens in the sense that, information will be integrated in the HCP, its access will be more direct and safe with the use of ICT technologies, and the flow of information about the updated state of the patient among the different professionals will become time-space independent.

From a professional point of view, K4CARE final product will represent an intelligent decision support system in which personalized FIPs will help caregivers to provide each patient with the best-available personalised treatment.

The final EHCR, the knowledge-base, and the CS platform will remain public at the end of the project for further uses and considerations.

K 4 C A R E

Knowledge-Based HomeCare eServices for an Ageing Europe

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- Telecom Italia Spa (IT);
- European Reseach and Project Office (GE);
- Ana Aslan International Foundation (RO);
- Instituto di Ricovero e Cura a Carattere Scientifico Santa Lucia (IT);
- Magyar Tudomanyos Akademia Szamitastechnikai es Automatizalasi Kutato Intezet (HU);
- The Research Institute for the Care of the Elderly (UK);
- Comune di Pollenza Macerata (IT);
- General University Hospital in Prague (CZ);
- Szent Janos Hospital of the Budapest Municipal Government (HU)

Timetable: from 03/06 – to 02/09

Total cost: € 3.727.430,00

EC funding: € 3.133.785,00

Instrument: STREP

Project Identifier:
IST-2004-026968

Keywords:

modelling, health professionals knowledge, personalised health, homecare, ageing, electronic health record, and knowledge integration and exploitation.

LHDL

Living Human Digital Library: interactive digital library services to access collections of complex biomedical data on the musculoskeletal apparatus

LHDL will develop the infrastructure, based on state-of-the-art ICT systems, to support the *Living Human Project* aimed at the creation of a worldwide, distributed repository of anatomo-functional data and of simulation algorithms, directly accessible by any researcher in the world.

Objectives of the project

Multiscale integration of biomedical information is becoming a clear need to solve critical problems (e.g. diagnosis, treatment planning, rehabilitation management) in dozens of clinical scenarios (e.g. bone tumours, cerebral palsy in children, large traumatic skeletal defects, paraplegia).

LHDL is aimed at developing the core ICT infrastructure to support the Living Human Project. At the outset a community server (based on Open Source software) will be established for community building and collaborative working. Three software independent, but strongly integrated, frameworks will be developed that will provide all the infrastructural services that the available software cannot provide. The scientific and technological objectives of the project are to create:

- a digital library specifically designed to support a virtual laboratory, with all its aspects and needs;
- an application framework for management, fusion and exchange of biomedical digital data;
- a service framework for the development, the sharing and the choreography of software services;
- knowledge-management framework to manage the repository of data, models and services

Project Description

The **LHDL** aims to create an in silico model of the human musculo-skeletal apparatus which can predict how mechanical forces are exchanged internally and externally at any dimensional scale from the whole body down to the protein level. This model should be designed as an infrastructure that can be updated and extended whenever new data and algorithms become available. It should also account at any level for the inter-subject variability observed in the population. The Living Human Digital library aims to develop this infrastructure. Around a community building and collaborative working server we plan to develop: an application framework for management, fusion and exchange of biomedical digital data; a service framework for the development, the sharing and the cho-

Scenario

LHDL will develop an anatomo-functional framework, connected to a simulation framework that will allow the development of multiscale subject-specific models to understand the physiology of the human musculoskeletal system. Using the **LHDL** infrastructure a Belgian anatomist will be able to create a detailed anatomical model of the whole body, using data from cadavers; an Italian bioengineer will combine these data with motion data taken from volunteers and will create a biomechanical finite element model that predicts the stresses induced in the femur by certain physical exercises; a Swiss physiologist will combine these data with microCT data of the bone tissue morphology in the region of the femoral neck; an English biologist will complement these data with measurements of the content of proteins in those tissues and their relationship with their micromechanical properties. The final model will be used by a physiatrist to predict the risk of femoral neck fracture in relation to the protein content and exercise type in osteoporotic elders.

reography of software services such as interactive extraction of iso-surfaces, automatic image segmentation, automatic mesh generation, signal filtering, FE solvers, etc.; a knowledge management framework that lets you develop Internet-based services that keep all the data and algorithmic resources of the repository organised in agreement with a dynamically defined ontology, and services for advanced resource discovery and retrieval, web services choreography, and maintenance of the metadata and of the ontology.

These objectives will be pursued using four core technologies, at their maximum potential and with the highest level of integration: GRID, Semantic Web, Web Services and Data Fusion. GRID technology is required to provide high-bandwidth to large collections of coarse-grained, distributed, non-textual, multidimensional, time-varying resources. Semantic Web technology is required to add machineunderstandable reasoning. Web Services technology is required to cope with the dynamic aspects of a digital library that provide as content, not only data, but also simulation services, collaborative work services, interactive visualisation services, etc. Data Fusion is essential for combining data coming from disparate sources into a coherent picture.

Expected Results & Impacts

The technology targeted by the **LHDL** project will be used to form a very large scientific repository of anatomical and functional data, by means of a continuous and autonomous contribution of each European researcher to this repository. This objective, impossible to achieve at the national level, is an indisputable step toward the creation of a European Research Area. This will provide to European researchers, clinicians, industrial engineers, and to the citizen at large, a perfect exemplification of the added value that a single ERA may provide.

Given the breadth and diversity of the areas on which biomechanics impacts, including health, ergonomics, safety, sport and leisure (mostly, it has to be said, unnoticed and unacknowledged by the general population) the effects of this project on the quality of life of the individual citizen are expected to be wide ranging. Further, given the current costs, both social and economic, of the problems that exist in these areas, the anticipated benefits in terms of personal comfort and reduction in pain, and in terms of the associated social spending are likely to be huge. Industrial exploitation will be an essential component of the project from the outset. The environment proposed has a priceless value for a number of operators in pharmaceuticals and healthcare: being able to tap with direct research, results and even generic know-how of the community may save billions of Euro in development costs of new drugs, services or medical devices.

L H D L

Living Human Digital Library: Interactive digital library services to access collections of complex biomedical data on the musculoskeletal apparatus

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- Computer Science Dept. University of Luton (UK)
- Knowledge Media Institute, Open University (UK)
- Anatomy and Embryology Dept. Université Libre de Bruxelles (BE)

Timetable: from 02/06 – to 02/09

Total cost: € 3,238,320

EC funding: € 2,250,520

Instrument: STREP

Project Identifier:
IST-2004-026932

Keywords:

Virtual physiological human, musculo-skeletal apparatus, eHealth networks and architectures, data fusion, Web Services, Semantic Web, GRID

MATCH

Automated Diagnosis System for the treatment of Colon Cancer by discovering mutations on tumour suppressor genes

MATCH project entitle the development of an automatic diagnosis system that aims to support treatment of colon cancer diseases by discovering mutations that occurs to tumour suppressor genes (TSGs) and contributes to the development of cancerous tumours.

Objectives of the project

Colorectal or colon cancer is a significant cause of mortality in Western populations. This cancer develops as a result of the pathologic transformation of normal colonic epithelium to an adenomatous polyp and ultimately an invasive cancer. Like most cancers, colorectal cancers have multiple causes, many of which remain unknown. Each of these conditions is caused in part by a known genetic mutation. Mutations in two classes of genes, tumour suppressor genes (TSGs) and proto oncogenes are thought to impart a proliferative advantage to cells and contribute to development of the malignant phenotype development and differentiation. Mutations are alterations in genetic material and take place in the genes, which are found in the long, chain like molecules of deoxyribonucleic acid (DNA). Genetic damage that occurs to these genes contributes to the development of a cancerous tumour.

"An automated diagnosis system that aims to support treatment of colon cancer diseases by discovering mutations in the tumour suppressor genes"

MATCH goal is the development of an automated diagnosis system concerning the support of the treatment of colon carcinoma. The whole process is associated with the field of biological therapies for colon cancer tumours. The colon cancer automated diagnosis system (by discovering mutations on TSGs) is a computer based platform that addresses doctors, biologists, cancer researchers, pharmaceutical companies and medical staff.

Project Description

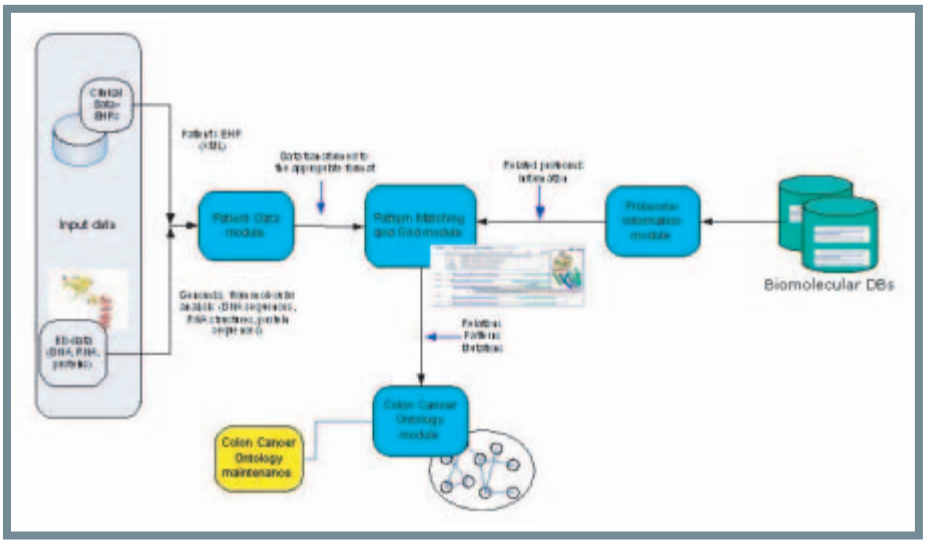
This project entitle the development of an automatic diagnosis system that aims to support treatment of colon cancer diseases by discovering mutations of TSGs and contributes to the development of cancerous tumours. Project goal is to perform medical integration between medicine and molecular biology by developing a framework and handling efficiently colon cancer diseases. Through this integration real time conclusion can be drawn for early diagnosis and more effective treatment. Constitution of the system is based on a) clinical data and b) biological information that will be derived by data mining techniques from genomic and proteomic sources. The advanced role of GRID based technologies together with the new applied scientific algorithms/methods for genomic and proteomic discovery will result to a high-end system for colon cancer treatment and pharmaceutical drugs research.

Scenario

MATCH database contain molecular and clinical data from patients with colon cancer. Suppose that researcher X use **MATCH** as support to choose the most suitable therapy for a new patient. All clinical and molecular information of the patient are stored into a single profile used as a query for the **MATCH** system. Dr. X is able to find that therapy A had a 32% of success rate on patients with a profile similar to the one provided, therapy B had 87% of success and therapy C had 89% of success but it may cause some negative side affects on the new patient (as suggested by his anamnestic/ molecular data).

Structure of the system is analyzed in modules. The main modules are:

1. Colon cancer ontology module. The diagnosis system is mapped around an ontology module where colon carcinoma diseases from clinical data will be associated with genomic molecular data from gene databases.
2. Proteomic information module. Access to protein sequence databases annotated with colon cancer related information (eg. Swiss - Prot)
3. Pattern discovery module. The discovery of TSGs mutations, will take place by using data mining techniques for the discovery of structural and functional protein patterns being correlated with the type of colon carcinoma in each case.



4. GRID – support module. Use of GRID enabled open-source tools for genomic and proteomic data management.
5. Simulation tools module. The establishment of the links that connect colon cancer medical ontology data with genomic data for clinical diagnosis will be achieved with the additional integration of visualization and simulation modules.

Expected Results & Impacts

MATCH project will provide to health professionals an advanced multi-functional platform for colon cancer prevention, pharmaceutical research, grouping of unrelated health care data and mainly new drug design and discovery. Recapturing scientific and technological objectives, together with the system functionality, this project directly contributes to health care sector as an advanced multi-functional platform for: colon cancer treatment, pharmaceutical research, grouping of unrelated health care data and mainly new drug design and discovery. Health professionals using the **MATCH** system will be able to retrieve information from heterogeneous types of resources transparently and efficiently of as low level as molecular. This objective will be realised by exploiting information databases in which information is hidden.

MATCH

M A T C H

Automated Diagnosis System for the treatment of Colon Cancer by discovering mutations on tumour suppressor genes

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- Sineura Spa (IT)
- Sheffield Hallam University (UK)
- Team Consulting Polska Sp.zo.o (PL)
- Jagiellonski University (PL)

Timetable: from 01/06 – to 07/08

Total cost: € 2.974.889

EC funding: € 2.015. 033

Instrument: STREP

Project Identifier:
IST-2005-027266

Keywords:

Automated Diagnosis System,
Colon Cancer,
data mining techniques,
visualization and
simulation tools,
TSGs mutations.

MicroActive

Automatic Detection of Disease Related Molecular Cell Activity

MicroActive will develop an instrument for molecular diagnostics intended for use in the doctors' office. The instrument will in the first instance be used to screen patients for a group of viruses, known as human papilloma virus, which is implicated in cervical cancer. Microfluidics and biotechnology form the basis for the development.

Objectives of the project

Currently many common diseases require that samples are sent to remote labs for diagnosis. This is costly, time consuming, increases patient anxiety and delays the start of treatment. **MicroActive** will make it feasible to carry out automatic, accurate diagnosis at the local doctor's office. **MicroActive** will achieve this by using bio-marker mRNA detection. Compared to commonly used approaches (e.g. PCR amplification and immunoassay methods), mRNA detection avoids false positive results and has a high sensitivity. This approach is currently used to detect cervical pre-cancer, cancer, STDs and a range of respiratory diseases, to mention a few. In addition, recent advances in the field of molecular biology and high throughput technologies are generating hundreds of potential biomarkers every day. **MicroActive**e will:

- Develop an integrated system based on microtechnology and biotechnology for automated diagnosis of a wide range of diseases. The system will analyze biological samples and be specifically designed for use in primary health care.
- Validate the sensitivity of the system using cytological samples from women at risk of developing cervical cancer (the second most common female cancer) as test cases. Results from the new, automated system will be compared with gold standard hospital lab tests for human papilloma viruses (HPV).
- Prepare for industrial production of the system.

Project Description

Within the **MicroActive** project the partners will:

- Develop one chip for sample preparation with all the necessary liquid reagents integrated.
- Develop a second chip for amplification and detection of HPV with dried spotted reagents stored in micro-channels.
- Develop disposable chips so there will be no risk of contamination between samples.
- Develop manufacturing methods for spotting and drying of reagents, surface coating, patterning, and polymer chip lamination that will not inhibit the biomolecular processes.
- Perform multi target detection from a single sample. This is possible due to simultaneous amplification and detection in separate parallel detection channels.

"A low-cost, fully automated diagnosis system will widen the availability of advanced diagnostics for all citizens"

Scenario

Year 2009: Anne visits her doctor for her cervical smear test. Three years ago she had to wait for weeks while the pap-smear was analyzed at a central laboratory. This time the doctor selects a polymer chip for cervix screening from his fridge. A droplet of a solution containing Anne's epithelial cells is applied to the polymer chip and the chip is inserted into the **MicroActive** instrument on his desk. Two hours later the doctor tells her that her test is negative; no mRNA activity was found for the 5 markers of high cancer risk human papilloma virus types. This result has a lower probability for false positive results than those obtained from traditional tests.

- Test more than 5 different bio-markers (in the first instance biomarkers of HPV infection) from one sample droplet.
- Test the performance of the system. At early stages of the project, perform tests on clinical samples. This is already underway, using test-chips for separate functions.
- Develop an instrument without manual protocols.
- Test the instrument on clinical specimens and compare to gold standards
- Address factors such as reliability, usability and cost of the total instrument which are crucial to acceptance by health care professionals.

Expected Results & Impacts

A low-cost, fully automated diagnosis system will widen the availability of advanced diagnostics for all citizens. The end result will reduce the time from patient testing to diagnosis, lessen patient anxiety and facilitate earlier treatment.

Using an automatic diagnosis system as an alternative to today's diagnostic testing will imply cost savings for the public health authorities.

The result of the **MicroActive** project is an automated diagnostics instrument that will be unique because:

- It is based on sensitive detection of RNA biomarkers. This method offers high clinical sensitivity to cellular activity related to disease, and largely avoids false positive results.
- It provides a generic technology platform, consisting of a re-usable instrument and two disposable chips:
  - o The chips are disposable to avoid contamination between samples.
  - o Chip no. 1 will include reservoirs with all necessary reagents to perform sample preparation consisting of cell concentration, lysis and nucleic acid purification.
  - o Chip no. 2 will include all reagents to perform multiplex amplification and fluorescent detection of mRNA. The enzymes and primers will be stored in a dry state for long-term stability. The primers are disease specific.
- It provides new methods for spotting and drying of enzymes and primers for storage in the microchannels.
- It provides the repeatable and stable fluid control required by a commercial system through use of simple pumps in combination with surface modification.

μACTIVE

MicroActive

Automatic Detection of Disease Related Molecular Cell Activity

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- IMTEK, University of Freiburg (DE)
- BioFluidix GmbH (DE)
- The Coombe Lying-in Hospital (IE)

Timetable: from 12/05 – to 11/08

Total cost: € 2.779.600

EC funding: € 1.600.000

Instrument: STREP

Project Identifier:
IST-2005-017319

Keywords:

Biomedical sensors, molecular diagnostics, nanotechnologies, microfluidics.

MULTI-KNOWLEDGE

Creating new knowledge in networks of medical research

The MULTI-KNOWLEDGE Project aims to integrate different biomedical information from heterogeneous sources (clinical, laboratory and metabolic) with data on gene and protein expression provided by new high throughput technologies in a system committed to cardiovascular risk profiling.

Objectives of the project

The classical approach in global cardiovascular (CV) risk assessment can be faulty: classical risk factors (such as high cholesterol, high blood pressure, smoking, etc) are able to explain only 50% cases of CV events; it is furthermore not possible to assess the differential impact of risk factors in different subjects and it is still unclear whether the correction of risk factors can fetch CV risk to zero. **There arises the need to to get a better prediction of the clinical events and a more efficient prevention strategy**.

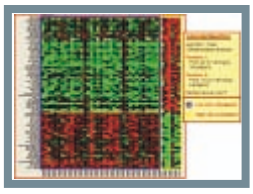
The **MULTI-KNOWLEDGE** Project's general goal is therefore the construction and implementation of a predictive algorithm combining clinical, laboratory, metabolic, gene and protein expression data to identify the presence of early signs of vessel wall atherosclerotic disease in subjects at different degree of cardiovascular disease (CVD) risk on the basis of traditional risk factors and insulin resistance level.

Scientific-medical objectives:

- To investigate the impact of CV risk factors on systemic inflammation using gene expression profiling
- To integrate clinical and molecular data to predict the presence of early signs of atherosclerosis

Technical aims:

- To implement mutliuser collaborative instruments to manage and analyze data from high-throughput technologies and clinical data



Project Description

MULTI-KNOWLEDGE starts from the data processing needs of a network of Medical Research Centres, in Europe and USA, Partners in the Project and co-operating in researches related to the link between metabolic diseases and cardiovascular risks. These needs are mostly related to the integration of three main sources of information: clinical data (EHR), patient-specific genomic and proteomic data (in particular data produced through Micro-arrays technology), and demographic data. The general aim of the project will be the development of a knowledge management environment to allow networks of co-operating medical research centres to create, exchange and manipulate new knowledge from heterogeneous data sources.

"MULTI-KNOWLEDGE will create an intelligent workflow environment for multi-national multi-professional research consortia aiming at cooperatively mining, modelling, visualizing biomedical data under a single common perspective."

This will allow retrieval and analysis of millions of data through bio-informatics tools, with the intent of improving medical knowledge discovery and understanding through integration of biomedical information.

MULTI-KNOWLEDGE will contribute to the creation of standards to link heterogeneous data. The clusterization models produced within the project will allow discrimination between normal and pathologic and

Scenario

To integrate clinical and molecular data several experts in different fields of research need to create a collaborative group supported by a single system of data entry and management accessible from different locations and suitable for direct data entry, as well as data input from clinical records and from outputs of laboratory and molecular research software. After data entry, clinical researchers, epidemiologists and biostatisticians need to access the system from several locations, operate sub-sequentially different tasks of the analysis (data cleaning, quality control, etc.), implement analysis algorithms, and make clinically/statistically oriented decisions for data analysis based on their specific competences.

produce insight for clinical research and disease management.

The MULTI-KNOWLEDGE architecture and set of tools will be tested for the development of a structured system to integrate data in a single informative system committed to cardiovascular risk assessment. Therefore this project will also contribute to establish guidelines and operating procedures to manage and combine data coming from gene expression and protein microarrays and make them easily available for the imputation of study algorithm.

Expected Results & Impacts

The MULTI-KNOWLEDGE Project will produce

- **Strategic impacts on the health care ICT market**, contributing to the consolidation of the EU Healthcare market -which has at the moment a fragmented supply against a growing demand- and constituting a crucial intellectual asset for the involved IT professionals, thanks to the knowledge it will accumulate and the contacts among researchers it will encourage
- **Strategic impact on the EU healthcare systems**, fostering the trend towards standardization of health processes as well as helping decision makers to establish more rationalized disease management policy, satisfying the need to optimize resources because of rising costs in healthcare
- **Strategic impact on social communities**, helping improve the level of health through the implementation of evidence based disease management
- **Strategic impact on scientific research**, improving the high risk patients identification, the estimation of vascular/systemic inflammation extent and the knowledge on cellular effects of risk factors and systemic impact of specific CVD risk factors. It will represent the 1st multilevel model for the study of complex diseases and also provide novel instruments in genomic and proteomic data management and analysis

Achievements and results

Following preliminary achievements have been gained so far:

- implementation of the **first project prototype** (Feb. 2007) including the **MK Data Entry System for data collection** (a first in the art system to support entry of diverse data types, including clinical and high throughput genomic data) and Pilot **MK Data Analysis tools** to enable preliminary interpretation of pilot data (including first in the art components)
- selection, screening and execution of full pilot activities for 50 apparently healthy subjects (including whole –genome transcriptomic analysis of circulating mononuclear cells) at low CVD risk
- identification of **first scientific results** with reference to certain data types (Gender, Smoking, LDL-cholesterol, High-Sensitivity C-reactive protein -hs-CRP-, Intima-Media Thickness)

thus enabling the following prelimary scientific conclusions:

- for the first time mild clinical and laboratory phenotypes related to CVD are correlated with high-throughput data
- Multi-Knowledge system allows to explore high-throughput differential expression profiles on continuously distributed data in a powerful and meaningful way

MULTI-KNOWLEDGE

Creating new knowledge in networks of medical research

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- INFORMATION MANAGEMENT GROUP LTD (UK)
- DATAMED A.E. HEALTHCARE INTEGRATOR (Greece)
- THE STANFORD LELAND JUNIOR UNIVERSITY (Usa)

Timetable: from 01/06 to 03/2008

Total cost: € 3.776.148,00

EC funding: € 2.440.00,00

Instrument: STREP

Project Identifier:
IST-2004-027106

Keywords:
- Healthcare
- Genetics
- Knowledge management
- Biomedical informatics
- Electronic health records

MyHeart

Fighting cardio-vascular diseases by preventive lifestyle & early diagnosis

MyHeart is an Integrated Project aiming to develop intelligent systems for the prevention and monitoring of cardiovascular diseases. The project develops smart electronic and textile systems and appropriate services that empower the users to take control of their own health status.

Objectives of the project

Cardio-vascular diseases (CVD) are the leading cause of death in developed countries. Roughly 45% of all deaths in the EU are due to cardio-vascular diseases. With the ageing population, it is a challenge for Europe to provide its citizens with healthcare at affordable costs.

'Cardio-vascular diseases are the leading cause of death in Europe'

It is the aim of the **MyHeart** project to fight CVD by prevention and early diagnosis. A healthy and preventive lifestyle as well as early diagnosis of heart diseases could save millions of life years annually, reduce the morbidity significantly and, simultaneously, improve the quality of life of the European citizen. Prevention offers the opportunity to systematically fight the origin of cardio-vascular diseases as well as to improve the medical outcome after an event. Classical medical institutions offer only intermittent, episodical treatment, while prevention asks for a lifelong continuous change of habits and therefore for a continuous health-care delivery process. With its innovative system-solutions for integrated textiles, sensors and on-body electronics, the **MyHeart** project significantly contributes to the European excellence in the area of bioengineering and thereby to the Lisbon strategy of the EC.

Project Description

MyHeart has taken a very innovative approach in ensuring the applicability of the project results in the real world. The consortium has started with a set of application ideas and only afterwards investigated the necessary technologies in order to serve these applications. In a new research field like "Personal Healthcare" it first had to be understood which applications are of the highest medical and commercial interest. For this reason the project started with 16 application ideas at the end of 2003, defined and investigated these concepts in detail and then carried out a testing and interview phase with users as well as medical and business professionals in the second project year (2005). This process led to a concept selection in mid-2005, during which 4 out of the 16 application concepts have been selected for further research and development in the remaining two project years.

The four product concepts have been defined in a way that they cover four different user segments:

- Healthy people
- People at risk
- People after an event
- Chronically ill people

Scenario

Robert is 70 years old. He suffered from two severe heart attacks, which damaged his heart irrecoverably and turned him into a chronic heart failure patient. Last year he started to retain fluid in his body without noticing it, because his heart was too weak to maintain the fluid equilibrium in the body. After this experience, Robert is very interested in monitoring his disease more closely. The **MyHeart** system will enable physicians to monitor Robert's vital parameters on a daily basis. Signals will be taken while Robert is sleeping in the bed as well as by letting Robert wear a sensor-equipped shirt during part of the day. Robert will get instructions when and how to take measurements by his personal user device, which is also able to transmit the data via a mobile phone network to his physician. A professional user interface on the physician side will support him in detecting health problems, like a developing decompensation. The physician can act accordingly and e.g. adapt the medication dose that Robert has to take. This will significantly increase Robert's quality and duration of life and avoid unpleasant and costly hospitalizations.

The four product concepts that have been defined for these four groups are:

- "Activity Coach": Making the most of your exercise both in terms of pleasure and health impact, anywhere, anytime.
- "Take Care": Assessing and lowering your risk factors for cardiovascular diseases by vital signs monitoring as well as coaching and motivation.
- "Neuro Rehab": Improving and shortening the rehabilitation process (motor and cognitive exercises) in the rehabilitation ward and in the patient's home.
- "Heart Failure Management": Improving quality of life and life expectancy of heart failure patients by early prediction of decompensation and improved patient (self-) management.

In early 2007 the prototypes for the four product concepts have been completed. For three of the four product concepts a set of systems have been produced in the course of the year, which has allowed the concepts to start user validation campaigns..

The system components of the fourth concept, Heart Failure Management, are in the process of being CE certified as medical devices. Once this process is completed, a larger quantity of devices will be manufactured. With these devices a medical study will be carried out in the year 2008.

Expected Results & Impacts

With long-term test beds, **MyHeart** will show how users employ the system over months and the success will be documented in terms of adaptation of healthier life-style and early prediction of acute events. The results will be benchmarked against clear outcome parameters like weight reduction, reduction in average heart rate, reduction in blood pressure and increase in physical activity.

In addition, the project will assess the cost benefits for the stakeholders in the healthcare delivery system. The final outcome will include documented test beds showing the effectiveness and efficiency and the design of business propositions for exploitation of the results.

Keywords :

Personalized health, prevention, telemedicine, wearable medical systems, textile biomedical clothes

M y H e a r t

Fighting cardio-vascular diseases by preventive lifestyle & early diagnosis

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- Philips International B.V. – NL
- Philips Innovative Technology Solutions NV – B
- Medtronic Iberia SA – E
- Fundacion Vodafone – E
- Milior – S.P.A. – I
- Smartex – S.R.L – I
- Dr.Hein GMBH – D
- Medgate AG – CH
- Centre Suisse D'Electronique et de Microtechnique SA – CH
- Commissariat à l'énergie Atomique – F
- Eidgenossische Technische Hochschule Zurich – CH
- Universita degli Studi di Pisa – I
- Universidad Politecnica de Madrid – E
- Instituto de Aplicaciones de las Tecnologías de la Información y de las Comunicaciones Avanzadas - Asociación – E

Consorzio di Bioingegneria e Infomatica Medica – I

- Politecnico di Milano – I
- Universita'degli studi di Padova (university of Padova) – I
- Universita degli studi di Firenze – I
- Universitaetsklinikum Aachen – D
- Hospital Clinico San Carlos de Madrid Insalud – E
- Fondazione Centro San Raffaele del Monte Tabor – I
- Fondazione Salvatore Maugeri Clinica del Lavoro e della Riabilitazione – I
- Universidad Politecnica de Valencia – E
- Facludade de ciencias e technologia da universidade de Coimbra – P
- Hospital de Unisersidate de Coimbra – P
- Philips Electronics Nederland b.v. – NL
- Lineapiu S.P.A. – I
- W. Zimmermann GmbH & Co. KG – D

Timetable: from 01/04 – to 12/08
Total cost: € 34.733.599
EC funding: € 16.000.000
Instrument: IP
Project Identifier: IST-2002-507816

NEUROWEB

Integration and sharing of information and knowledge in neurology and neurosciences

NEUROWEB project improves healthcare delivery achieving knowledge-based, personalised diagnosis and therapy through vertical integration of existing clinical and genetic databases. NEUROWEB stimulates the sharing of knowledge on cerebrovascular diseases using an on-line web platform.

Objectives of the project

The amount of biomedical information that can be accessed through the Internet has reached a level no one could have dreamt of just ten years ago. The success of the genome sequencing projects has created an enormous amount of data that cannot be manually analysed. Since disease phenotypes arise from complex interaction between genetic factors and environment, the value of high-throughput genomic research would be dramatically enhanced by associations with key patient data. These data are generally available but of disparate quality and sources. The development of a data management system which integrates genomic databanks, clinical databases, and data mining tools embedded into a common resource accessible to health care professionals would be extremely advantageous.

Ischemic stroke is a major health problem in the developed countries. It is a complex, multigenic disorder, since there are several subtypes and risk factors, and most of the cases have non-mendelian inheritance. The integration and the analysis of a large number of well-defined clinical, radiological and molecular data will improve the evidence on the different roles played by genetic and environmental risk factors in stroke pathophysiology.

Within the framework of cerebrovascular disease, the objectives of the **NEUROWEB** project are:

- To integrate clinical and genetic databases of the participating centres, different for structure and language, into a single virtual database;
- To query the genetic databanks containing human genetic profiles present on the web;
- To generate new knowledge on single patients with cerebrovascular disease, in order to achieve personalised prevention, diagnosis and therapy;
- To promote collaborative research practices among the research communities involved in the project in order to share and enhance knowledge in the neurological domain.

The final aim of the **NEUROWEB** project is to foster vertical integration between clinical and genetic data in other common and complex diseases (i.e. cardiovascular diseases and tumours), in order to improve and personalise healthcare delivery in EC.

Project Description

NEUROWEB knowledge will be initially based on four existing databases referring to patients affected by cerebrovascular diseases. The four **NEUROWEB** hospitals will make available their genetic, biological, clinical, and imaging data, according to each partner's specialization. The genetic database will be based on innovative technologies such as cDNA-microarray for

Scenario

The exploitation of genomic information into the daily clinical practice requires a data management system which integrates genomic databanks, clinical databases, and data mining tools. NEUROWEB purpose is to create an innovative system based on integrated biomedical data from heterogeneous and various sources, aimed at obtaining enhanced knowledge on the single patient for individualized prevention, diagnosis and treatment.

"The final aim of NEUROWEB is to foster vertical integration between clinical and genetic data, in order to achieve knowledge-based and personalised healthcare"

single nucleotide polymorphisms (SNPs) genotyping. These data will constitute the kernel of the project and will be used also to validate currently used protocols in the participating centres.

From a technological point of view, **NEUROWEB** is aimed at integrating this information using metadata profiling with the support of ontologies to improve user access and distribution of information in a standard web environment. In particular, specific support systems will be developed to interconnect Clinical Information Systems (CIS) and static HTML web sites in a common dynamic environment. Web service technology will support such integration. The intelligent navigation tool will be supported by a knowledge base, flexible and easy to update system, containing the logic paths and the search templates offered to the final user.

The success of the **NEUROWEB** will be measured in terms of genetic discoveries enabled and improved knowledge of cerebrovascular diseases' etiology. Specifically, identifying which genes and pathways are causal in has the potential to provide a new and solid foundation for biomedical research. NEUROWEB will also allow continuous updating and verification of clinical protocols adopted in participating clinical institutions.

Expected Results & Impacts

NEUROWEB will verify finalized vertical integration of patient's data. The model will improve clinical practice and biomedical research, and could be easily extended to other common and complex diseases.

NEUROWEB will allow health care managers to verify the appropriateness of the different clinical protocols (aimed to direct all the steps of the diagnostic and therapeutic process) applied by their care-givers, both in terms of success and costs.

NEUROWEB will promote the potential diffusion of advanced technologies as gene-chips in advanced medical practice and consequent cost-effective "genomic medicine".

The exploitation of **NEUROWEB** results envisages the enlarging of such knowledge with the adhesion of other institutions, both enhancing the quality of their own offered services and improving the **NEUROWEB** itself with their data (**NEUROWEB** Knowledge Club).

NEUROWEB-KC

NEUROWEB

Integration and sharing of information and knowledge in neurology and neurosciences

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- Erasmus University of Rotterdam (NL);
- Medical School of Patras University (GR);
- Orszagos Pszichiatriai es Neurologiai Intezet (HU);
- University of Veszprém (HU);
- SirseNet spa (IT);
- Microsystems srl (IT);
- Velti A.E. (GR)

Timetable: from 06/06 – to 05/08

Total cost: € 2.751.129

EC funding: € 1.883.500

Instrument: STREP

Project Identifier:
IST-2006-518513

Keywords:

biomedical informatics, personalised health, genomic medicine, cerebrovascular diseases, non-mendelian diseases.

NOESIS

Platform for wide scale integration and visual representation of medical intelligence

NOESIS will provide health professionals involved in research and cure of cardiac and cardiovascular diseases, with an easily and from everywhere accessible Knowledge Management system equipped with a Decision Support System tool, to be used for supporting them in their clinical decisions both in emergency situations and during their daily work with patients.

Objectives of the project

Medical knowledge is inherently complex and uncertain. Medical experts may provide different interpretations for symptoms since all of them also depend on a given context and most of them are established by statistical utilisation. In the United Kingdom a pilot study found a 10% adverse event rate, of which half were preventable.

NOESIS will develop an intelligent environment that enables ubiquitous management of citizens' health status and to assist health professionals in coping with some major challenges, risk management and the integration into clinical practice of advances in health knowledge". The selected clinical domain addressed by the project will be Cardiology.

In particular NOESIS will contribute to:

- Reduce the uncertainty in diagnosis of diseases, focusing on cardiovascular diseases.
- Support the process of diagnosis and treatment by reducing errors and minimising risks.
- Enhance the quality of medical care provided through the use of decision support mechanisms.
- Provide methods for establishing trust and confidence of users towards information sources.

This goal will be achieved by implementing a Knowledge Management and Decision Support Framework.

Project Description

NOESIS provides an easily accessible knowledge repository linked to a Knowledge Management system and a Decision Support Framework embedding ECG signal interpretation, diagnosis and therapy proposal for CAD, Arrhythmia an Ischemia, Aortic Stenosis early detection and Anticoagulant therapy prescription, to be used for supporting general practitioners and cardiologists in clinical decisions both in emergency situations and during their daily work with patients.

"NOESIS will develop an intelligent environment that enables ubiquitous management of citizens' health."

The range of technologies employed in order to offer the desired services will include: speech recognition, content-based image retrieval, image comparison and data mining, utilisation of an ontology to assist in the semantic integration of information sources, natural language pro-

Scenario

1. Emergency episode:In the emergency situations the cardiologist must examine the patient and decide fast and accurate about the severity of a patients' symptoms and the treatment. His decision is based mainly on his knowledge and experience and he hasn't enough time to retrieve information. For these reasons we believe that the NOESIS package in cannot be utilised.

2. Routine treatment: The NOESIS package can be quite useful in the patient's routine treatment. First of all the cardiologist may utilise the everyday clinical data kept in the hospital's Electronic Patient Record system (EPR), since the NOESIS Decision Support System operates on the top of hospital records. This way NOESIS may be useful in the everyday clinical practice for diagnosis and treatment.

cessing methods, automatic keyword extraction, intelligent search engines, annotation tools, classification of information based on hybrid methods combining fuzzy clustering and Self Organising Maps (SOM), establishment of personalisation and profiling methods using attentive agents and usage mining.

The **technology** platform developed by **NOESIS** combines a smart Knowledge management system and a Decision Support System (DSS), which include:

- an enhanced site seer for medical sciences based on a semantic integration platform associating medical concepts with information items, a knowledge model for classification of extracted knowledge components and intelligent interactive multimodal interfaces.
- a decision support framework capable of producing a preliminary diagnosis based on a knowledge model including a knowledge base and inference rules.

Expected Results & Impacts

The **NOESIS** platform is designed in order to facilitate the knowledge and competence transactions between health care experts and operators and to support the professionals in taking evidence-based decisions at the point of need. The **NOESIS** tools will bring benefit in terms of:

a) Effectiveness and efficiency of work

b) Response time and appropriateness of care/intervention to patients, so realising an optimisation of resources and cost reduction

c) Risk reduction by avoiding unnecessary transits to MD specialists of hospital departments, as **NOESIS** will be able to indicate the most appropriate diagnostic path.

d) Flexibility and scalability of operations

e) Integrated approach to treatment and care through shared knowledge and shared intervention guidelines

Other benefits are related to:

- Building an all inclusive knowledge society ("ambient intelligence"). The focus of the project is in the integration of dispersed information and very concentrated knowledge into the everyday working environment of health care professionals, enhancing knowledge sharing and collaboration through easy-to-use human interfaces..
- Public health. **NOESIS** will promote the development of more efficient and secure "Health Knowledge Info-Structure".

N O E S I S

Platform for wide scale integration and visual representation of medical intelligence

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- Siemens S.A. (ES)
- Airial Conseil (FR)
- Universite Joseph Fourier Grenoble (Timc Laboratory) (FR)
- Centre Hospitalier Regional Universitaire de Grenoble (FR)
- Sesa Ltd. (AT)
- University of Ioannina (GR)
- Hellenic Cardiological Society (GR)
- Medisell Co. Ltd. (CY)
- M.R.I. Lefkothea Medical Services (CY)
- Business Flow Consulting (FR) SWORD Luxemburg

Timetable: from 01/04 – to 12/06

Total cost: € 7.715.793

EC funding: € 4.400.000

Instrument: IP

Project Identifier:
IST-2002-507960

Keywords:

cardiology,
knowledge management,
clinical DSS,
computer-aided Decision Support System,
ontology, intelligent agents

OFSETH

Optical Fibre Sensors Embedded into Textile for Healthcare

OFSETH will develop Optical Fibre based sensors to continuously assess the vital parameters of a patient. The objective is to demonstrate the validity of optical sensing solutions for healthcare and develop this technology taking into account the issues linked with textile and wearability for a future efficient and continuous care of patients.

Objectives of the project

Healthcare monitoring is a general concern for patients requiring a continuous medical assistance and treatment. In order to increase mobility of such patients, a huge effort is pursued worldwide for the development of wearable monitoring systems able to measure vital physiological parameters such as respiration movements, cardiac activity, pulse oxymetry, temperature of the body. Technical or smart textiles that incorporate many different sensors play a growing role in these developments as they are well suited for wearability and can ensure comfort to the user.

While most developments up to now have been focused on the use of electrical sensors, the aim of OFSETH is to take advantage of pure optical sensing technologies for extending the capabilities of medical technical textiles for wearable health monitoring.

"OFSETH will explore particular applications where optical sensing seems to be the only practical choice."

OFSETH research will focus on how silica and polymer optical fibres can be used for sensing vital parameters while being compatible with a textile manufacturing process.

The main objectives of OFSETH are the following:

- Develop textile-based fibre optics sensors for the monitoring of vital parameters (respiratory and cardiac activity) of patients
- Test the sensors onto simulators and compare with standard sensors
- Integrate the sensors into a wearable and autonomous monitoring system
- Validate the project results through a clinical evaluation with patients and healthy volunteers

Scenario

Juan, a seven years old child, has to undertake an MRI examination. He however has to be anesthetised because he can not face the stressful environment of the MRI. But the very nature of MRI examination makes it a unique situation in regard to anesthesia: the whole body must be introduced inside the MRI bore and no medical staff can stay near the patient. This makes it difficult to assess – from the distant control room – the well being of the anesthetized patient.

By developing an MRI compatible monitoring system, OFSETH will increase the safety of MRI examinations on anesthetised patients. Furthermore, thanks to the system wearability and comfort, patients will be always monitored, even during transportation from the induction room to the MRI room.

Project Description

Optical fibre sensors have already demonstrated great capabilities for many applications where distance, electromagnetic compatibility (EMC), risk of explosion, need for distributed measurement,… limit the use of standard competing technologies. Up to now however, their use as embedded sensors in technical textiles for medical applications has not been fully explored, despite their expected positive impact.

In this context, OFSETH will notably investigate how measurements of various vital parameters such as cardiac, respiratory rates and pulse oxymetry can be performed through pure optical devices and techniques, such as fibre Bragg gratings (FBG) sensors and near infrared spectroscopy (NIRS), among others, and which could also, in a longer term, suit for non-invasive pH or glucometry measurements. The feasibility of such sensors using polymer optical fibre (POF) instead of standard glass (silica) fibre for an easier integration into the textile will be investigated, with a special focus on POF FBGs.

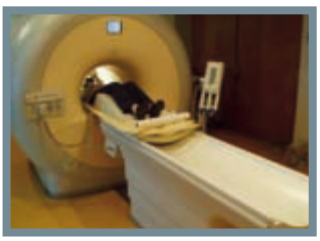
In parallel, OFSETH will explore all suitable techniques for processing optical fibres together with textile yarns, for the realisation of medical textiles with embedded optical sensors. Specific developments of weaving and knitting techniques as well as custom design of optical fibres shall be necessary in order to obtain a textile manufacturing compatible process that does not damage the optical fibres nor degrade their sensing properties.

In the frame of OFSETH, prototypes of fibre based sensors integrated into textiles will be developed and compared with standard sensors when tested onto simulators. A complete monitoring textile with embedded monitor shall then be produced and used for clinical evaluation with patients and healthy volunteers.

Expected Results & Impacts

OFSETH expects to achieve a breakthrough in healthcare monitoring applications where standard (non-optical) monitoring techniques show significant limits. In particular and as short and mid-term results, OFSETH developments will be assessed for monitoring the vital parameters of sedated or anesthetised patients under medical resonance imaging (MRI), where there is a need for safe, reliable and fully EMC compliant monitoring systems and therefore an interest for the promising properties of pure optical sensing solutions.

The wearability and comfort of the system will then be assessed as it is an additional goal of OFSETH to enlarge the capabilities of the technique to ambulatory healthcare monitoring and SIDS (Sudden Infant Death Syndrom).



O F S E T H

Optical Fibre Sensors Embedded into Textile for Healthcare

Project co-ordinator:
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- Shishoo Consulting AB (SE)
- TAM télésanté (FR)
- Centre Hospitalier Régional Universitaire de Lille (FR)
- Bundesanstalt für Materialforschung und – Prüfung (DE)
- Advanced Optics Solutions GMBH (DE)
- Fiberware Generalunternehmen für Nachrichtentechnik GmbH (DE)
- Technische Universität München (DE)
- ELASTA Ind (BE)
- TYTEX A/S (DK)

Timetable: from 03/06 – to 08/09

Total cost: € 3.507.517

EC funding: € 2.324.353

Instrument: STREP

Project Identifier:
IST-2005-027869

Keywords:
Optical fibre, textile fabrics, healthcare, monitoring, noninvasive, sensor, respiratory rate, cardiac rate, oximetry.

OLDES

Older People's e-services at home

The number of elderly people is increasing significantly and rapidly in all EU countries, creating substantial problems in terms of resources needed for assistance. OLDES aims to plan and develop a technological, cheap and easy to use platform for tele-assistance and tele-company, thanks to the joint work of 11 EU partners.

Objectives of the project

The number of elderly in the EU is dramatically increasing and the related burden in term of public expense getting higher and higher – these are the two main reasons motivating the OLDES project. Today more and more old people are living alone, in many cases with no families helping them nor enough money to afford private carers. Starting from these facts, OLDES will plan and implement an innovative technological platform, with low cost and easy use able to provide a wider range of services to an higher number of elderly. The platform will be tested by 100 elderly people in Italy (10 of them with heart disease) and a sample of diabetics in Prague. Mr. Paruolo, Bologna Municipality's Deputy Mayor for Health, firmly wanted this project; he believes that the welfare model has to be renewed quickly, making the most of new technologies and high tech devices to offer a wider number of old people tele-medicine, tele-assistance, tele-entertainment and tele-company services. Consequently, the number of people assisted by public services will be enlarged, even if public resources are decreasing whilst the number of old people increases.

OLDES objectives are:

- To develop a cost optimized technical solution;
- To define the profile of "elderly people";
- To define a standardized procedure for tele-care interaction;
- To develop a programme for results evaluation.

Project Description

To achieve OLDES' goals, new technological concepts will be integrated and adapted. OLDES will provide: user entertainment services, through easy-to-access thematic channels and special interest forums supported by animators;

as well as, health care facilities based on established Internet and tele-care communication standards.

The system will include wireless environment and medical sensors linked via a contact centre to social services and health care providers.

OLDES will also cover the definition, implementation and evaluation of a Knowledge Management program, an advanced user profiling system that will enhance communication between all the stakeholders. The system will be tested in Italy on 100 elderly (10 suffering from heart disease) and in the Czech Republic (10 diabetic patients).

OLDES puts older people at the centre and makes their needs the main priority. This will be achieved through the use of modeling and animation tools to create scenarios designed to elicit responses from them, their carers and service providers. Animation and simulation will help to ensure that developments are at all stages grounded in the realities of social and health care, the cultures and economies of the specific pilot contexts, and as wide a range as possible of other

Practical Example / Scenario

Tom is 80, affected by heart disease and alone; his relatives his son lives in an other city and other live far from him. In spite of this, he is still willing to be in contact with friends, be part of a club and be informed on what's going on. His life was not so pleasant before knowing OLDES platform facilities; he felt insecure in his home, he could not be often in contact with friends and club mates and take part to his city's life, without considering all practical problems that he was not able to solve alone. Now he is daily assisted at distance by medical professionals who checks his vital parameters thought telemedicine devices connected to OLDES platform and thanks to it now Tom can daily chat on many channels with friends on his hobbies and be informed on recent events. His life has changed. He can easily ask for help when he needs, for example, to go shopping or to visit somebody and David, a volunteer working for an association, soon come to give him a lift and brig him where he needs. OLDES, in a word, has made again his life serene, not lonely nor boring and active; today he can also be the "animator" of a channel on football and twice a week he works for it. All those changes where possible thanks to the implementation of an easy to use and low cost local infrastructure offering a wide range of services developed by OLDES.

"The number of elderly people in all EU countries dramatically increasing and the related burden in terms of public expense; these are the reasons motivating OLDES".

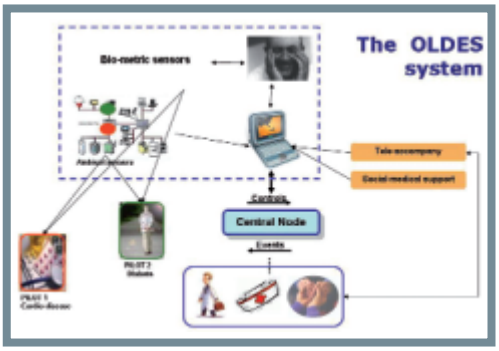
European public service contexts. To maximize its flexibility and exploitability of its products, technical outputs will be packaged appropriately into highly configurable service components.

Partners will contribute to the project as follows:

- Enea-Brussels office is the project's coordinator
- Bologna Municipality is in charge of the dissemination and communication activities and will be responsible for the pilot project carried out in Bologna.
- CUP2000 will lead the exploitation and evaluation phase and involved in the execution of the pilot in Bologna
- Bologna University will be responsible for the design of the GUI interface. UNIBO will develop algorithms for health measurement and will provide the devices and sensors for the equipment and testing of 10 older persons with cardiovascular disease
- AUSL Bologna will take part in the pilot execution and will lead Oldes evaluation, validation and testing
- Newcastle University will assemble a panel of experts from academic institutions and research establishments across Europe for conducting local surveys and undertake research and analysis
- CETIC will lead the software development and will be in charge of the design and the development of the communication system between the sensor modules and INK PC
- CVUT_ Prague University will develop the radio user interface
- Charles University will co-ordinate the pilot on diabetics
- INK Media (Canada) will develop software for updating the operating system of the INK PC and it will provide 120 PCs to be used for experimentation
- AGENTSCAPE will develop behavior alarm software for data analysis.

Expected Results & Impacts

This 36 month project will aim to defining an innovative and alternative welfare system, replacing the existing one, no longer sustainable, where technology will be customized according to user needs and used on a large scale. External evaluation will be provided by an expert, assessing intermediate and final project results. The testing phase will be important for assessing and validating results achieved through the two pilot phases.



Thanks to OLDES, potentially all elderly people in the cities and surrounding areas in the future will be tele-assisted, contributing greatly to the simplification and systemization of assistance services and providing public cost savings. The solutions produced will allow older people and their families to live serene and assisted lives in their own homes, without representing too high a cost burdening the whole society.

O L D E S

Older People's e-services at home

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- Centre d'Excellence en Technologies de l'Information et de la Communication (B)
- Ceske Vysoke Uceni Technicke v Praze (CZ)
- Ink Media Inc (Canada)
- Agentscape AG (Germany)
- Comune di Bologna (IT)
- Azienda Unita Sanitaria Locale di Bologna (IT)
- Univerzita Karlova v Praze (CZ)

Timetable: from 01/01/2007 - to 31/12/2009

Total cost: € 3.647.844

EC funding: € 2.500.000

Instrument: STREP

Project Identifier: IST-2005-045282

Keywords:
distributed system governance
low cost system engagement
entertainment

PALLIANET

Decision Support and Knowledge driven Collaborative practices in Palliative Care

The *PALLIANET* project focuses on the improvement of collaborative practices in Palliative Care networks. It aims at setting up an Information and Communication system that will improve communication and real time access to information, thus enabling a Palliative Care Team to support allied professional care providers.

Objectives of the project

Palliative care is intrinsically multidisciplinary and can only be achieved through the development of collaborative practices in city-hospital networks consisting of:

- A palliative care coordination team generally composed of a specialist medical doctor, a nurse, a psychologist and a secretary.
- The city professionals: independents generalist and specialist doctors, nurses, other homecare actors such as social care actors, voluntary workers, home-helpers,…

"The system will enable a Palliative Care Team to support allied professional care providers both medical practitioners and non-medical professionals"

PALLIANET aims at improving collaborative practices in Palliative Care networks, in particular communications and real time access to information for healthcare professionals involved in these networks, in order to improve the quality of care services. The system will enable a Palliative Care Team to support allied professional care providers, both medical practitioners and non-medical professionals in:

- Better understanding the patient's context (clinical, psychological and social dimensions),
- Making relevant decisions in a complex and unusual context.

Project Description

PALLIANET strategic objective is to support knowledge driven collaborative practices in order to minimise risks in the context of palliative care. The project aims at conceiving an advanced solution supporting the needs of city professionals by combining a Community & Knowledge Management service, Advanced human-computer interaction features that makes access for caregivers easy and natural, and Coordination Facilities that would enable to maintain the quality and relevance of knowledge and in particular to analyse the way in which patients cases have been handled in order to measure the risks associated to palliative care; assess their costs; make explicit new Best Practices that can be disseminated through "Best Practice Guides" and possibly revise the semantics to improve knowledge accessibility.

By support Health Professionals in implementing knowledge driven collaborative practice and providing them with relevant Knowledge and Advice, **PALLIANET** is perfectly in line with the IST priority objective of supporting health professionals in taking promptly the best possible decision for prevention, diagnosis and treatment Pilot Actions will be conducted in France and UK to find balance between the technology and user perspectives:

- The palliative care team at Guys' and St Thomas' Hospital provides the context of an integrated service offered by hospital staff both in and out of the hospital;

Scenario

Mrs Ames has been diagnosed with cancer and is referred by her General Practitioner to the palliative care team at Guy's & St Thomas Hospital. The team receives the electronic referral and makes an appointment with the patient usingthe *PALLIANET* solution. The relevant data is downloaded to the tablet PC of the palliative care member who will be visiting Mrs Ames. Current medical protocols and guidelines for Mrs Ames medical condition are already synchronised and stored locally along with contact details of all relevant agencies that may be involved in Mrs Ames care. Many of the initial communications with agencies take place "real-time" during attendance, ensuring Mrs Ames will receive the care and support she needs in a timely manner.

- The Nepale network provides the context of a light palliative care team coordinating the activity of city care providers in delivering palliative care in a geographic area.

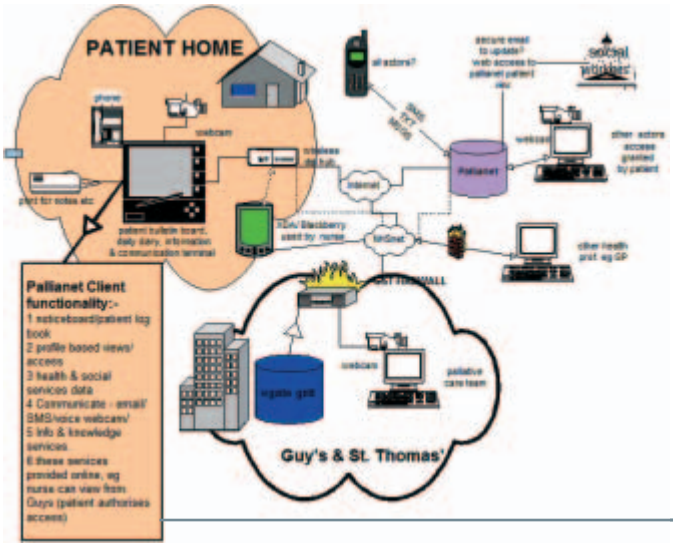
Expected Results & Impacts

Outputs of the **PALLIANET** Project will be:

- **Innovative Technologies** for ontology based and knowledge driven collaborative practices, permitting to healthcare professionals to benefit from advice based on best practices, case discussions and knowledge of care delivery context. In particular, innovations concern:
  - The Community & Knowledge Management service implementing decision support tools that permit to produce Best Practices, Clinical protocols and guidelines. The linking of these best practices with patient record will bring a great added-value support to health professionals permitting them to access guidelines relevant to a patient case.
  - The Best Practices/Knowledge Generator using combined Mining of Text (emails, chats, forums) and Data (patient cases) to identify best practise.
- A **Software Solution** targeting Palliative Care Networks.

The impacts expected from **PALLIANET** in relation to user needs are:

- Reduction of time from referral by a General Practitioner to the first assessment visit to the patient
- Reduction of time spent (and cost) by members of the palliative care team to prepare the 1st visit
- Drastic reduction of the number of desirable interventions of agencies which cannot take place after the 1st assessment visit due to lack of communication
- Elimination of communication disruptions between care givers intervening at patient's home
- Reduction of the percentage of difficulties encountered by care givers that need the intervention of members of the palliative care team
- Reduction of time needed to prepare a case study
- Reduction of costs associated to the implementation of clinical guidelines/protocols.



PALLIANET

Decision Support and Knowledge driven Collaborative practices in Palliative Care

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- E-Net Solutions S.A. (GR)
- Language & Computing Nv (BE)
- Sword Technology S.A. (LU)
- Guys' and St Thomas' Hospital - Palliative Care department (UK)
- Nepale Palliative Care network (FR)

Timetable: from 01/04 – to 06/06

Total cost: € 4,221,000

EC funding: € 2,350,000

Instrument: STREP

Project Identifier:
IST-2002-507863

Keywords:

Palliative Care;
Collaborative Practices;
Health professionals' knowledge;
Decision Support Systems;
Best Practices

PIPS

Personalised Information Platform for Life and Health Services

The PIPS project will make a significant step forward in the processes for healthcare delivery to theEuropean Public by means of creating a new Health and Life Knowledge and Services Support Environment. This will improve current Healthcare delivery models while creating possibilities for Health Professionals to get access to relevant-updated medical knowledge and the European Citizens to choose healthier lifestyles.

Objectives of the project

The current situation of health services is characterized by the demand of high quality services, available to all social groups and Professionals.

PIPS Project aims to create a new Health and Life Knowledge and Services Support Environment, improving current healthcare delivery models. The main objective is encompassing the entire set of business processes, professional practices and products applied to the analysis and preservation of the Citizen's well-being using the latest innovations in Information Technologies. The project joins Healthcare Suppliers, Citizens, Public Organizations, Food/Drug Industry, Researchers, Health Policy Makers, affected by the health status of individuals. PIPS results will enable:

- Professionals to deliver just-in-time personalized and prevention-focused Healthcare services compliant with the Citizen's personal health state, preferences and ambient conditions
- Citizens to make informed decisions about therapies and nutrition at any time/place according to the real-time evaluation of their health state
- Healthcare Authorities to improve risk management of Healthcare systems
- Actors in the Healthcare delivery value chain to get access to and generate valuable information, assuring the global sustainability of the system.

Project Description

PIPS Project supports:

- *Health and Life domain*: act on prevention and preservation of the well-being of the Citizen, considering psychological/social and physical dimensions
- *Early prevention*: **PIPS** enables continuous selfmonitoring via home medical devices connected to the system and recognizes patient health deterioration. PIPS provides prevention-oriented information dealing with attitudes and behaviour (balanced nutrition, periodic health revision, etc.)
- *Primary prevention*: after a disease, PIPS contributes to reduce risk of other acute events.

Scenario

DIABETES : Mary Johnson is a diabetic/ infarcted and her GP suggest to contact a specialist for an appointment. Marygoes to Dr. Brown who uses the PIPS system and prescribes Mary a therapy and a set of tests to be done at home. Athome PIPS reminds Mary to take her test and, after having done, it recognizes an abnormal state. The system maychange the prescription following the doctor's indication and asking for approval or will alert Dr. Brown who, looking at hervital signs and the result of the questionnaire, will suggest Mary to fix an appointment to review the therapy.

NUTRITION: Steve Miller is an overweight person who decides to contact a nutritionist to lose some. Dr. Green assigns, using PIPS, apersonalised weekly diet to Steve who will be supported by the PIPS system to be compliant, both at the supermarket and at home.After one month following the diet, PIPS will ask Steve to fill in a recall questionnaire and advise to make an appointment with Dr.Green

- *Secondary prevention*: the secondary prevention intends reducing the risk of relapse or the appearance of other collateral disease. The principles of working of PIPS are similar than for the primary prevention, however the alarm level of the control prescribed by the doctor will be higher.

The technical infrastructure presents these significant core parts:

- *Knowledge Management*: the aim is transforming heterogeneous information sources in a trusted homogeneous valuable knowledge base
- *Decision Support*: the aim is using intelligent agents technology to generate new personalised user-oriented knowledge and support action
- *Trust infrastructure*: the aim is integrating security protocols to protect sensible information
- *User interaction*: the aim is integrating state of the art and new generation of multimedia personal assistance devices (e.g., home telecare equipment, internet enabled home appliances).

Expected Results & Impacts

- **PIPS** healthcare delivery model addresses societal challenges by facilitating the shift from treatment oriented medicine to preventio-noriented healthcare for Individuals
- **PIPS** develops a health and life knowledge and service environment
- **PIPS** approach supports a dependable infrastructure to provide privacy and continuity of care
- **PIPS** helps to match the compliance issue by providing support tools to act over the prevalent causes of non-compliance (non-voluntary, voluntary, abandoning treatment before completion), acting on motivation leverage
- **PIPS** provides a wide set of services to all the stakeholders to guarantee the integration across the healthcare value chain and the sustainability of all the system
- **PIPS** system will be validated by three levels of Users:
  - o Professionals knowing **PIPS** approach, that will lead the key – choices in order to match in the best way the expectations of those categories that will work with **PIPS** platform
  - o External Experts and Professionals, that, independently from the project team will see and analyze the system , highlighting the strength and generating elicitation within professional and social categories
  - o End – Users, that will use the system in their everyday life, highlighting advantages conferred by the proposed approach, coherently with their respective IT literacy.

P I P S

Personalised Information Platform for Life and Health Services

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- Atos Origin Italia (IT)
- Instituto de Aplicaciones de las Tecnologias de la Informacion y de las Comunicaciones Avanzadas – (ES)
- University of Liverpool (UK)
- Joint Research Centre (EU)
- AstraZeneca S.p.A. (IT)
- Medic4All LTD. (IL)
- GlaxoSmithKline S.p.A. (IT)
- Marsh Risk Consulting B.V. (NL)

10 - Universidad Politecnica de Madrid (ES)
11 - Fundacion para la Investigacion Nutricional (ES)
12 - Health On the Net Foundation (CH)
13 - Politechnika Gdanska (Poland)
14 - Atena Uslugi Informatyczne i Finansowe Spolka Z Ograniczona Odpowiedzalnoscia (PL)
15 - Università degli Studi di Parma (IT)
16 - Neusoft Co., LTD (CN)

Timetable: from 01/04 – to 12/07

Total cost: € 14,247.222

EC funding: € 9,847,255

Instrument: IP

Project Identifier:
IST-2002-507019

Keywords:

Personalised Health for the Citizens;
Health and Nutrition Promotion;
Trust, Security,
Privacy and Identity Management

Q-REC

European Quality Labelling and Certification of Electronic Health Record systems

Q-REC is a Specific Support Action and its main objective is to develop formal methods and to create a mechanism for the quality labelling and certification of Electronic Health Record systems in Europe, in primary- and in acute hospital-care settings.

Objectives of the project

The main objective of **Q-REC** is to create an efficient, credible and sustainable mechanism for the certification of Electronic Health Record (EHR) systems in Europe by addressing mainly:

1. EHR Systems Quality Labelling and Certification Development, thereby:
   - producing a State of the Art Report on EHRCertification Schemas as already implemented in at least three European countries;
   - performing a Pan European Requirements Assay;
   - proposing a profiling and classification system for EHRs to be certified;
   - harmonising the EHR-Certification Procedures at a European level;
   - drafting the Certification Guidelines and Procedures (inc. Legal);
   - planning future Pilot Implementations.
2. Resources for EHR Interoperability, including:
   - the inventory of Conformance Criteria and Guidance Documents for obtaining EHR Certification;
   - an inventory and guidelines for EHR Archetypes;
   - the registration of Coding Schemes in Europe (as mandated by CEN/TC 251);
   - an inventory of existing and relevant EHR standards;
   - an inventory of XML schemas and Open Source components for EHRs.
3. Benchmarking Services :
   1. defining the Formal Test Plans for EHR Certification;
   2. preparing the Business Plan for EHRCertification related Services.

Project Description

The EHR has evolved to become centre-stage in the national health informatics strategies in Europe. There is a need for interoperability standards that can permit clinical computer systems to share health record data whilst preserving faithfully the clinical meaning of the individual authored contributions.

The structural organisation of the EHR needs to be appropriate to the needs of clinicians. Flexibility of data entry and support of narratives are major reasons for the retention of paper records by many clinicians. Achieving the optimum balance between structured, systematised record-keeping and holistic narrative is difficult, and the EHR must not be prescriptive about this: it needs to accommodate both. An EHR system must be underpinned by a common terminology to express clinical content that can accommodate such freedom of expression, whilst supporting the need for structured and semistructured interpretation of each entry.

"Quality labelling and certification of EHR systems will be very instrumental to an accelerated further deployment of interoperable EHRs"

A vast number of such requirements relate to the applications and systems that will capture EHR data from clinicians, carry out processing on that data including decision support, recalls and reminders, and deliver integrated or detailed views of EHR data back to clinicians. It is recognized that this vast field of clinical system design is broader than the conventional EHR concept, which is usually considered more limited in scope to the faithful and interoperable representation of EHR data itself. However, the EHR will grow through data contributions from a wide range of diverse and heterogeneous

clinical applications, and will also be presented back to clinicians through such applications. It is therefore not possible to separate completely the requirements for quality of EHRs from the clinical systems that manage and interact with them.

Quality labelling and certification of EHR systems will be very instrumental to an accelerated further deployment of interoperable EHRs.

> *"The general objective of Q-REC is to create an efficient, credible and sustainable mechanism for the certification of EHR systems in Europe"*

Having access to comprehensive, interoperable and secure EHRs has been shown to improve quality of care and patient safety.

Voluntary certification of EHR systems is a powerful mechanism to ensure that EHR systems are robust enough. Certification in this context is defined as the procedure and action by which a body duly authorised and recognised as a legitimate provider of this service evaluates and certifies an EHR system as meeting predetermined quality standards. The successful deployment of EHRs certification services will reduce the risk for purchasers and accelerate the adoption of higher quality EHRs.

Expected Results & Impacts

The general objective of **Q-REC** is to create an efficient, credible and sustainable mechanism for the certification of EHR systems in Europe. The core objectives of **Q-REC** will be to define a Model with harmonised guidelines and procedures for EHR systems certification and to incorporate the formal test plans into a Benchmarking Process Manual for quality labelling and certification of EHR systems across Europe. In summary, the main kinds of outputs that will be accumulated through the **Q-REC** work packages are as follows.

- A State of the Art Report on existing EHRs Certification Schemata;
- A Labelling Terminology and Functional Profiles for classification of EHRs to be certified;
- Model Certification Guidelines and Procedures;
- A Benchmarking Services Manual for EHRs Quality Labelling and Certification;
- An Inventory of Resources for EHR Interoperability, with registers of Quality Conformance Criteria, EHR-Archetypes, XML schemes, Health Coding Systems and relevant EHR Standards;
- A fully worked out Business Plan.

Q-REC

Q – R E C

European Quality Labelling and Certification of Electronic Health Record systems (EHRs)

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- ProRec (FR)
- ProRec (BE)
- MEDIQ A/S (DK)
- ProRec (DE)
- RAMIT (BE)
- University College London (UK)
- ProRec (SI)
- ProRec (BG)
- ProRec (RO)
- TNO (NL)

Timetable: from 01/05 – to 06/08

Total cost: € 1.331.317

EC funding: € 1.299.000

Instrument: SSA

Project Identifier:
IST-2004-27370

Keywords:

Electronic Health Record; Quality Labelling; Certification; Standards; Interoperability

RIDE

A Roadmap for Interoperability of eHealth Systems in Support of COM 356 with Special Emphasis on Semantic Interoperability

RIDE is a roadmap project for interoperability of eHealth systems leading to recommendations for actions and to preparatory actions at the European level. This roadmap will prepare the ground for future actions as envisioned in the action plan of the eHealth Communication COM 356 by coordinating various efforts on eHealth interoperability in member states and the associated states.

Objectives of the project

It is not realistic to expect to have a single universally accepted clinical data model that will be adhered to all over the Europe and that the clinical practice, terminology systems and EHR systems are all a long way from such a complete harmonization. Therefore, the **RIDE** project will address the interoperability of eHealth systems with special emphasis on semantic interoperability.

In order to create **RIDE** Roadmap, first the European best practices in providing semantic interoperability for eHealth domain will be assessed and the quantified requirements to create a valid roadmap will be identified. Based on these requirements, the goals, and the economical, legal, financial and technological challenges of the industry for the 21st century for achieving interoperability in eHealth solutions will be elaborated. **RIDE** will also focus on the limitations of the policies and strategies currently used in deploying interoperable eHealth solutions. Through eight **RIDE** workshops a shared vision for building a Europe-wide semantically interoperable eHealth infrastructure will be created. After assessing the gaps between the "as-is" situation and the "to-be" eHealth vision, the emerging trends and opportunities to achieve the vision statement, the required advances in the state of the art research, technology and standards will be identified.

"RIDE project, we will address interoperability of eHealth systems with special emphasis on semantic interoperability with the aim of laying a roadmap"

Project Description

RIDE is a roadmap project for research and development in interoperability of eHealth systems leading to recommendations for actions and to preparatory actions at the European level. This roadmap will prepare the ground for future actions as envisioned in the action plan "eHealth – Making Healthcare Better for European Citizens: An Action Plan for a European e-Health Area" by coordinating various efforts on eHealth interoperability in member states and the associated states.

A number of EHR standards and frameworks have been developed to assist with the interoperability and integration of distributed EHR information. Ideally, all EHR systems would adopt common and systematized hierarchies of component names, use multi-lingual clinical coding systems

Scenario

The family doctor, Bob Smith wishes to refer a patient named John Doe to a diabetic specialist named Mary Brown in Istanbul Hospital. The referral note of Bob Smith should be available to Mary Brown to continue the care process. This has several requirements some of which are presented here: The Patient Identifiers used by the document source and document consumer should be matched; the communication protocol used by these parties should be fixed; the interoperability of the messaging and EHR standards used by the parties should be facilitated.

with perfect cross-mappings and use identical reference models for measurements. However, this has not been realized yet.

It is unrealistic to expect a single universally accepted clinical data model that will be adhered to by all of these groups. Clinical practice, terminology systems and EHR systems are all, hence, a long way from such a complete harmonization. Therefore this problem can better be addressed at the semantic interoperability level.

RIDE project, we will address interoperability of eHealth systems with special emphasis on semantic interoperability with the aim of laying a roadmap by coordinating various efforts in Europe to prepare the ground for future actions as envisioned in the eHealth action plan.

Achievements & Results

The following achievements of the **RIDE** Project are available in the project web site (http://www.srdc.metu.edu.tr/webpage/projects/ride/modules.php?name=Calendar):

- European Best practices in providing semantic interoperability in eHealth domain have been surveyed, where the Current eHealth Practices in European Countries, USA, Australia and Canada have been elaborated.
- Standardization efforts for providing semantic interoperability in eHealth domain have been surveyed. The challenges on the standards for semantic interoperability, standardization activities on Electronic Healthcare Records, content of Patient Summaries, Ontologies, Terminologies and Coding schemes have been summarized.
- The Requirement Analysis of **RIDE** Roadmap has been finalized and reported. In this document, requirements of eHealth Interoperability for a wide range of issues that are important in Europe are provided. Furthermore, in "RIDE Vision", current and envisioned situation for all these issues are provided.
- The Goals and Challenges of **RIDE** Roadmap have been finalized and reported. Nine goals have been identified and described with exemplary scenarios. The main challenges affecting these goals are also discussed. Also, the alternative implementation plans for the goals are detailed.
- The gaps between the "state of the art" research ongoing in the eHealth domain and the desired future description identified in the **RIDE** vision statement for achieving semantic interoperability in eHealth are identified.
- Analysis of the current trends and opportunities in health care IT interoperability with special emphasis on those trends and opportunities which affect semantic aspects of interoperability is made.
- **RIDE** Project has made a proposal to OASIS ebXML Business Process Technical Committee entitled "ebBP Profile for Integrating Healthcare Enterprise (IHE)" to facilitate establishing electronic relationship among IHE Actors.
- The first and second versions of **RIDE** Roadmap have been finalized.

Keywords:

eHealth networks and architectures, Semantic Interoperability of eHealth in Europe.

R I D E

A Roadmap for Interoperability of eHealth Systems in Support of COM 356 with Special Emphasis on Semantic Interoperability Intelligent Healthcare Monitoring based on Semantic Interoperability Platform

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- European Institute for Health Records, EuroRec, (FR)
- National Council of Research, Institute for Biomedical Technology, CNR, (IT)
- National Technical University of Athens, Institute of Communication and Computer Systems, NTUA, ICSS, (GR)
- National University of Ireland, Digital Enterprise Research Institute, NUIG, DERI, (IL)
- IHE-D e.V., Integrating the Healthcare Enterprise – Deutschland, IHE-D, (DE)
- OLE Office Line Engineering NV, OLE, (BE)

Timetable: from 01/06 – to 12/07

Total cost: € 1.223.766

EC funding: € 1.156.269

Instrument: CA

Project Identifier:
IST-2004-027065

RIGHT

Reducing diagnosis and treatment risks by leveraging knowledge and practices of Health Care Professionals

Right project provides HealthCare Professionals of new Member States with a semantics-based solution accessible from a wide variety of mobile devices that will offer a complete access to information and possibility of sharing knowledge with all the levels of care in order to minimise medical errors in diagnosis and treatment.

Objectives of the project

Recent studies highlight that risks in diagnosis and treatment are one of the most important problems in the care management. Healthcare Professionals (HCP) not having protected environment such as hospital/clinics in where practice are even more subjected to these risks and in particular the HCP in the new Member States who are facing a series of healthcare system reforms; it rises therefore the necessity of an improvement of HCP skills/knowledge.

RIGHT project aims to:

- develop a knowledge management system integrated with Electronic Healthcare Record (EHR) systems easy to be used by Healthcare Professionals of new member States;
- provide meta-search functionality and retrieve information from multiple, distributed content sources in parallel;
- end-users to access the system from a wide variety of mobile devices in order to make the interaction with the system available from any location;
- guide HCP and medical students through a Decision Support System based on clinical guidelines issued by medical authorities;
- make available to HCP information and contacts to face the common problem of an adverse geographical distribution that implies lack of contacts with specialized structures/doctors to share knowledge but also a variety of different clinical cases to face.

Project Description

RIGHT project develops a Knowledge Management system integrated with Electronic Healthcare Record systems aimed at integrating, via semantic web services, clinical patient profile, HealthCare Professional knowledge and scientific community knowledge. The solution will be used by the new members States HCPs in dealing with all their daily tasks. The HCP could rely on a platform that will offer a complete access to information.

The main goal of RIGHT project will be to deploy the outlined solution in new member States. For each pilot a specific scenario adequate to the context has been planned (EHR used, Involved guidelines, locations, …)

	Involved		
	professionals	patients	pathologies
Institute Of Public Health Of The Republic Of Slovenia	50 GPs	10 patients per GP	Depression,Hypertension
Marshall Office of Lower Silesia	Medical/sociology students, Geriatric Doctors, GPs	100 people over 65	COPD, Diseases of locomotive system, Dementia, Depression in elders
University of Debrecen, Department of Family Medicine	Medical/sociology students, Geriatric Doctors, GPs	100 people over 65	COPD, Diseases of locomotive system, Dementia, Depression in elders
Association of Family	GPs (60), GP's nurses,	30-40 patients per GP	Hyperlipoproteinaemia, Pregnancies

Sharing inpatient/outpatient hospital information is fundamental for example in case of incompatibilities between drugs prescribed by hospital and by HCPs: the **RIGHT** toolset, thanks to the integration with EHR system and to a drugs and protocols and patient profile matching system, sends back an alert to the doctor as well as an alternative drug possibility.

RIGHT provides a federated information retrieval system based upon domain ontologies and Natural Language Processing.

The solution integrates a multi-channel delivery system to allow HCP to access the system from any location through several mobile devices. **RIGHT** foresees also a Decision Support System based on clinical guidelines issued by medical boards for health professionals and medical students, guiding them and acting as a health expert.

To validate the project a series of field trial and users cases has been planned in steady cooperation with the pilot users yet involved in the phase of specification and that, during the development phase, will constantly give feed-back about early prototypes.

Expected Results & Impacts

HCPs in new Member States appear to use internet primarily searching for information (47%) or to exchange patient records (13%) (eEurope+ Progress Report - February 2004) and **RIGHT**, being a web based service enabling intelligent information harvesting and with an integration with the EHR, could have a sure positive impact in satisfying that exigency.

RIGHT, reducing errors in diagnosis and treatments, allows a cut of the expenses necessaries to make up for the mistakes itself, and, helping in singling out a correct diagnosis, avoids waste in treatments useless or even detrimental to health and offers a drugs, protocols and patient profile matching system.

Another source of savings is the reduction of the time necessary to reach a definitive and sure diagnosis and the cut to the number of specialized visits that in this way could be addressed only to the cases in which are really needed. Beside what explained, the expected results Achieved during the project are:

- an health regional directorate, a national health institute and almost 200 HCPs of new member States involved;
- a toolset for the risk management tested/refined;
- an exploitation plan of the results in the new Member States and almost 1000 HCPs involved in awareness/dissemination activities.

R I G H T

Reducing diagnosis and treatment risks by leveraging knowledge and practices of Health Care Professionals

Project co-ordinator:
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- Institute of Public Health of the Republic of Slovenia (SI)
- Lower Silesia Voivodship (PL)
- University Of Debrecen - Faculty of Medicine - Department Of Family Medicine (HU)
- Cluj Association of Family Physicians (RO)

Timetable: from 01/06 – to 06/08

Total cost: € 2.974.406

EC funding: € 1.942.000

Instrument: STREP

Project Identifier:
IST-2004-027299

Keywords:

Medicine,
Health telematics,
Information technology,
knowledge management,
decision support system,
ontology

SAPHIRE

Intelligent Healthcare Monitoring based on Semantic Interoperability Platform

The SAPHIRE project aims to develop an intelligent healthcare monitoring and decision support system on a platform integrating the wireless medical sensor data with hospital information systems.

Objectives of the project

The medical practitioners at all levels are becoming more overloaded as the aging population of Europe increases. The decrease in mortality rate among elderly people increases the demand for healthcare. Advances in networking, mobile communications and wireless medical sensor technologies offer a great potential to support healthcare professionals and to deliver healthcare services at a distance hence providing the opportunities to improve healthcare.

"SAPHIRE aims to develop an intelligent healthcare monitoring platform based on clinical practice guidelines"

The **SAPHIRE** project will develop an intelligent healthcare monitoring and decision support systems (DSS) to address the delivery of healthcare problem in the enlarged Europe. In the **SAPHIRE** project, the patient monitoring will be achieved by using agent technology where the agent behavior will be supported by intelligent decision support systems based on clinical practice guidelines. In **SAPHIRE** system, patient history stored in medical information systems will be accessed through semantically enriched Web services to tackle the interoperability problem. In this way, the observations received from wireless medical sensors together with the patient medical history will be used in the reasoning process.

Project Description

Clinical DSS broadly refer to providing clinicians or patients with clinical knowledge and patient-related information, intelligently filtered and processed to enhance patient care. Despite the widespread of different publications, healthcare professionals have difficulties in understanding and applying the given guidelines in the clinical care setting. This necessitates computerized DSS automating clinical guidelines to support the health professionals. One of the major challenges in developing computerized DSS is accessing the many disparate data sources needed to retrieve patient-specific information. In the **SAPHIRE** project, the clinical DSS to be incorporated into the system as an agent behavior, will access patient medical history stored in medical information systems.

The **SAPHIRE** system will continuously monitor the patients through dedicated agents and will support the healthcare professionals through intelligent DSS that will produce and send alerts to the related people.

Creating such an information infrastructure requires safeguards to maintain security and privacy of patient data. Patient identification and medical records can

Scenario

Two pilot applications will be developed for the demonstration of the feasibility of the project. One of these pilot applications will be deployed in a hospital environment as an intelligent clinical decision support system guiding the healthcare professionals for patient care based on the data gathered from sensors, and medical information systems. The second pilot application will be a homecare application, where the patient's medical status will be monitored remotely through sensors. Based on the infrastructure provided by the SAPHIRE project, the healthcare institutes will deploy intelligent decision support systems for implementing appropriate clinical guidelines.

not be disclosed indiscriminately and different healthcare providers have different access rights. The **SAPHIRE** Project proposes comprehensive security and privacy mechanisms to complement the infrastructure proposed. While providing these confidentiality and privacy mechanisms, the EU directives 95/46/EC and 2002/58/EC presenting the general principles of processing of personal data, and in particular Recommendation R(97)5 of the Council of Europe discussing protection of medical data collected and processed automatically will be taken into account.

Achievements & Results

Current accomplishments of the **SAPHIRE** project are as follows:

- Wireless Medical Sensors for ECG, Oxygen Saturation and Blood Pressure and Bike Ergometer
- An OSGI based interoperability platform for wireless medical sensors
- Semantic Marking and Web Services Exposition of sensor data
- Computerization and automatization of two Clinical Guideline Models for cardiovascular diseases (CVD) domain (one for "Management of Acute Myocardial Infarction", the other for "Management of acute coronary syndromes in patients presenting without persistent ST-segment elevation")
- An agent based clinical decision support system for clinical guideline execution
- Integration of clinical decision support system and interoperability platform with Medical Information Systems
- A user interface for clinicians to monitor clinical guideline execution
- HL7 Clinical Document Architecture (CDA) representation of Electronic Health Records and IHE XDS architecture implementation for accessing clinical documents
- Alert Component for delivering medical alerts to the healthcare users
- Implementation of Privacy and Security mechanisms for Web Services and Sensor Network

SAPHIRE

S A P H I R E

Intelligent Healthcare Monitoring based on Semantic Interoperability Platform

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- Institute for Automation Bucharest, IPA, (RO)
- The Internal Medicine and Cardiology Department of the Emergency Hospital of Bucharest, SCUB, (RO)
- Schüchterman-Klinik, SSK, (DE)
- Tepe Teknolojik Servisler AS, Tepe Technology, (TR)

Timetable: from 01/06 – to 12/08

Total cost: € 2.917.016

EC funding: € 2.040.775

Instrument: STREP

Project Identifier:
IST-2004-027074

Keywords:

Intelligent Healthcare Monitoring, Clinical Decision Support Systems, eHealth networks and architectures, Interoperability of Medical Information Systems, Web services for the medical domain.

Sealife

A Semantic Grid Browser for the Life Sciences applied to the study of Infectious Diseases

How can the researcher in the lab benefit from this new infra-structure to science? A technology is needed to transparently bring such services to the desks of the scientists. Sealife will develop a browser, which will link the existing Web to the currently emerging eScience infrastructure.

Objectives of the project

Currently, much effort is spent on creating a new computational and data infrastructure to facilitate eScience, the cooperation of geographically distributed organisations, which transparently integrate their computational and data resources at a structural and semantic level. Progress has been made with standards for grid computing and semantic representations for life science data with many projects creating a host of grid-enabled services for the life sciences.

The Web started with a browser and a handful of Web pages. The vision of eScience with an underlying Grid and Semantic Web will only take off with the development of a Semantic Grid browser. The **SEALIFE** project is filling this gap by developing such a semantic grid browser. These browsers will operate on top of the existing Web, but they introduce an additional semantic level, thus implementing a Semantic Web. Using ontologies as background knowledge, the browsers can automatically identify entities such as protein and gene names, molecular processes, diseases, types of tissue, etc. and the relationships between them, in any Web document. They collect these entities and then apply further analyses to them using applicable Web and Grid services. The **SEALIFE** browser will be evaluated in three applications relating to the study of infectious diseases.

Project Description

SEALIFE will solve the following problems to achieve its objectives:

- Ontologies: Design and integration of ontologies and associated infrastructure, which can serve as background knowledge for a Semantic Grid Browser geared towards life science applications ranging from the molecular level to the person level.
- Concept Mapping: Bridging the gap between the free text on the current Web and the ontologybased mark-up for the Semantic Web and Grid by developing automated mark-up modules for free text, which are based on textmining and natural language processing technologies.
- Service Composition: Bridging the gap between the ontologies of the Semantic Web and the services of the Grid by linking suitable ontology mark-up to applicable services and by supporting the interactive creation of such mappings for complex services.

The **SEALIFE** browser will be demonstrated within three application scenarios in evidence-based medicine, literature and patent mining, and molecular biology, all relating to the study of infectious diseases.

Scenario

To illustrate the power of this vision consider the following applications: Evidence-based medicine: Consider a clinician, who consults the national electronic library of infections to get trusted information on infections. The user visits the site and finds an interesting page on hipatitis and its treatment: "Ribavirin with or without alpha interferon for chronic hepatitis C". Using its background knowledge, the Sealife browser identifies hipatitis as disease and interferon as an immunologic factor. With this knowledge the browser automatically offers the user the ability to query the biomedical databases Ensmbl and PDB to learn more.

The three applications vertically integrate the molecule/cell, the tissue/organ and the patient/population level by covering the analysis of high-throughput screening data for endocytosis (the molecular entry pathway into the cell), the expression of proteins in the spatial context of tissue and organs, and a high-level library on infectious diseases designed for clinicians and their patients.

"The vision of eScience with an underlying Grid and Semantic Web will only take off with the development of a Semantic Grid browser"

Expected Results & Impacts

These systems will be advanced through **SEALIFE** and will ensure a link to a user base. Additionally, **SEALIFE** has set up an advisory board with members from Pfizer, AstraZeneca, Unilever, and others. Dresden has spun-off Transinsight.com, which is dedicated to intelligent search for life sciences. Transinsight has secured seed funding by the German High-tech Gründerfonds and has obtained an award by the federal ministry for economic affairs.

Sealife builds on a number of relevant systems already developed by the partners:

- GoPubMed.org, an ontology-based literature search engine
- MyGrid, a Grid computing platform,
- Corese, a concept resource search engine,
- NeLI, the National electronic library of infectious diseases,
- Edinburgh Mouse Atlas.

S e a l i f e

A semantic grid browser for the life sciences applied to the study of infectious diseases

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- Hariot-Watt University, Edinburgh, (UK)
- City University, London, (UK)
- University of Manchester, (UK)
- Scionics GmbH, Dresden, (DE)
- Inria, Sophia-Antipolis, (FR)

Timetable: from 4/2006 to 3/2009

Total cost: € 2.6M

EC funding: € 2.2M

Instrument: STREP

Project Identifier:
IST-2004-027269

Keywords:

Grid, semantic web, molecular biology, healthcare, bioinformatics

semanticHEALTH

Semantic Interoperability Deployment and Research Roadmap

SemanticHEALTH aims to develop a European and global roadmap for deployment and research in health-ICT, focusing on semantic interoperability issues of e-Health systems and infrastructures. The roadmap will be based on consensus of the research community, and validated by stakeholders, industry and Member State health authorities.

Objectives of the project

The Semantic aspects of interoperability have only recently been recognised as the major enabling factor for the safe and sensible communication of patient data. Health language is very large and diverse, and as such not equalled by other professional languages. The delivery of safe and effective health care is a challenge, particularly as the extent of medical errors is becoming apparent. The US Institute of Medicine report "To Err is Human" has estimated that 100,000 US citizens die each year through medical errors. Though there is no hard evidence on the exact role played by the lack of available adequate clinical documentation on patients, it is assumed the effect is substantial, and for the greater part avoidable.

Project Description

To efficiently implement e-Health to meet the rising needs of mobile citizens, patients and providers, the fragmented interoperability initiatives now distributed throughout different EU and Member State programmes must come together. They must be coordinated with the increasing need to link clinical data to information from basic biological sciences and evidence of best clinical practice.

Considering the need for interoperability at the Member State and cross-border level of the European Union – as expressed in the EU e-Health Action Plan – and for global interoperability – as represented by WHO – it is necessary to embark on a process that will prompt the divergent initiatives to join forces for the benefit of all citizens.

This **SemanticHEALTH** SSA develops a European and global roadmap for deployment and research in health-ICT, focusing on semantic interoperability issues of e-Health systems and infrastructures. The roadmap will be based on consensus of the research community, and validated by stakeholders, industry and Member State health authorities. It

- identifies key short-term (2-5 years) and medium-term (4-10 years) needs to achieve semantic interoperability of e-Health systems
  (including issues of nomenclatures presently in use, classifications, terminologies, ontologies, EHR and messaging models, public health and secondary uses, and decision support, their relationships, mapping needs, limitations)
- analyses unsolved issues arising in the context of realistic approaches to priority clinical and public health settings (reflecting on models of use, benefits expected, concrete application experience and lessons learned; relevance of open source model)
- takes account of the impact of non-technological (health policy, legal, socio-economic) aspects
- reflects and integrates results of related FP6 (eHealth ERA, i2-Health and other) studies.
- The consortium and associated experts represent centres of excellence from four continents and the WHO.

Achievements & Results

"The holy grail of connectivity is the transformation of the current paper-based medical record into an electronic medical record that is accessible to all necessary providers and possibly to the patient. Web-enabling the EMR expands the potential users and uses …"

To indeed realise this vision, interoperability is mandatory; interoperability not only at the technical and syntax level, but particularly at the semantic level. Semantic interoperability is vital to the seamless flow of data and consistency in meaning on patients' medical conditions globally, which will form the very foundation upon which future global health research, patient care and public health management evaluation can be effectively and competently carried out.

Technical and semantic standardisation is a key problem for interoperability and the exchange of data amongst health sector actors. Similarly, they have been identified as crucial issues for any National and Regional e-Health Roadmap. Furthermore, standards should be an explicit complement of regulations from one side, and implementation guidelines and certification on the other side. Consequently, it is to be expected that this SSA will have also a positive impact on much needed semantic standardisation in the health domain by identifying relevant priority issues and needs for actions for the near and medium-term future.

As a by-product of our project, the context for the development of standards will become more clear and explicit, and the relationship between research issues, standardization activities and industry will be made more effective.

Directly or indirectly, the proposed action will also impact on

- creating an "internal market" in e-Health research
- supporting the Lisbon strategy of Europe becoming the most competitive and dynamic knowledge-based economy until 2010,
- stimulating innovation and economic growth and hence the creation of qualified new jobs.

semanticHEALTH

Semantic Interoperability Deployment and Research Roadmap

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- Université Jean Monnet Saint Etienne, (FR);
- University College London, (UK)
- Empirca Communication and Technology Research (DE, subcontractor)

Timetable: from 01/06 – to 12/07

Total cost: € 968,860

EC funding: € 968,860

Instrument: SSA

Project Identifier:
IST-2005-027328

Keywords:

eHealth interoperability semantics clinical terminology ontology roadmap

SemanticMining

Semantic Interoperability and Data Mining in Biomedicine

The main concern of SemanticMining have been semantic interoperability, which simply means that meaning is preserved in communication between information systems, a condition which should be natural but has proven to be very hard to achieve, especially so in the complex application area of health care.

Objectives of the project

An overall objective of the European research programmes in the sixth framework has been the identification and filling of gaps in the European research infrastructure, to facilitate cross-fertilisation between scientific disciplines and to establish a durable structure for such a collaborative approach. SemanticMining is composed of partners from computer science, systems engineering, biomedical informatics, and public health care organisations, all bringing their experience and in-depths knowledge together into a common framework. A bridging activity addressed was knowledge transfer and co-operation between academia and organisations in the health and welfare sector, including standardisation bodies and the different public and private institutions involved in health care delivery and management. The national institutes and organisations responsible for policy making and quality management with a regulatory function will have an important role to play in the exchange of ideas and experiences.

A main concern of SemanticMining has been semantic interoperability in communication between health care information systems. The long-term goal of SemanticMining has been the development of generic methods and tools supporting the critical tasks of the field: data mining, knowledge discovery, knowledge representation, abstraction and indexing of information, semantic-based information retrieval in a complex and high-dimensional information space.

Project Description

Researchers in the network have played an influential role in the process of harmonisation and further development of ontologies and terminology systems. Examples of areas of interaction are the Gene Ontology, the Foundational Model of Anatomy, CNPU, LOINC and SNOMED CT.

The research activities in SemanticMining have been focused around the following areas:

The research activities in **SemanticMining** are focused around the following areas:

- principles in ontology engineering
- evaluation of SNOMED CT
- terminology systems in laboratory medicine (such as CNPU and LOINC)
- impact of ontologies on health statistics
- the construction of a multi-lingual medical dictionary
- information retrieval in bioinformatics
- the semantic-based electronic health record
- laymen terminology and patient-friendly documentation systems

Scenario

In some countries, patients already have or soon will have access to their own health records over the Internet, and hence there is a growing need for online facilities that can help patients without medical knowledge to access relevant information in the health records. In some cases it is even required that the records not only be made available as-is, but also that the patients should be able to receive their records in a generally understandable form. Research on the semantically well-defined electronic health record and language technology within SemanticMining, will be important facilitators for such systems.

Achievements & Impacts

It is well known that the health care system is faced with a series of challenges concerning quality and cost-effectiveness. The distribution of health care services in ways which allow the patient to take an active part in relevant decisions and the provision of evidence-based medicine at all levels in the system and the effective use of information are all key issues for the organisation of health care delivery in Europe.

Considerable effort has been invested over the years by the European standardisation community of CEN TC251 (and the HL7 community in USA) in advancing the formalism of the Electronic Health Record (EHR). A specific contribution is a standard for archetypes, as a template for structured data entry into the EHR, which have been pioneered by the openEHR foundation. SemanticMining has contributed with open source components compliant with the openEHR specification for archetype creation, binding of clinical data entry forms to entities or codes in terminology systems, and for visualisation of longitudinal patient records.

Research carried out with language technology in the network address the multi-lingual challenges of European health care. Because patient reports are written in national language all over Europe, cross-language abilities are needed to promote a unified and ubiquitous health care system across Europe. A concrete result of the SemanticMining research programme has been a multi-lingual medical dictionary with entries in English, German, French, Spain, Portuguese and Swedish. Experiments of patient-friendly documentation systems with transformation of professional health care language to laymen terminology have been carried out.

The need for cross-referencing between biological and clinical information provides a grand challenge. The vast amount of data available in bioinformatics databases together with the growing volume of electronically available clinical information calls for automated (or at least semi-automated) methods for high-quality indexing, annotation, and cross-referencing. Services and tools for text mining and information retrieval have been developed and are publically available e.g. at the European Molecular Biology Laboratory.

"The NoE has active interaction with standardisation bodies such as CEN TC251 and HL7."

SemanticMining

Semantic Interoperability and Data Mining in Biomedicine

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Partners:
SemanticMining is based on the partnership of 23 partners from 11 European countries with approximately 100 identified researchers (25 female) and 35 associated PhD students (10 female).

Timetable: from 01/2004 – to 06/2007

Total cost: € 6,384,000

EC funding: € 5,000,000

Instrument: NoE

Project Identifier:
IST-2002-507505

Keywords:

biomedical informatics, electronic health records, semantic interoperability, ontologies, data and text mining

Share

Supporting and structuring HealthGrid Activities & Research in Europe: developing a roadmap

SHARE goal is to ensure the successful take up of HealthGrids in the next 10 years by creating a roadmap for essential technology development years.

Objectives of the project

A major challenge for the coming years is to address the unique ICT aspects of the life sciences in an integrated way. Life science research present the need to access, analyse, protect and share massive quantities of diverse, geographically distributed information, computationally intensive analysis techniques and rapidly evolving medicine, science and technology.

The recent emergence of Grid technology opens new perspectives to enable interdisciplinary research and technology development at the cross roads of medical informatics, bioinformatics and system biology impacting healthcare.

Action on Grids for health is needed at EU level to address mobility of citizens and provide cross frontier interoperability of data, cross-frontier infrastructures, optimal exploitation of resources (both technical and medical), equitable distribution of healthcare; and definition and implementation of standards.

Such deployment requires harmonization of existing legal frameworks for storing, accessing, communicating, and processing health related data in Europe.

SHARE will achieve the following goals:

- To propose strategies to address some of the issues listed in the European Action Plan for e- Health.
- To define a roadmap for research and technology to allow a wide deployment and adoption of HealthGrids both in the shorter term (3-5 years) and in the longer term (up to 10 years).
- To define a complementary and integrated roadmap for e-Health RTD policy relating to Grid deployment, as a basis for improving coordination amongst funding bodies, health policy makers and leaders of Grid initiatives, avoiding legislative barriers etc.

Project Description

The HealthGrid roadmap will cover the domain of RTD and uptake of Grid applications in healthcare comprehensively, including infrastructure, security, ethical, legal, financial, economic and other policy issues.

Each section of the roadmap will detail actions to be taken in terms of objectives and possible methods or

Scenario

Suppose that the epidemiology department of a public health authority records primary care and drug prescription information from a regional area. A researcher from this epidemiology department has to take a decision on the preferred treatment for the disease "A" to inform medical practitioners. This information has been traditionally obtained from the drug manufacturer companies and obtained through clinical trials. However, the information registered would enable to perform more realistic cost-efficiency and safety analysis. After talking with the experts, the epidemiology researcher selects the most relevant fields and performs a correlation study of treatment length, adverse effects, treatment cost, patient physical information and medical records. This study requires consolidating the information from several databases and performing long and computationally-costly knowledge discovery processes which are executed on a grid infrastructure, taking into account the security and integrity restrictions. Final data determines that for a group of the population "X", current treatment is inadequate and costly, whereas alternative treatment "Y" seems very effective. This information is published for the medical practitioners who use this as an advisory guide for their daily work. Finally, treatment cost of disease "A" has been reduced.

"The Share Roadmap will focus on identifying requirements for further research and technology development"

approach as well as recommended milestones for completion, stakeholders responsible, appropriate methods of coordination etc All sections of the roadmap will take fully into account issues related to standards and will respect the security requirements for handling medical data. Non-European issues will be factored in to our roadmap in order to ensure that European HealthGrid policy does not inadvertently preclude international interoperability.

The conceptual work during the start-up phase of the project will also specify in detail both the general scope and specific features of the roadmap. In this sense, the roadmap will focus on identifying requirements for further research and technology development.

It will also sketch a realistic picture with respect to desirable applications/ICT implementations and indicate which technologies may have the potential to make a substantial contribution in this context. This will be supported through the presentation of good practice examples.

To ensure that the RTD roadmap ultimately to be generated will actually yield positive results and desired impacts it will be based upon and, wherever possible, justified by empirical evidence from the research domain and a bottom-up assessment involving relevant stakeholders.

In a sequential process, relevant research communities and communities of practice at EU, national and global levels will be joined up to enable an iterative refinement and extension of the initial road map.

Achievements & Results

Health care systems in all countries are under strong pressure to reduce costs and improve (economic) efficiency. For quite some time, the European Union through the various framework programmes for RTD has strongly supported the development of ICT applications in the health sector, albeit with mixed results.

The same holds for various national activities; only recently these have gained in scope and relevance for health care professionals and citizens. The overriding societal goal of all these activities - and in line with **Share** as well - is to contribute towards better health and care across Member States, in particular through implementation and diffusion of e-health products and services on regional, national and trans-European e-healthcare infrastructures based on the Grid technology.

It is expected that this will contribute to better medical outcomes, better quality of life for citizens and patients, more efficiency and improved access - key impacts for all countries and all their citizens. As an additional result, the Share project will also offer to the whole biomedical research community a knowledge base on projects, actors and developments related to grid for health.

S h a r e

Supporting and structuring HealthGrid Activities & Research in Europe: developing a roadmap

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- University of the West of England, Bristol (UK)
- Facultés Universitaires Notre-Dame de la Paix (BE)
- European Health Management Association (IL)

Timetable: from 01/06 – to 03/08

Total cost: € 1.026.000

EC funding: € 980.000

Instrument: SSA

Project Identifier:
IST-2004-27694

Keywords:

HealthGrid,
eHealth networks and Architecture,
Interoperability,
Biomedical informatics,
Electronic Health Record,
Open Source,
Knowledge Base

SIMAP

Simulation modelling of the MAP kinase pathway

SIMAP will develop a simulation model of the cancer related MAP-kinase pathway, integrating and analyzing data from various types of resources, which may assist in the development of better cancer treatment.

Objectives of the project

The completion of the human genome gave hope for a new age of medical understanding, but 4-5 years later costs of drug development are still rising and the success rate has not improved. Drugs that have already hit the market are found to have major side effects not perceived in the past and are often given to patients without discrimination on their likeliness to respond.

"The SIMAP project is tackling a key cause to many forms of cancer... it is hoped the prototype will serve as a tool to improve the bedside treatment of patients based on a multi-level genomic / proteomic profile"

Large scale methodologies that thrive in recent years, allowed the industry and academia to gather more information on RNAs and proteins. However, the understanding of the molecular and cellular processes is still lacking, not to mention the connection to the clinical outcome. In order to fully use this data, a comprehensive integration and modelling effort is needed. A systematic rational hypothesis-driven research approach connecting all those levels of information is a much needed computational tool. This is the main goal of **SIMAP** project. The ultimate goal of **SIMAP** is to develop a comprehensive simulation biochemical model of EGFR-MAP kinase pathway in connection to cancer clinical information. **SIMAP** will:

- Incorporate low-level biochemical modelling of individual molecules;
- Simulate the behaviour of the pathway;
- Add genomic and proteomic data;
- Incorporate individual patients' responses; and
- Analyze sub population of responses in the context of the biochemical behaviour and genotype data

Project Description

The MAP-kinase pathway is a major pathway that relays signals from the plasma membrane into the nucleus. A deep understanding of this pathway is important for the development of rational anti-cancer therapies. The **SIMAP** consortium intends to develop a comprehensive and robust simulation model of the pathway, which will incorporate data from the literature, as well as experimental and clinical work. The model is expected to create qualitative predictions, followed by experimental verification. It is expected to integrate and analyze data from various types of resources ranging from single molecule information, to pathway modeling, to clinical data and patients' response.

This approach is expected to enable hypothesis-driven research aimed at the establishment of systems level computational platforms available for various pharmaceutical applications.

The concepts and methods intended to be developed could help in the design of new therapeutic drugs, decrease the attrition rate of new drugs and make it possible to select patients for treatment on the basis

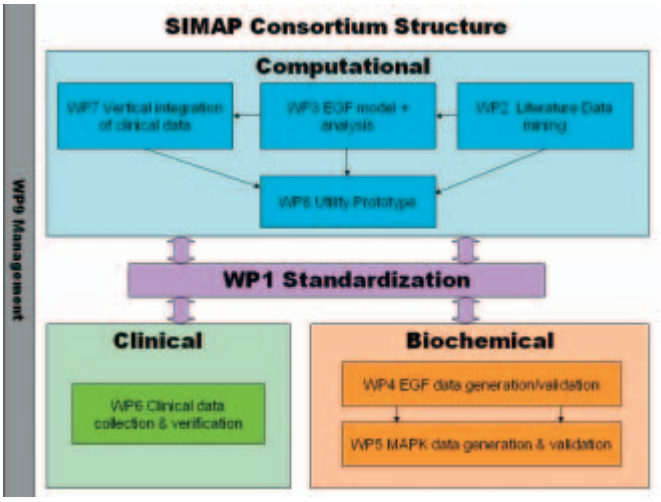
Scenario

Mrs Cohen has been diagnosed with breast cancer. Dr. Levy would like to put her on chemotherapy and an ErbB2 inhibitor. However there are few inhibitors in the market with varied level of efficiency. Dr Levy would be very happy if she could perform some genetic tests on the biopsy taken from Mrs Cohen and predict up to a certain level which is the best inhibitor to use, what is the optimal drug administration regime that would best improve her prognosis. It is hoped that SIMAP platform will assist Dr. Levy to tailor-made a treatment to Mrs Cohen based on her individual parameters

of individual parameters. Model-driven predictions regarding the impact of drug combinations could allow dramatic improvement in the design of pre-clinical and clinical trials, enhance patient response and limit adverse effects of drugs.

SIMAP pioneers the integration of clinical phenotype into this improved biochemical model. Such multi-scale modelling is a step forward in the field of Systems Biology.

The project is lead by a drug and diagnostic discovery SME and interdisciplinary industrial and academic leading teams of investigators.



Expected Results & Impacts

The **SIMAP** project offers a unique opportunity to develop a sophisticated tool to profile the population that will be treated with or without agents directed to the MAPK signalling network. **SIMAP** prototype will allow not only for better drug development but will also allow clinicians to give better treatments to patients on a case by case basis. Europe is already the leader in the development of MAP-Kinase inhibitors with many of the available molecules being patented by European Pharmaceutical companies.

The availability of a computer simulated model that will assist in better developing and trialling drugs based on these molecules will help to reduce the development costs and time to market for these companies.

SIMAP will contribute to the European Community's health by allowing the identification of genetic and protein markers, which will define sub-population of patients who will benefit most from targeted agents, have most toxicity (and should therefore avoid the treatment or undergo dose reduction) or who will prove resistant to these agents and should therefore be exposed to alternative therapies.

The **SIMAP** project is tackling a key cause to many forms of cancer and as such a major societal and economic challenge. In the long run it is hoped the prototype will serve as a tool to improve the bedside treatment of patients based on a multi-level genomic/proteomic profile.

S I M A P

Simulation modelling of the MAP kinase pathway

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- Fundacio Institut De Recerca De L'Hospital Universitari Vall D'Hebron, (ES)
- Fondazione IRCCS Istituto Nazionale Dei Tumori, (IT)
- The Max-Planck Institute for Infection Biology, (DE)
- The University of Glasgow, (UK)
- The Weizmann Institute of Science, (IL)

Timetable: from 01/06 – to 12/08

Total cost: € 4.464.201

EC funding: € 3.126.662

Instrument: STREP

Project Identifier:
IST-2004-027265

Keywords:

Biomedical informatics , Modelling, Systems biology, Clinical data integration, Pathway simulation

SmartHEALTH

Smart Integrated Biodiagnostic Systems for Healthcare

The SmartHEALTH Integrated Project will develop and deliver the next generation of smart diagnostic systems fully integrated into healthcare systems in Europe. Driven by key applications in cancer diagnostics, SmartHEALTH will enable enhanced medical diagnosis leading to earlier and more precise results and thus contributing to an increased quality of life.

Objectives of the project

Addressing the high economic burden of the healthcare sector, prevention, early diagnosis and informed therapeutics are indispensable. Tests must be highly accurate and well integrated into medical management to avoid unnecessary treatment and tress to users. **SmartHEALTH** will address these complex issues by developing highly intelligent diagnostic technologies that are fully integrated into healthcare systems, optimising their impact in management and work practice.

"SmartHEALTH technology will deliver better and improved solutions for diagnostics"

Driven by key targeted applications in cancer diagnostics (breast, cervical and colorectal), the project will deliver prototype systems with the aim of moving instrumentation from the laboratory, through to portable devices localised at the "point of care."

Project Description

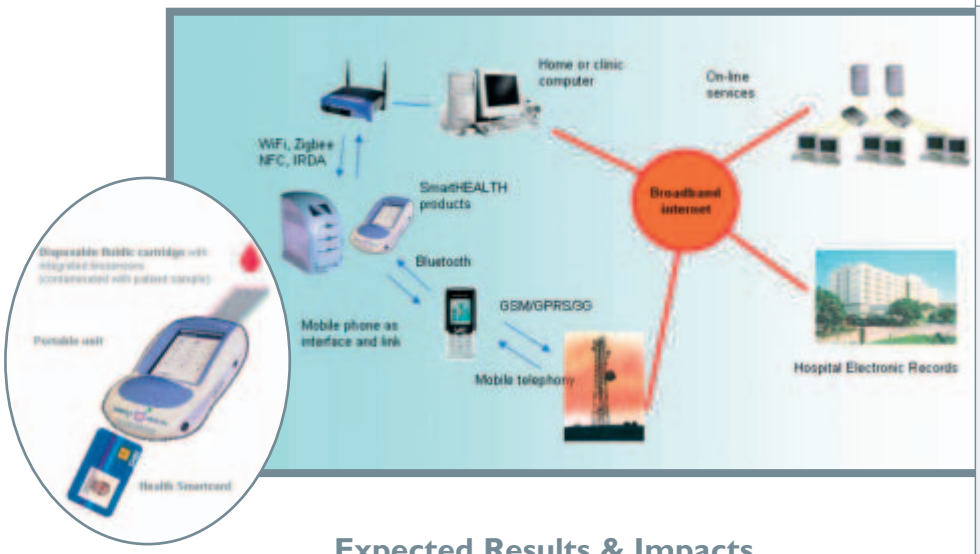
Driven by clinical applications and MNT & IST technology, **SmartHEALTH** will develop an open integrated architecture for new biodiagnostic systems to support European companies exploiting bioassays or new application concepts. The initial system has a disposable fluidic cartridge with a desktop base-station linking to the ambient e-Health environment - health cards, patient data, online services. This concept will be miniaturised and cost engineered into a portable and more available product. It will perform multi-analyte sensing and interpretation, for nucleic acids and proteins and will handle multiple biological sample types.

Results will be interpreted and presented using bioinformation analysis. Systems will be healthcare user identity and ambient environment aware, respecting confidentiality and information access rights. The IP will enable enhanced medical diagnosis, leading to earlier and more precise results contributing to an increased quality of life as well as increasing the competitiveness of the European IVD sector.

Clinical areas for **SmartHEALTH** application are in Cancer Diagnostics - breast cancer recurrence monitoring, cervical cancer case finding, and colorectal cancer – diagnostic, theranostic, prognostics. Each application includes clinical validation and commercial exploitation partners.

Scenario : SmartHEALTH technology providing new solutions for cancer monitoring

Cancers are not 'cured' but 'managed'. One of the major areas of progress with cancers, such as breast cancer, is the benefit of long term therapies for reducing growth rates. This approach requires regular monitoring such that the efficacy of maintenance therapy is rapidly noted and different therapy can be initiated as required. This necessitates regular testing for cancer load. People wish to avoid hospital yet want results interpreted expertly and communicated rapidly. They want tests that do not miss problems yet avoid unnecessary worry. **SmartHEALTH** aims to develop such an integrated breast cancer monitoring diagnostic eventually useable in a localised and more available setting.



Expected Results & Impacts

The European Community has made health and well-being one of its top priorities, not least in view of EU enlargement. Even though Europeans are now enjoying long and healthy lives, one person in every five will die prematurely before the age of 65. Cancer will account for some 40% of these deaths, cardiovascular diseases for another 30%, accidents and suicides for some 10%. Three lines of action have been suggested: 1) Improving information for the development of public health; 2) Creating an EU surveillance, early warning and rapid reaction capability; 3) Health promotion and disease prevention, screening and testing of target populations. **SmartHEALTH** impacts all these areas.

The economic impact of the results of **SmartHEALTH** are potentially very considerable with proposed technologies that will facilitate improved healthcare provision, from improved centralised screening systems, through to fast and flexible point of care systems. Expenditure for diagnosis generally represents less than 1% of total healthcare expenditure, thus increased testing cannot significantly increase healthcare costs but can significantly contribute to the quality of health care as it:

- Allows earlier and more appropriate and therefore less costly treatment.
- Helps to rule out expensive treatments.
- Reduces costs of treatment of complications.
- Potentially shortens the length of hospital stay by making therapies more effective and therefore more cost-effective.

Keywords:

biomedical sensors,
nanotechnologies,
diagnostic systems,
point of care, eHealth networks.

SmartHEALTH
Integrated Project

SmartHEALTH

Smart Integrated Biodiagnostic Systems for Healthcare

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- Zarlink Semiconductor (UK),
- Fraunhofer - Institut für BioMedizinische Technik (DE),
- Netherlands Organisation for Applied Scientific Research TNO (NL),
- Ikerlan Sociedad Cooperativa (ES),
- Fundación Gaiker (ES),
- IMEC (BE),
- Universitat Rovira i Virgili (ES),
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- iXscient Ltd (UK),
- Fujirebio Diagnostics AB (SE),
- Olivetti I-Jet (IT),
- Forschungszentrum Karlsruhe GmbH (DE),
- Telecom Italia S.p.A. (IT),
- Charité – Universitätsmedizin Campus Buch (DE),
- Frauenklinik der FSU Jena (DE),
- Fundación Vasca de Innovacion e Investigación Sanitarias (ES),
- SINTEF ICT (NO),
- Multi-D Analyses AB (SE)

Timetable: from 12/05– to 11/09

Total cost: € 21.768.293

EC funding: € 12.298.211

Instrument: IP

Project Identifier:
IST-2004-2016817

STEP
A Strategy for the EuroPhysiome

STEP was a Coordination Action that sought to coordinate European activity relating to the physiome – a description of human physiology that will span multiple levels from the whole body down through the organs to the cells and beneath in an integrated manner.

Objectives of the project

The physiome is the integrated description of the physiology of a species. Integration has become more important because of recent results produced from the genome, molecular biology and evolutionary biology; recent advances in computer technology are now making it feasible.

European research is currently developing the concept of ***Virtual Physiological Human*** (VPH) to develop models that will provide an improved description of the human physiome. The VPH relates closely to the Physiome Project (more accurately described as the Physiome Initiative), which is organised under the auspices of the International Union of Physiological Sciences (IUPS).

The VPH activities will run alongside the Physiome Project but will focus on areas in which strong European work currently exists to ensure that it continues to maintain its leading position. The VPH places a heavy emphasis on research that will have a strong impact on the clinical and industrial areas.

STEP produced a roadmap defining the best way forward for European research in this area. To do this, it:

- engaged all interested parties in the discussion in an inclusive manner
- invited recognised experts from around the world to provide informed opinion
- organised two conferences to focus the debate.

Project Description

STEP brought together all European projects that were engaged in physiome-related work at the time. **STEP** moved to a situation in which the issues were considered more holistically.

To reduce the complexity of the problem, **STEP** was organised as a two-stage process:

- initially, the overall picture was broken down into Strands related to tissue types, e.g. hard tissue, soft tissue, fluids
- once the Strands had identified how progress could best be made in their own areas, they discussed, together, how to achieve their goals in a unified and coherent manner, avoiding redundancy and overlap as much as possible.

The first conference will enabled the Strands to focus on their own specific problems and define consensual positions.

This was followed by an intense Internet-based debate in which the Strands completed their deliberations and defined positions for circulation to the other Strands.

The second conference brought these documents together and started to define the final roadmap which addressed, amongst other things, the following issues: common objectives and research challenges; the resources required; ethical, gender and legal issues; impact analysis; dissemination models; community building initiatives; exploitation models and long term sustainability.

Scenario : Cardiome, University of Oxford

This pioneering project has grown out of work established in the 1960s and is probably the most advanced of the Physiome organ-level models. It is seeking to develop electro-mechanically representative models of cardiac structure and function of a variety of species, including human.

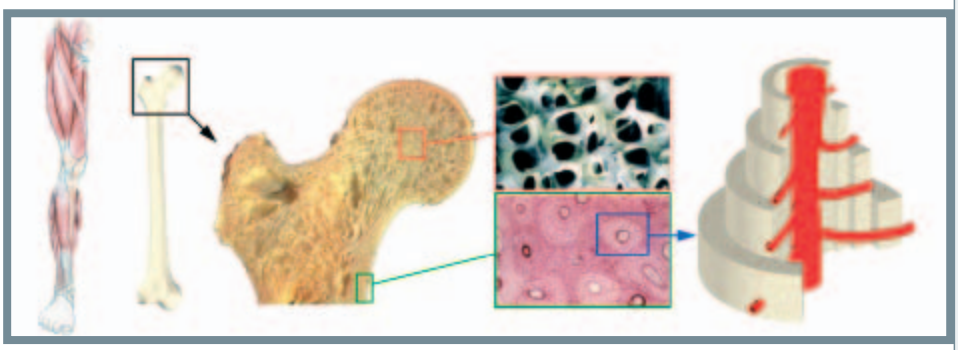
All of these studies emphasise how complex the heart is. Heart disease is influenced by many factors, not least the genes of the individual, so development of treatments must take account not only of the heart as an organ but also of factors at a subcellular level. This is why physiome-based approaches are likely to lead to many breakthroughs when the models developed reach maturity.

Expected Results & Impacts

Given the diversity of areas on which biomechanics and biophysics impact – health, ergonomics, safety, sport – the effects on the quality of life of the individual citizen are expected to be wide ranging.

Further, given the current costs, both social and economic, of the problems that exist in these areas, the anticipated benefits in terms of personal comfort and reduction in pain, and in terms of the associated social spending are likely to be huge.

The European biomedical industry, mostly formed by SMEs, is struggling under the fierce competition of the multinational, normally US-based, companies that have gained dominance in many markets.



For application domains, the challenges include:

- enhancing our ability to study the human body, its functioning, its inter-subject variations, and to develop and validate complex models that can accurately predict a variety of physiological and pathological conditions
- allowing the European Physiome communities to create the world's largest and most sophisticated collection of information on the human body.

Physiological knowledge is so intimately linked to clinical practice that the direct impact on clinical practice will probably be substantial:

- multiscale modelling should open new scenarios in preventive medicine, or environmental medicine, in general health studies, and in the design of drugs and medical devices
- new developments in diagnosis, treatment, monitoring and rehabilitation, which may provide improved insights to assist with patient care
- support for evidence-based medicine.

For the scientific community, the roadmap addresses:

- the development of numerical simulation, interactive visualisation, and instruments for community building and collaborative working
- the evolution of core technologies to a usability level that will make them accessible by nontechnical users, such as biomedical researchers and clinical professionals
- the deployment of infrastructures that provide the necessary levels of security and trust.

STEP

S T E P

A Strategy for the EuroPhysiome

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- Université Libre de Bruxelles (BE)
- University of Sheffield (UK)
- Aalborg Sygehus (DK)
- University of Oxford (UK)
- University of Nottingham (UK)
- CNRS-IBISC (FR)
- University College London (UK)

Timetable: from 01/06 – to 03/07

Total cost: € 1,240,770

EC funding: € 1,185,360

Instrument: CA

Project Identifier:
IST-2004-027642

"The roadmap was circulated widely amongst relevant parties throughout Europe who are associated with health care and the planning of healthcare systems. It can be downloaded from http://www.europhysiome.org."

Keywords:

physiology, medical technology, physiome, in silico human, multiscale modelling, bioinformatics

SYMBIOmatics

SYnergies in Medical informatics and BIOinformatics

SYMBIOmatics is a Specific Support Action that aims to identify and exploit synergies between bioinformatics and medical informatics. The project will document the state-of-theart in biomedical informatics in Europe.

Objectives of the project

Bioinformatics and medical informatics are both rapidly advancing fields. Advances in molecular biology, the starting point for bioinformatics, demand that it broaden its domain to the biology of cells, tissues, organs, organisms and populations. Within medicine, increasing understanding of the molecular basis of disease, and the effect of genotype on disease propensity and treatment efficacy, create an opportunity for convergence between the disciplines.

There are emerging proofs of concept of the clinical importance of biological and genetic information. We are witnessing the adoption of biological and/or genetic information into informatics systems for clinical practice (e.g. in functional imaging, electronic patient records and especially clinical trials). We are furthermore witnessing a growing recognition of the importance of biomedical informatics integration technologies and platforms to enable the integration of bioinformatics and medical informatics information. This is particularly important in the area of semantic interoperability and ontologies in biomedicine which provide a structure for the organisation and sharing of knowledge between the domain of medicine, biology and genetics.

"The project will document the state-ofthe-art in biomedical informatics in Europe and identify areas of new opportunity"

The objectives of the **SYMBIOmatics** SSA are to stimulate these developments and seek to identify and exploit synergies between bioinformatics and medical informatics as well as identifying addressable challenges for the medium term future.

Specifically to:

- Document state of the art activities in Biomedical Informatics in the EU member states
- Identify potential research challenges and opportunities (visions).
- Prioritise these according to (i) appropriateness to fund at an EU level; (ii) likelihood of strong intermediate results and (iii) industry commitment/validation.
- Summarise and make recommendations for the prioritised research actions to be taken into account in future European Commission funding programmes.

Project Description

SYMBIOmatics is an information gathering and dissemination activity which will stimulate developments in bioinformatics and medical informatics and exploit the synergy between them.

The project will document the state-ofthe-art in biomedical informatics in Europe and identify areas of new opportunity.

This will be done by systematically identifying European expert and collecting their insights. Initially this will be approached through an open-ended consultation whose output will be used to create an internet survey from which results will be summarised and presented.

Simultaneously, bibliometric and data-mining methods will identify and analyse the content of the relevant scientific literature. Areas of opportunity will then be documented and prioritised.

An Open meeting on 29th June 2006 will present these findings for discussion by the wider community of bioinformatician, medical informaticians, practitioners who activities currently or in the future will intersect these domains and nationally and internationally mandated policy makers.

A White Paper summarising the findings will be completed by Nov 2006 and will provide input to future European scientific and funding policy

Achievements & Impacts

Upon successful completion, the impact of the **SYMBIOmatics** SSA can be identified both in terms of the specific short term objectives and deliverables of the SSA and in terms of the medium and longer benefits to the EU member states.

- Specific Deliverables

The impact in term of the specific deliverables will be:

- A documented survey of EU activity based on synergies in biomedical informatics.
- A set of prioritised and achievable research challenges and opportunity to drive the area forward under FP7
- Medium term impacts The medium and longer term impacts are expected to include but not be limited to:
- Contributions to standards and specifically standards underlying the intersection of bioinformatics and medical informatics
- Recommendations for prioritised research will impact of CEC policy development. Specific contributions to policy development will also be coordinated with other IST ERA coordination projects.
- Longer term impacts
- In the longer term the impact from the standards and subsequently funded research is likely to impact but not be limited to the following areas:
- Changes in electronic patient records
- Standards for use of personal genetic information in clinical trials
- Health and risk assessment

SYMBIOmatics

SYnergies in Medical informatics and BIOinformatics

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- University of Genoa (IT)
- Institute of Biomedical Technologies (IT)
- Erasmus Medical Center (NL)
- INSERM (FR)
- Scientific Generics Ltd (UK)
- Ipsos-UK Ltd (UK)

Timetable: from 05/05 – to 11/06

Total cost: € 550,000

EC funding: € 550,000

Instrument: SSA

Project Identifier:
IST-2004-015862

Keywords:

biomedical informatics, bioinformatics, medical informatics, eHealth.

TACIT
Technologies Augmenting Clinical InsighT

The TACIT project aim is to unlock the tacit knowledge of Europe's senior clinicians both by linguistically analysed multimedia recording and by expert location and communications.

Objectives of the project

The objective of **TACIT** is to unlock some of the tacit knowledge of Europe's highly experienced senior clinicians and to combine that knowledge with readily accessible explicit knowledge. This will enhance decision making at all levels of care delivery – including the experts themselves – by facilitating sharing of expertise within Healthcare Communities of Practice, with the goal to reduce clinical risk and improve the quality of service for the patient throughout the care delivery process.

The emphasis of this approach is on the clinician, providing instruments to allow him/her to take better and more informed decisions. It will be fully prototyped and experimented within the key clinical process of cancer care, addressing the substantial problems of bridging clinical expertise between secondary (hospital) care and after care led by the general practitioner and supporting specialist community nurses.

The challenges to achieving this vision are:

1. Defining what knowledge is required – **TACIT**, as its name implies, will focus on the tacit knowledge held by experienced clinicians and will analyse exactly how this gets applied in clinical decision processes within the user partners. In addition, a key feature of **TACIT** will be a self-learning capability, recognising that clinical decisions are iterative, reducing uncertainty and imprecision through stages of tests, analysis and the generation of further ideas.
2. Eliciting tacit knowledge – **TACIT** will prototype ubiquitous knowledge elicitation tools which will monitor, record, film and capture the actions, words and results of the senior clinicians as they work with patients, and store this in a multimedia database.
3. Applying the knowledge – the aim of **TACIT** is to try to apply the latest thinking in "expertise" management to tapping into the tacit knowledge base in unstructured and interactive ways.
4. Locating expertise when systems for knowledge fail – a major aspect of tacit knowledge management is the identification of who holds the expertise, and the provisioning of communications with that person when required (expert location). **TACIT** will include a peer-to-peer expertise location and sharing network to enable experts to be quickly identified and communicated with.
5. Taking cultural and linguistic differences into account – **TACIT** aims to cross linguistic and cultural boundaries as far as possible in the sharing of clinical experience, ensuring that expertise can be shared across Europe's health organisations.

Project Description

Health is essentially a knowledge industry, with islands of expertise isolated by poor communications. Efforts to share knowledge have so far focused on explicit knowledge, mainly data, while tacit knowledge remains in the mind of the expert, only to be accessed by training or practice.

TACIT will enable expertise sharing within healthcare Communities of Practice with the goal to reduce clinical risk and improve the quality of service to patients. **TACIT** will be prototyped and piloted in cancer care where it will support the entire clinical process across primary and secondary care.

TACIT will determine the key knowledge requirements of the clinicians in the project's two pilots. It will specify, prototype and test Ambient Knowledge Elicitation integrated with an Expertise Browser and expert locator. It will ensure that the tools can operate across multiple languages and cultures, promote

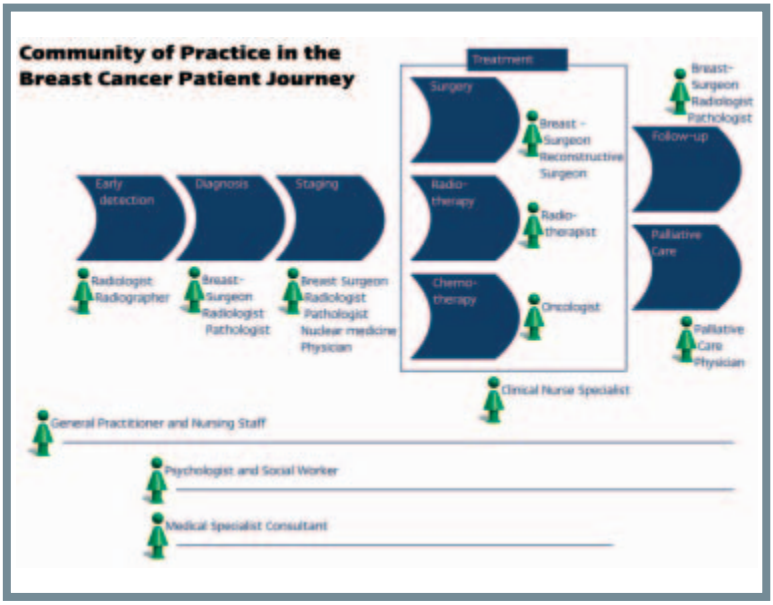
the results via an aggressive dissemination campaign, and plan and implement an effective route to exploitation.

TACIT will lead to shorter waiting times for admissions and outpatients, higher quality of care. This will create social and economic benefit.

Expected Results & Impacts

From the technological point-of-view **TACIT** aims to:

- record and capture actual clinical practice via speech-to-text combined with video
- tap into experts' tacit knowledge, either from the stored repository, or via live chat having located the expert within the Community of Practice
- combine the power of access to heterogeneous sources of information, with a multimedia knowledge base
- provide an interactive front end which combines intelligent search with expert location and chat tools
- support multiple languages and cultures within the same knowledge base
- self-learn from decisions taken.
- These innovations will be piloted and fully validated in two European hospitals, leading to a strong set of case studies and results which will be disseminated to the healthcare ICT community, knowledge management technology and practice community and to the wider European research community.



TACIT

T A C I T

Technologies Augmenting Clinical InsighT

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- FOURSIGHT Limited, (UK)
- EXPERT SYSTEM S.P.A., (IT)
- METAWARE S.P.A., (IT)
- Libera Universita "Campus Bio-Medico" Di Roma, (IT)
- Center for Usability Research & Engineering, (AT)
- AIRIAL CONSEIL, (FR)
- Corpora Plc, (UK)

Timetable: from 06/04 – to 08/06

Total cost: € 4.271.940

EC funding: € 2.500.000

Instrument: STREP

Project Identifier:
IST-2002-507691

Keywords:

Tacit knowledge, linguistically analysed, clinical expertise, knowledge elicitation, senior clinicians, expert location, cancer care, expertise browser

TMA-Bridge

A Bridge Towards Coordinated eHealth Implementation

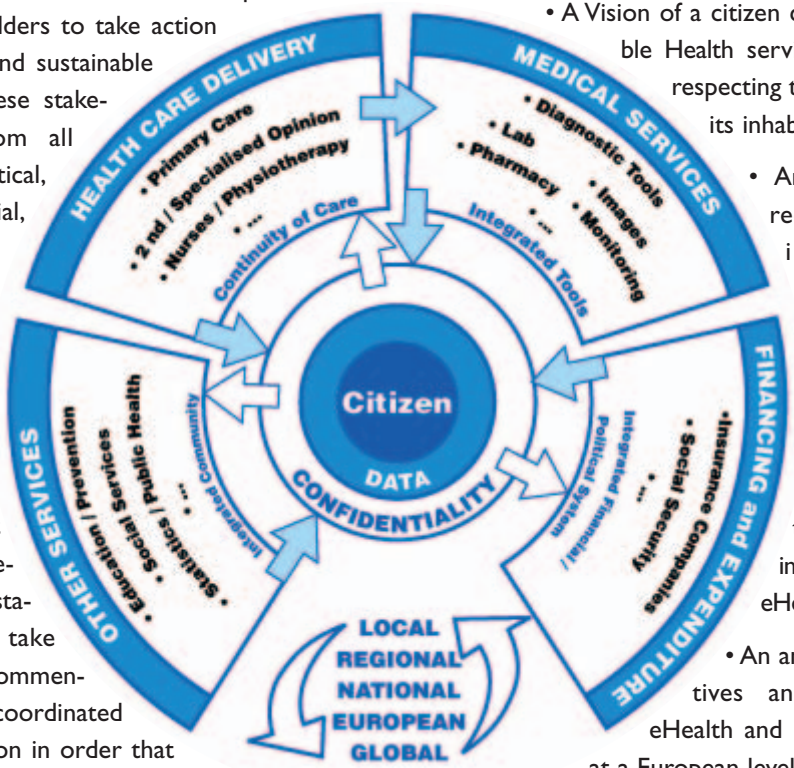
The TMA-Bridge project is aimed at promoting the creation of a European eHealth Area, favouring the mobility of citizens and patients in the European Union. To this end, a set of concrete recommendations has been addressed to the EC and to the governments of the EU Member States.

Objectives of the project

The **Telemedicine Alliance (TMA)**, in its first phase of work, formulated a Vision for citizen-centred eHealth services by 2010[7]. A key outcome of this study shown that the issue of interoperability was a major obstacle to the implementation of eHealth.

The overall goal of **TMA-Bridge**, the second phase of work of the TMA, was to provide a **Strategic Plan** for transnational eHealth interoperability with creative, citizencentred, action-oriented, strategic actionable recommendations. The focus of the plan is to enable the stakeholders to take action to achieve actual and sustainable interoperability. These stakeholders came from all areas, including political, organizational, social, and technical.

The Strategic plan and its recommendations to the European Commission and the EU Member States are in fact relevant for all stakeholders. Indeed, all stakeholders must take heed to these recommendations, and take coordinated and concerted action in order that the immense investment in eHealth now being expended in the individual Member States to contribute to improved healthcare in those States, will also facilitate interoperable trans-national services across Europe. This will help the mobile patient and health professional and could have farreaching implications for ICT development in Europe: the full investment and creative forces of industry can be unleashed in this lucrative market, thus improving the economic health of European industry, as well as that of its citizens only with established and interoperable standards across Europe.



Project Description

The TMA proposes concrete recommendations for action within a concise and consistent strategic framework. These recommendations are based on:

- A Vision of a citizen centred interoperable Health service across the EU respecting the civil rights of all its inhabitants
- An analysis of the requirements for interoperability which would support trans-national eHealth within the European Union
- Recommendations for action to improve transnational eHealth interoperability
- An analysis of the initiatives and strategies for eHealth and its implementation at a European level or internationally
- The results of a 2nd international workshop to make recommendations on appropriate actions to foster trans-national eHealth in Europe
- Feedback from presentations given by the **TMA-Bridge** team at a number of international conferences on eHealth

[7] "Telemedicine 2010: Visions for a Personal Medical Network", TM Alliance, ESA BR-229.

• Direct input received from the participating organisations, being ESA, ITU and WHO.

This strategy is supported by a series of recommended actions, which, if carried out across Europe, should facilitate progress on the road towards coordinated implementation of interoperable trans-national eHealth across Europe, bringing closer the realization of the TM Alliance Vision, as illustrated below.

Achievements & Results

A set of recommendations were formulated and presented to the European Communication:

- Take Legal and Regulatory Action
- Create and implement a framework for monitoring and evaluation to measure progress towards meeting trans-national citizen's needs.
- Develop a workflow model which will incorporate organisational and social models into trans-national systems
- Create an environment for sharing knowledge of proven (good) practice and build the knowledge and capability of health professionals
- Create the facilities and the content to ensure that eligibility to receive treatment, and reimbursement, can be known at the point and time of care, by the patient and the care provider
- Ensure that relevant data in electronic form is available to the treating healthcare professional and citizen
- Ensure that language and cultural differences are incorporated into the system and available at the point and time of care
- Create a European telecommunications infrastructure as part of the eEurope initiative
- Incorporate a set of value-added applications into the infrastructure
- Develop a central access point for health information standards
- Increase awareness of the importance of existing interoperability-related standards for eHealth

THE TELEMEDICINE ALLIANCE

TMA-Bridge

A Bridge Towards Coordinated eHealth Implementation

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- WHO - Regional Office for Europe, Office for Integrated Health Care Services, Barcelona, (ES)
- ITU Telecommunication Development Bureau, Geneva, (CH)

Timetable: from 08/04 – to 07/05

Total cost: € 550 000

EC funding: € 550 000

Instrument: SSA

Project Identifier:
IST-2004-507871

Keywords:

Telemedicine. eHealth, ICT, interoperability, strategy, standardisation, ESA, WHO, ITU, Telemedicine Alliance, TM Alliance, TMA.

VIROLAB

A Virtual Laboratory for Decision Support in Viral Disease Treatment

ViroLab enables easy access to distributed resources as well as the sharing, processing, and analysis of virological, immunological, clinical and experimental data.

Objectives of the project

Genetic information is likely to become increasingly significant in many areas of medicine. This provides an unparalleled opportunity to advance the understanding of the role of genetic factors in human health and disease, to allow more precise definition of the non-genetic factors involved, and to apply this insight rapidly to the prevention, diagnosis and treatment of disease. Large numbers of complex genetic sequences are increasingly becoming available, providing a unique opportunity for studying the many diseases where genetic information will become important in future years, such as in the case of infectious diseases.

As a prototype the problem of HIV drug resistance is addressed. **ViroLab** integrates biomedical information from viruses (e.g., proteins and mutations), patients (e.g., viral load) and literature (e.g., drug resistance experiments), resulting in a rule-based distributed decision support system for drug ranking, as well as advanced tools for (bio)statistical analysis, visualization, modelling and simulation.

The **main objectives of ViroLab** are to:

- develop a virtual organisation that binds the various components of the **ViroLab**;
- develop a virtual laboratory infrastructure for transparent workflow, data access, experimental execution and collaboration support;
- virtualize and enhance the state of the art in genotypic resistance interpretation tools, integrating them into the virtual laboratory;
- establish epidemiological validation showing that **ViroLab** correctly and quantitatively predicts virological and immunological outcome, and disseminate the results to stakeholders.

Project Description

ViroLab is based on Grid security infrastructure, middleware and user interfaces. The virtualization of resources such as data, compute nodes, tools, and users allows full resource transparency.

"ViroLab will lead to new valuable clinical data and information on treatment of HIV-infected persons"

These resources are made available by adopting Grid computing, and building on existing tools from projects such as CrossGrid, EGEE and VL-e.

The virtual organisation spans a number of geographically separated "physical" institutions across Europe, including five hospitals. ViroLab uses a uniform interface to available resources in the virtual laboratory, with functionality defined by well defined tasks in clinical environments. The virtual lab allows users to

Scenario

In **ViroLab**, a specialist member of the virtual organization logs into the virtual laboratory and accesses the distributed decision support system, which interprets the genotype of a patient by using rules developed by experts in the organization on the basis of literature mining of context sensitive data. The specialist then applies a set of multi-scale methods such as molecular dynamics modelling of HIV infection, and automatically generates new rules that are checked for consistency and redundancy. The specialist then validates the new set of rules, covering this way the fast temporal and spatial scales required to infer information from a molecular (genomic) level up to patient medical data.

select either pre-defined tasks or to compose novel tasks by means of orchestration registered available resources. The virtual lab also provides a virtual whiteboard and experimental (provenance) logbook for scientists at geographically separate locations.

Since **ViroLab** offers access to many disparate kinds of data from many sources,much effort is devoted to providing a uniform interface to all of these resources by virtualizing them and coupling advanced modelling, simulation and analysis tools in a way that is highly accessible to specialists and researchers.

Since **ViroLab** offers access to many disparate kinds of data from many sources,much effort is devoted to providing a uniform interface to all of these resources by virtualizing them and coupling advanced modelling, simulation and analysis tools in a way that is highly accessible to specialists and researchers.

Expected Results & Impacts

The collaborative research will result in a virtual laboratory for decision support in infectious diseases treatment. We focus on HIV antiviral resistance (and thereby on a specific scientific community and patient group) for the purpose of creating a prototype for the broader application for infectious diseases. It will also provide means for collaborative experimentation studies based on modelling and simulation of HIV-related processes.

The project will benefit from the development of innovative pharmaceutical research, (antiviral drug development and use of information of clinical trials). ViroLab will lead to new valuable clinical data and information on treatment of HIV-infected persons, which will provide essential insights into the prevalence of drug resistance patterns in treated individuals on a continuous basis. It is of crucial importance for future development of new drugs effective against drug resistant HIV.

ViroLab will demonstrate measurable, quantifiable benefits, respecting all aspects of confidentiality, fulfilling the urgent need for standardised rules and systems for reliable quantitative HIV-1 genotypic resistance interpretation, providing medical doctors throughout Europe with accessible and user-friendly tools for significantly improving the clinical usefulness of genotypic assay results. The virtual laboratory will function as Europe's first rule-based decision support system for drug ranking, including advanced tools for (bio)statistical analysis, modelling and simulation , enabling prediction the temporal virological and immunological response of viruses with complex mutation patterns to drug therapy, leading to better individual based treatment.

ViroLab will be validated in epidemiological studies and will include elaborate and advanced Grid security infrastructures, respecting the aspects of confidentiality, security and trust.

VIROLAB

VIROLAB

A Virtual Laboratory for Decision Support in Viral Disease Treatment

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- Institute de recerca de la SIDA IRSICAIXA Foundation (ES)
- Institute of Infectious and Tropical Diseases, University of Brescia (IT)
- Laboratory for Clinical and Epidemiological Virology, REGA institute, Catholic University Leuven (BE)
- Dept. of Plant Taxonomy and Ecology, Eötvös Loránd University (HU)
- GridwiseTech (PL)
- AGH University of Science and Technology (PL)
- University College London (UK)
- Virology Education B.V. (NL)

Timetable: from 03/06 – to 03/09

Total cost: € 3.499.240

EC funding: € 3.334.840

Instrument: STREP

Project Identifier:
IST- 2004-027446

Keywords:

Decision support systems, biomedical information, innovative pharmaceutical research, modelling and simulation, visualisation, virtual laboratory

WOUNDMONITOR

Mobile system for non-invasive wound state monitoring

WOUNDMONITOR project aims at producing a non-invasive system device which can monitor the state of a patient's wounds simply by detecting bad bacteria in the air emitted from the wound. Using state of art sensors we will be able to detect and diagnose the presence of an infection almost instantaneously.

Objectives of the project

The treatment of critically ill patients suffering from burns, chronic skin ulcers or serious wounds, is often complicated by infection. Early detection of bacterial and/or fungal infections is a well identified problem in healthcare, where there are significant scientific and technical problems to be overcome.

WOUNDMONITOR will apply state of the art sensor technology for research and development on an innovative diagnostic system that will enable:

- non-invasive sampling of volatiles emitted from burns, skin ulcers or gaping wounds
- rapid processing of such samples with a mobile laboratory-based multi-technology gas sensor array and pattern recognition system
- rapid diagnosis of changes in state of a patient
- assistance to medical personnel in decision-making in the treatment of such patients
- enhancement of patient safety and personalisation of healthcare and lifestyle management for patients.

"will help in early and rapid diagnosis of changes in state of a patient, and aid decision making by medical personnel in the treatment of such patients"

Project Description

The systems of health care in the European Union and the New EU Countries face the challenge of attaining simultaneously the three-fold objective of access to care for everyone, a high level of quality in the care provided and the financial viability of health care systems. This project meets the challenge by aiming at the long-term objective to develop new medical instruments and/or intelligent diagnosis equipment for healthcare of the future, using advanced sensing systems. The project intends to solve well-identified scientific/technical problems related to acquisition of accurate data for healthcare and to explore new concepts for the integrated systems for health.

The research project involves teams from 4 European Countries, namely UK, Germany, Italy and Lithuania. **WOUNDMONITOR** aims to combine a laboratory-based sensor module, pattern recognition subsystem and non-invasive sampling of volatiles emitted from such wounds into highly intelligent

system that allows the rapid processing of these samples and is capable of assisting in early and rapid diagnosis of changes in state of a patient, and aid decision making by medical personnel in the treatment of such patients.

Scenario

A patient suffering from serious burns will have swabs taken for microbiological testing. These tests take typically three days to carry out. If the patient has a bacterial infection, then this may develop rapidly during the time taken for analysis. With **WOUNDMONITOR**, sampling of volatiles may take a few minutes, and the results will typically be available within half an hour to the clinician.

The main purposes of **WOUNDMONITOR** are:

- Adaptation of electronic nose technology to a personalised monitoring system capable of early detection and identification of the wound clinical infection.
- Definition of the relationship between the gas sensor outputs and the microbiological data and medical information on the tissue and person levels. Integration of the available information into a snapshot of the state of the patient's health.
- Combination of several gas sensor types in an integral sensor module.
- Implementing methods for the dynamic data recording and analysis in the electronic nose technology and adapting of the recognition algorithms to automate diagnosis.
- Development of a prototype system based on electronic nose technology.

The project consists of several work-packages that include:

- Investigation of the volatile compounds acceptable as markers of individual infectious agents in wounds.
- Research on development of non-invasive sampling of the volatile products of the infectious agents for presentation to a sensor system.
- Description of basic principles of multi-technology arrays of volatile chemical sensors optimised to key markers of clinical infections of wounds in specific medical applications.
- Implementing dynamic signal processing and pattern recognition algorithms to automate early diagnosis of clinical infections.
- Manufacture of portable prototype systems for demonstration and laboratory testing.
- Testing such systems in a clinical environment to evaluate acceptability and effectiveness of the diagnosis / prognosis.

Expected Results & Impacts

The medical field and patients will benefit from better diagnostic procedures. Success in this challenging field and the utilisation of microsystems will give positive visibility to the field to the world-wide scientific community and also heighten the perception of average European citizens to new technological developments.

A non-invasive monitoring system for wound healing will be a new innovative tool to improve the quality of life and health of patients with serious wounds. The project will lead to low cost products of significant market horizon and social impact. The new sensor system will allow the implementation of EU and international policies, which refer to numerous societal and medical problems.

WOUNDMONITOR

Mobile system for non-invasive wound state monitoring

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- Kaunas Medical University Hospital (LT)
- CNR-Istituto Nazionale per la Fisica della Materia, Brescia (IT)
- Biodiversity SPA (IT)
- Umwelt-Systemtechnik GmbH (DE)
- Department of Burns and Plastic Surgery at South
- Manchester University Hospitals Trust (UK)

Timetable: from 01/06 – to 12/08

Total cost: € 2.242.496

EC funding: € 1.665.687

Instrument: STREP

Project Identifier:
IST-2004-027859

Keywords:

Gas Sensor Arrays, Bacterial volatiles, Detection of Infection, Non-invasive sampling, Diagnostic aid

FP6 Studies

Support to Action Plan

eHealth plays a clear role in the European Union's eEurope strategy, and is key to achieving stronger growth and creating highly qualified jobs in a dynamic, knowledge-based economy - the vision set out by the Lisbon European Council in March 2000.

Member States have shown that they are keen to take eHealth Action Plans forward in their own countries that draw on best practices and experiences from across the Union. The 3-page European Action Plan is the culmination of the work that enables a move towards a European e-Health Area; a framework built on a wide range of European policies and initiatives. This Action Plan for a European eHealth Area is comprehensively described in the Communication of the Commission COM (2004) 356 "e-Health - making healthcare better for European citizens: An action plan for a European e-Health Area", in particular pages 24-26.

The eHealth Action Plan includes a series of activities during the period 2005-2010 which are to be supported by the Commission services. Four key points are supported by three studies, and cover the time period, 2005-2008. These are as follows: the study on Exchange of good practices in eHealth which is supporting the issue of Addressing common challenges; the studies on Patient identity in eHealth, and Legal and regulatory aspects of eHealth, which are underpinning the issue of the eHealth Action plan - Working together and monitoring practices.

Additionally, the eHealth Action Plan builds on the almost 20 years of research and development in health telematics which have been undertaken within the framework of the IST programme. Examples of results are integrated regional health information networks, standardised electronic health records, reliable and effective telemedicine services (tele-consultation and home telemonitoring), and personal systems for citizens to support and manage their health status.

Digital technologies are becoming more important in health management both at individual practitioner level and at national and regional levels. Besides offering the potential to reduce administrative costs, to deliver health care services at a distance and to avoid unnecessary duplicate examinations, one of the most important aspects of the eHealth services is the potential improvement of Patient Safety and reducing risk in healthcare.

In order to support the uptake of ICT in the area of Patient Safety and Risk management, and prepare the next call for proposals of FP7 in the IST priority and the longterm future research activities, in 2005 the Commission issued a tender entitled Impact of ICT on Patient Safety and Risk Management in Healthcare.

5 studies have been selected to support this eHealth Action plan-oriented initiative. They are shortly presented hereafter.

1 For the purposes of this study good practice is loosely defined as real life solutions with actual usage which represent leading edge experience, though not necessarily the best, ideal or unproblematic. Good practices can provide useful learning experiences for others, likely to stimulate creativity, thinking and the transfer of good ideas.

2 See issue number 1 - Addressing common challenges: Exchange of good practices in eHealth and issue number 3 of the eHealth Action plan - Working together and monitoring practices.

Study on eHealth impact:

eHealth IMPACT is now completed. The study has developed a generic economic assessment and evaluation framework for eHealth applications. The method was applied to 10 sites, identifying costs, realised benefits, in particular for citizens, and overall net benefit over time. An online database of good practice examples in eHealth across Member States was also created.

Study on Exchange of good[1] practices in eHealth:

To advance the implementation of a comprehensive and continuous approach to disseminate and transfer learning experiences the Commission took the initiative of launching a study on good practice exchange in eHealth. The approach is to gain maximum leverage from good practice exchange work going on elsewhere in the globe and throughout Europe, and to encourage and stimulate contributions from the field to the good practice framework itself. The good practice framework should itself form an example of a good practice in promoting the information society, thus achieving a multiplier effect.

The objectives of this study are:

- To contribute to the actions of the eHealth Action Plan that outlines the need for the collection and dissemination of eHealth best practices[2]
- To identify good practices in eHealth area in the Member States, in particular those that contributes to improved efficiency and cost benefits.

Study on Patient identity in eHealth:

The study outlines a common approach to patient identifiers in Europe. This objective contributes to the particular item of the eHealth Action Plan which focuses on addressing common challenges: Patient identity in eHealth.

This study takes into account best practices and developments in areas such as the European Health Insurance Card and identity management for European citizens. The tender is based on the present state-of-the-art in eHealth, in the eGovernment area, and in inter-administration communications, and draws on the current and future implementations plans that are being developed in other major countries such as the United States, Canada, and Australia.

Study on Legal and regulatory aspects of eHealth:

The study identifies the legal and regulatory aspects related to the use of eHealth products and services in Europe. The purpose of this study is to contribute to the creation of a framework for greater legal certainty of eHealth products and services liability within the context of existing product liability legislation.

The study contributes to the particular item of the eHealth Action Plan related to the identification of the legal and regulatory aspects of the use of eHealth products and services.

Study on Impact of ICT on Patient Safety and Risk Management in Healthcare:

The objective of this contract is to provide the Commission with well-researched background materials on the current state of the art concerning the use of ICT in the area of Patient Safety and Risk Management in Healthcare.

The study addresses the following key areas:

- Identifies key topics in Patient Safety and Risk Management in Healthcare;
- Presents the state of play of eHealth use in Patient Safety in the twenty-five Member States;
- Presents relevant examples in the area of Risk management in Europe and worldwide;
- Outlines the major opportunities and challenges for eHealth applications in the area Risk Management in Healthcare in Europe;
- Presents a longterm vision - future eHealth research topics in the area of Patient Safety and risk management over the next decade;
- Identifies the necessary instruments - administrative, legal, technical, and financial - in order to achieve a 10-year vision in the area of Patient Safety and Risk Management in Healthcare.

eHealth IMPACT

Study on Economic and Productivity Impact of eHealth

eHealth IMPACT developed a generic economic assessment and evaluation framework for eHealth applications. The method was applied to 10 sites, identifying costs, realised benefits, in particular for citizens, and overall net benefit over time. An online database of good practice examples in eHealth across Member States was also created.

Objectives of the Study

Despite the general availability of eHealth systems and services, they are not widely used in medical or healthcare environments across the EU. A major reason why European and national policy goals for eHealth applications have not been achieved so far is that very little reliable evidence is available on the economic impact of using ICT in delivering high quality healthcare. The impact is potentially enormous, but has been difficult to measure, especially some of the benefits. Evaluations often have only one perspective, such as financial, or the view of a single stakeholder.

eHealth IMPACT deals with these shortcomings. The aims are to:

- develop a generic, adaptable assessment and evaluation framework and method for eHealth applications and services, focusing on economic performance and measurement tools for quantitative indicators
- identify good practice examples of eHealth applications across Member States and across the whole eHealth domain, integrating the experience and lessons learned from these examples into the method
- apply the method and measurement tools to ten sites, each with proven eHealth applications and reflecting the regional and health system diversity of the Union

Study Description

eHealth IMPACT developed a generic methodology for economic assessment and evaluation of eHealth applications. It is a context adaptive model, so it fits a wide diversity of applications, such as clinical settings or supply chain solutions. The model relies on the concept of cost-benefit analysis. Costs include the initial and continuous eHealth investments, such as those in ICT and change management, as well as healthcare running costs. Special attention has been paid to identifying the benefits to, and impact on, citizens. At the same time, benefits to all potential stakeholders can be analysed. The concept of cost-avoidance is important in identifying benefits. This is the cost for achieving the ICT-based performance without ICT, which is often prohibitive, i.e. such performance is not achievable without ICT.

"A positive economic impact of eHealth is shown by applying the eHI evaluation method in ten proven eHealth settings"

Case study: Institut Curie, Paris, France – Elios (EPR) and Prométhée (database inquiry) tools

Institut Curie, a combined research and treatment hospital, specialises in oncology. Elios is their comprehensive Electronic Patient Record (EPR) system, allowing for patient data access also by external physicians involved in their treatment. Prométhée is a sophisticated tool for simultaneous enquiries in a large number of hospital and clinical research databases, including Elios, enabling fast data compilation and analysis for research and evaluation purposes.

Elios and Prométhée together fundamentally transformed healthcare processes, improved the quality of care, supported the change towards a paperless hospital, and led to considerable economic gains. Doctors have better support and more time to prepare for consultations with patients, can review their own clinical performance in real time, and base treatment decisions on latest results in evidence based medicine. Medical secretaries, who ensure realtime update of EPR entries, assist the process. The result is instantaneous surveillance of care processes and better quality healthcare for patients. An estimated 75% of the benefits accrue to patients, with 25% for Institut Curie. This was achieved by sustained eHealth investments since 1995, building on effective teamwork that produced net benefits from 2001, with an increased sustained performance from 2002.

Ten selected eHealth application sites were evaluated in great detail to test and refine the eHI methodology. The results from each case show the - sometimes unexpectedly high - positive economic impact of eHealth systems and services. Aggregating them indicates a positive, sustainable economic impact in a virtual health economy over fifteen years as depicted in the accompanying chart.

A steering committee and an external advisory board of global experts from Canada and Australia continuously monitor the progress, rigour and methodology of the study.

Methodology:

First, **eHealth Impact** developed an initial context-adaptive model and applied it to two eHealth application sites. These were NHS Direct Online in the UK and Kind en Gezin's vaccination database and Vaccinet applications in Flanders, Belgium. Simultaneously, eHI identified good practice examples for the online database, mainly using secondary literature.

'The project website includes an eHealth good practice database with 90 cases, the eHI methodology, and web-based appraisal too'

Second, the model was refined, based on the experience at the first two sites.

In the third phase, **eHealth Impact** evaluated the remaining eight sites, then analysed the results into a synthesis report. It shows the individual economic performance of each site, as well as the aggregated impact of eHealth on the virtual heath economy. The online database of good practice in eHealth is set up and the **eHealth Impact** method and tools are available online.

Expected outcomes

eHealth Impact developed a robust and tested methodology for economic assessment and evaluation of eHealth investments. **eHealth Impact** illustrated the impact and potential of eHealth by applying this methodology to ten proven eHealth applications and identifying good practices across the whole eHealth domain.

Concrete outcomes are:

- A generic, context-adaptive method and associated tools for economic evaluation of eHealth applications available online
- Measurable, positive, sustainable economic performance of eHealth at each site
- Detailed description and evaluation of ten proven eHealth applications
- A synthesis report drawing conclusions from the ten sites and making policy recommendations
- An online database with short descriptions of about 90 good practice cases of eHealth in the EU.

eHEALTH IMPACT

eHealth IMPACT

Economic and Productivity Impact of eHealth

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- Kadris Consultants (FR)
- Jagiellonian University (PL)
- ESYS Consulting (UK)

Timetable: from 01/05 – to 02/06

Total cost: € 350 000

Study n°: 2004 / S159-137695

Keywords:

eHealth, economic impact, benefits, costs, good practice, evaluation, assessment

GOOD eHEALTH

Exchange of Good practices in eHealth

Good eHealth aims to advance the implementation of a comprehensive and continuous approach to disseminate and transfer learning experiences.

Objectives of the Study

Despite the relatively slow implementation of eHealth in Europe, many eHealth developments have nevertheless been successfully implemented. These implementations constitute a source of valuable experience and of examples of good practices which to date have not yet been properly communicated for emulation and exploitation.

The objectives of this study are thus to:

- Identify good practices and their associated benefits;
- Develop and implement common approaches to wider dissemination and transfer of learning experiences;
- Stimulate and foster accelerated uptake of eHealth by addressing the common challenges of eHealth and common lessons learnt.

"What is the market reality of eHealth? Real benefits or over-ambitious dreams?"

Study Description

The study rests on four pillars:

- The development of a methodology and assessment criteria for identifying, selecting, assessing, labelling and describing good practices in eHealth
- The practical identification, selection, research, analysis, presentation and quality control of good practice cases
- The wider dissemination of results
- The development of a platform, web site and knowledge base, for information, exchange, dialogue and collaboration.

Methodology: the broad lines of the study framework, approach and implementation will be as follows:

- A template will be developed providing a common description of eHealth services;
- A methodology will be developed and assessment criteria will be defined for evaluation of good practices, including a handbook on how to award a "good practice" label.
- A set of **eHealth good** practice examples, the implementation of which has already taken place at a national or Community level and which had in general a successful follow-up, will be selected with the help of an expert panel..
- A number of recommendations should also emerge on the measures to be taken in the implementation of new projects to facilitate their impact evaluation in the future.
- A study of the results of these evaluations will permit the identification of cases of good practice.
- A web site and an intelligent knowledge management base to demonstrate the benefits of eHealth will be produced to allow easy selection and extraction of cases.

Good Practice Case: IZIP, Czech Republic – Internet Access to Patients Health Records

IZIP was designed by physicians who tried to solve their daily communication problems. Information from the IZIP system enables the patient and his physician to anticipate unnecessary repetition. Patients' files may be browsed only by the patient or by authorised health professionals, ensuring privacy and ownership of patient data. Sustainability of the system is guaranteed by the participation of health care insurance companies.

Technically IZIP's biggest task is interoperability with systems of hospitals and doctors. By the end of 2005 IZIP had 471.000 registered users and 5.182 registered health professionals eligible to write entries into medical files of patients.

- A dissemination and communication plan of the "good practices study" will be developed and implemented.
- A set of practical conclusions and recommendations for future policy development of the eHealth action plan in this area.
- Three workshops will be organised. These three workshops will address specific topics that are relevant for further development of the eHealth Action Plan.

Expected outcomes

Submitting existing eHealth developments to a "good practice label" using a common approach and method, and identifying usable assessment criteria, can be expected to strongly increase the confidence of policy and decision makers in recommending eHealth-based strategy and allocating adequate funds for more rapid progress.

The potential impacts expected are:

- Providing good examples of effective eHealth applications, positively evaluated by defined methods and meeting suitable quality criteria
- Increasing the confidence of decision makers in high-level strategy development, including providing political and financial incentives for mid-term investment
- Improving health professionals' confidence in accepting and using eHealth tools and solutions
- Helping to demonstrate the case for the citizen in the areas of knowledge-based and citizen-centred care tools and solutions
- Allowing for longer term expansion of eHealth benefits to achieve health care transformation, supported by robust assessment techniques.
- Providing the basis for an overall approach to benchmarking eHealth developments in Europe.

Keywords:

eHealth networks and architectures,
electronic health records,
telemedicine,
personalised health,
patient safety,
interoperability,
good practice

GOOD eHEALTH

GOOD eHEALTH

Exchange of Good practice in eHealth

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Timetable: from 01/06 – to 12/08

Total cost: € 499.650

Contract n°:
2005 / S137-135419 (lot 1)

"Legally eHealth"
Study on Legal and Regulatory Aspects of eHealth

The study on Legal and Regulatory aspects of eHealth has the central objective of contributing to the Actions of the eHealth Communication and Action Plan that address the need to establish greater legal certainly in Europe with respect to the practice of eHealth service delivery and the use of eHealth tools within the context of the existing legal framework of relevant EU level legislation.

Objectives of the Study

Context: eHealth is premised on a fundamentally new patient experience that is unconstrained by familiar points of entry to healthcare or traditional channels for delivering information or care. eHealth allows services to be delivered at a distance, outside standard healthcare settings and with a preservation of anonymity or pseudonymity if the patient so wishes. Not surprisingly, therefore, the eHealth revolution has as many serious implications for healthcare regulators and lawyers as well asit does for medical professionals.

Although policy makers have noted at both European and national level that a lack of legal certainty about the use of eHealth tools and services exists, little has been done to study the issue in detail, to the point that legal barriers are perceived as an obstacle to the deployment of eHealth.

Accordingly the Action Plan proposes that by 2009 the European Commission shall "provide a framework for greater legal certainty of eHealth products and services liability within the context of existing product liability legislation."

In this context, the Commission called for the present study in order to **establish a baseline report on existing EU level legislation, its impact on the delivery of eHealth and an analysis of the legal lacunae that may exist**.

"Legally eHealth" is delivering this through:

- An analysis of the existing EU level legal framework pertaining to the use of eHealth tools, systems and services;
- The development of a series of case studies to explore and elucidate the practical implications of the identified legislative issues in the use of eHealth tools, systems and services; and
- Recommendations on bridging such legislative and regulatory barriers and lacunae as may exist.

Study Description/Methodology

Methodology: The study uses both traditional legal research methods and the case study method.

The study begins by cataloguing and analysing the EU level legal aspects of eHealth. It then explores the extent of the impact of that legislation on the delivery of healthcare using eHealth tools, systems and services through a series of composite case studies built

Scenario

Examples: Dr. Jones would like to provide a patient with information specific to his diabetes treatment. She is concerned about ensuring that he accesses the right kinds of information, and also about her own liability and responsibility…

Mr. Breton has developed a tool to track instruments in hospital settings and to link the information to patient data. Before marketing it, he wishes to ensure that the tool fulfils all requirements and criteria on data protection…

Dr. Jones and Mr. Breton can find, in the Legally eHealth reports, case vignettes that resemble their situation. Through a series of FAQ's, each step of the vignettes is linked to the relevant legal and regulatory questions that arise and how they affect their respective situations. While some questions remain, they now know the parameters of their situation and the issues they will have to address.

"Case vignettes are used to bring to life the complex nature of key legal concepts through the telling of a compelling case story"

from a range of real event reports. The case vignettes are used to bring to life the complex nature of key legal concepts such as data protection, data ownership, and product and service liability, through the telling of a compelling case story.

Outcomes

eHealth is defined broadly in the context of this study, so that we explore the wide range of settings in which eHealth tools, systems and services can be used and to map them onto the existing EU level legislation as well as selected examples from Member State level legislation. Three clusters of legal and regulatory issues are explored in detail, as those most affecting the use and deployment of eHealth:

- o Data Protection, confidentiality and security in the context of the collection and sharing of person identifiable data for healthcare and advice;
- o Product and Liability and Consumer Protection in the use of eHealth tools, devices and services in both traditional healthcare delivery and; eCommerce and distance contracting (including ePharmacy and advertising).
- o Trade and Competition in the context of using use of eHealth tools in health services planning and delivery in traditional, remote or cross-border healthcare delivery.

The core deliverables on these three clusters are written in a web based style, with both internal bookmarks and external hyperlinks. Each legal area is covered with a broadly accessible introductory section as well as detailed legal analysis and presentation of the legal texts.

In addition, the study has elaborated a series of case study vignettes to enable a variety of readers representing a range of eHealth stakeholders to 'see a bit of themselves' in the fictional characters, and thus understand the types of questions they might face or might need to ask.

The study thus clarifies for EU and national policy makers the extent to which existing EU level legislation is sufficient to regulate eHealth, and highlights any issues that may require legal clarification, or indeed new legal responses. The end purpose, in the context of the eHealth Action Plan, is to enable a 'healthy' deployment of eHealth tools, systems and services, i.e. in a context in which all users are reassured on their rights, duties and responsibilities.

"Legally eHealth"

Study on Legal and Regulatory Aspects of eHealth

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- BASIL Strategies, France
- With the intellectual support of Cisco, Internet Business Solutions Group.

Timetable: from 01/06 to 12/06

Total cost: € 95,000

Study n°:
30-CE-0041734/00-55

Keywords:

security and privacy, legal aspects of eHealth, regulatory aspects of eHealth, data protection, data ownership, and product and service liability

Patient identity in eHealth

Exchange of good practices in eHealth

The Action Plan for a European eHealth Area which is comprehensively described in the Communication of the Commission COM (2004) 356 "e-Health – making healthcare better for European citizens, includes a series of activities during the period 2005-2010 which are supported by the Commission services. One of the key points is supported by this study which dealt with a common approach to "patient identifiers in Europe". It took account of "best practices" and developments in areas such as the European Health Insurance Card and identity management for European citizens. The study started from the collection of best practices in identity management in both Europe and worldwide.

The continuity of care across multiple providers and the retrieval and assembly of relevant patient care information from past episodes of care requires the use of a unique patient identifier.

"The study aimsed at outlining a common approach to "patient identifiers in Europe"

Objectives of the Study

In order to outline a common approach to patient identifiers in eHealth in Europe, the study covered:

1. Identification of best practices in *patient identity mangement* in Europe and worldwide taking into account existing standards and experience.
2. Development of a *proposal for a strategy* to achieve interoperability with respect to patient identifiers between existing eHealth and other health systems based on identified best practice. The proposal approached the issue of patient identifiers at European level and provided ideas for how to realize the proposed strategy.
3. Establishment of a model for the *patient identification* process in different countries based on an architectural approach.

Best pratice

The study of identity management in the EU Member States, Norway, Australia, Canada, Turkey and the USA showed a range of different identity management systems. The definition of best practice in identity management was elaborated considering the basic conditions for implementing the kind of management necessary for, e.g. a unique life-long person identifier. National legislation, the size of the population and the constitution and political tradition of a country are the elements of foundation upon which all identity management systems are built.

A strategy for interoperability

It was concluded that a strategy for achieving interoperability with respect to patient identifiers between existing eHealth and other health systems at European level is conceivable provided that

1. Patient IDs are unique and possibly life-long in order to ensure unambiguous patient identification in any episode of care.
2. Patient IDs are employed as keys in all (relevant) health care systems. The distinction between relevant and not-so-relevant health care systems depends on the need for data.
3. A solution is found to the problem of allowing cross-border exchange of health data.

The fulfilment of the first requirement is a long term goal. However, the number of countries that meet this requirement totally or in part is sufficiently high to justify a serious effort to meet the second requirement by those who meet the first. Cross-border interoperability with respect to patient identifiers will not be established over night in any case. Consequently, gradual progress through pilot and demonstration projects in a limited number of countries followed by bilateral agreements on interoperability will be necessary in order to pave the way for general European interoperability.

The architecture of patient identification

The proposed architectural approach covers four levels which make it possible to identify with increasing precision the "ideal" patient identification process:

1. **The business level**. The business level is concerned with the legal and organisational barriers to best practice in patient identification and with those business processes that should be supported.
2. **The level of architectural principles**. Four principles were derived from the proposed strategy to achieve interoperability with respect to patient identifiers: Trust, subsidiarity, no semantics and double interface (manual as well as digital).
3. **The process level**. Describes how patients are identified, and how the identity data are employed. This level is not only concerned with the use of identity data by health care professionals in the actual confrontation with the patient, but also with the attribution of identity data to a person and the maintenance of these data.
4. **The technical level**. Describes the kind of ICT systems, networks etc which are needed to support the patient identification processes. The technical level embodies the architectural principles stated in level 2 and support the processes described in level 3.

Patient identity in eHealth

Exchange of good practices in eHealth

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Timetable: from 01/06 – to 12/06

Total cost: € 100.000

Study n°:
2005 / S137-135419 (lot 3)

Keywords:

Patient identity, Best practice, Interoperability

eHealth for Safety

Impact of ICT on Patient Safety and Risk Management

eHealth for Safety addresses the contributions which ICT applications make to patient safety and risk management in healthcare. An important focus is on tangible benefits for European citizens and healthcare providers. The study identifies priority issues, interviews experts and stakeholders, and develops concrete recommendations for future R&D activities.

Objectives of the Study

Evidence suggests that in advanced healthcare systems medical errors are killing more people each year than breast cancer, AIDS or motor vehicle accidents together. About one in ten patients admitted to a hospital is unintentionally harmed. ICT can make a vital contribution in reducing errors, thereby saving lives and enhancing efficiency – and improving the quality of care for European citizens.

eHealth for Safety has the following overarching goals:

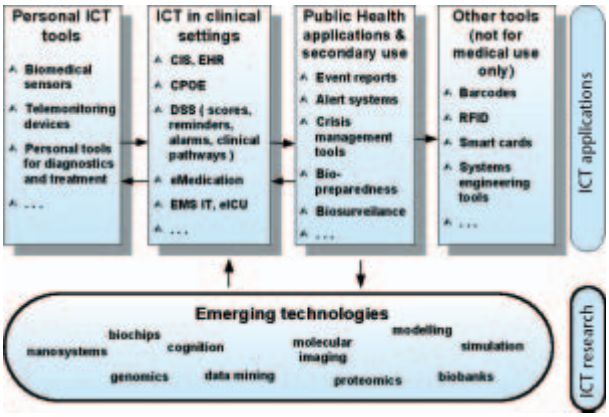
- **Identification of key issues**, topics and challenges where ICT applications can have a high impact on improved patient safety
- **Development of a 10 year vision and concrete recommendations** for RTD measures (within the EU's 7th Framework Programme and for longer term research activities)

"ICT can in a comprehensive way contribute to higher patient safety across European health systems"

These two goals translate into a **three-phase approach** consisting of baseline research including a thorough literature review, followed by an empirical survey, and finally the development of a synthesis report as well as a roadmap for further research. Identification of good practice cases will form part of the study.

Study Description

The study starts out by reviewing the state of the art in the wider (eHealth) patient safety and risk management domain, structuring the field and identifying key issues. Topics to be discussed include personal ICT tools, ICT in clinical settings, public health applications, general ICT tools as well as lessons to be learned from applications in non-medical domains. **Emerging technologies** will also be taken into account as the figure below shows:



Outcomes of this first phase will be discussed by selected high-profile experts in a workshop. The results will feed into the design of a survey and an information gathering instrument. In the second phase (empirical analysis), these tools will be applied to an

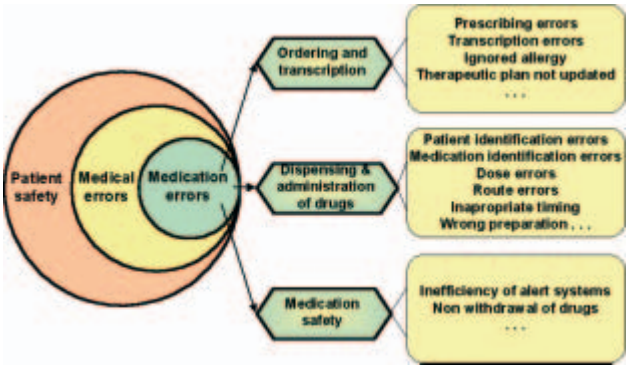
Pilot case study: Improving medication handling through structured prescribing pathways - Wirral Hospital NHS Trust, UK

At Wirral Hospital NHS Trust the introduction of structured, ICT-supported medication handling pathways drastically reduced errors in the prescription of specific high risk drugs. For instance, an error rate of 82% in the prescription of low molecular weight heparin (identified by an audit) was eliminated. Similarly, in paediatrics structured pathways led to reductions of specific error rates from 26% to just 4% for paediatricians and from 76% to less than 7% for non-paediatric specialists. Furthermore, the introduction of an automated dispensing system reduced the risk of medication errors while electronic prescription improved the legibility and completeness of prescriptions. Moreover, the use of ICT applications supporting work processes freed staff for clinical activities at the bedside.

Source: Case study originally prepared for the eHealth Impact study

enlarged and carefully selected target group of experts and competence centres in the EU and at the global level. A web-based consultation interface will be applied, complemented by personal interviews and site visits.

Specialised patient safety ICT applications are a complex subject, and each issue has its own specific subtopics. Medication errors, for instance, include a variety of related issues that all need to be taken into account, as the figure below illustrates:



The third phase will validate and further refine the outcomes of the study process: a concluding workshop will allow for further discussions and will also provide an opportunity to disseminate the results of the work conducted.

Outcomes

The study identifies priorities for improved and new ICT applications to further enhance patient safety as seen by both clinicians and experts. Recommendations will be derived on how to integrate them into EU research activities like the 7Th Framework Programme and other support programmes. In doing so, **eHealth for Safety** contributes to ensuring that European citizens reap the benefits of improved safety through ICT.

The study will deliver the following results:

- A structure and model of the (eHealth) patient safety and risk management domain
- A literature review of the global state-of-play in ICT-based patient safety and risk management approaches and tools
- An empirical survey of experts and patient safety institutions in the EU 25 plus selected other countries on approaches to patient safety and risk management, levels of ICT use and priority fields for further research
- Identification and short descriptions of good practice cases from around the world
- A vision and roadmap for concrete steps in RTD towards improving patient safety and risk management in healthcare, with the support of ICT tools and services

eHealth for Safety

Impact of ICT on Patient Safety and Risk Management in Healthcare

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Timetable: from 01/06 – to 12/06

Total cost: € 100.000

Study n°:
2005/175-173232

Keywords:
eHealth, patient safety, risk management, ICT, roadmap

Annexes

Annex II - Index of projects

PROJECTS	PAGE	IDENTIFICATION	I - Personal health management systems and services based on biosensors	II - Tools for health professionals	III - Biomedical Informatics	Studies
@HEALTH	20	IST-2004-015886	■	■	■	
@NEURIST	22	IST-2004-027703		■		
ACGT	24	IST-2004-026996			■	
ALLADIN	26	IST-2002-507424		■		
ARTEMIS	28	IST-2004-002103	■	■		
ASSIST	30	IST-2002-027510			■	
AUBADE	32	IST-2002-507605	■	■		
BIOPATTERN	34	IST-2002-508803			■	
CAALYX	37	IST2005-045215	■			
CARDITIS	36	IST-2002-507170		■		
CARE-PATHS	38	IST-2002-507017		■		
CLINICIP	40	IST-2002-506965		■		
COCOON	42	IST-2002-507126		■		
DESSOS	44	IST-2004-027252		■		
DICOEMS	46	IST-2002-507760		■		
DOC@HAND	48	IST-2002-508015		■		
E-HEALTH ERA	50	IST-2004-015854	■			
EMERGE	54	IST-2005-045056	■	■	■	
EURESIST	52	IST-2004-027173			■	
HEALTHAGENTS	54	IST-2004-027214			■	
HEALTH-E-CHILD	56	IST-2004-027749			■	
HEALTH-PLUS	58	IST-2004-027126		■		
HEARTFAID	60	IST-2004-027107		■		
I-KNOW	62	IST-2004-027294			■	
IMMUNOGRID	64	IST-2004-028069			■	
INFOBIOMED	66	IST-2004-507585			■	
INTREPID	68	IST-2002 507464	■			
K4CARE	70	IST-2004-026968		■		
LHDL	72	IST-2004-026932			■	
MATCH	74	IST-2004-027266			■	
MICROACTIVE	76	IST-2004-017319		■		

PROJECTS	PAGE	IDENTIFICATION	I - Personal health management systems and services based on biosensors	II - Tools for health professionals	III - Biomedical Informatics	Studies
MUTLI-KNOWLEDGE	78	IST-2004-027106			■	
MYHEART	80	IST-2002-507816	■			
NEUROWEB	82	IST-2004-518513			■	
NOESIS	84	IST-2002-507960		■		
OFSETH	86	IST-2002-027869		■		
OLDES	92	IST-2005-045282	■			
PALLIANET	88	IST-2002-507863		■		
PIPS	90	IST-2002-507019		■		
Q-REC	92	IST-2004-027370	■			
RIDE	94	IST-2004-027065	■			
RIGHT	96	IST-2004-027299		■		
SAPHIRE	98	IST-2004-027074		■		
SEALIFE	100	IST-2004-027269			■	
SEMANTIC HEALTH	102	IST-2004-027328	■	■	■	
SEMANTICMINING	104	IST-2002-507505			■	
SHARE	106	IST-2004-027694			■	
SIMAP	108	IST-2004-027265			■	
SMARTHEALTH	110	IST-2004-016817		■		
STEP	112	IST-2004-027642			■	
SYMBIOMATICS	114	IST-2004-015862			■	
TACIT	116	IST-2002-507691		■	■	
TMA-BRIDGE	118	IST-2004-507871	■			
VIROLAB	120	IST-2004-027446			■	
WOUNDMONITOR	122	IST-2004-027859			■	
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eHealth Impact	130	2004/S159-137695				■
Exchange of good practices in eHealth (L1)	132	2005/S137-135419				■
Legal & regulatory aspects of eHealth (L3)	134	2005/S137-135419				■
Patient identity in eHealth (L2)	136	2005/S137-135419				■
Patient safety & risk management in healthcare	138	2005/175-173232				■

Annex III - Index of Participants

LEGAL NAME	LEGAL COUNTRY	ACRONYM	CALL N°	CONTRACT TYPE
A. PERSIDIS & SIA O.E.	GREECE	ACGT	4	IP
AALBORG SYGEHUS	DENMARK	STEP	4	CA
AALBORG UNIVERSITET	DENMARK	AMICA	1	STREP
AARHUS UNIVERSITETSHOSPITAL, AARHUS SYGEHUS	DENMARK	I-KNOW	4	STREP
ACCENTURE INSURANCE SERVICES & SYSTEMS SPA	ITALY	DOC@HAND	1	STREP
ADVANCED OPTICS SOLUTIONS GMBH	GERMANY	OFSETH	4	STREP
AGENTSCAPE AG	GERMANY	OLDES	6	STREP
AGENZIA SANITARIA REGIONALE EMILIA-ROMAGNA	ITALY	CARE-PATHS	1	STREP
AGILENT TECHNOLOGIES ISRAEL LTD	ISRAEL	MULTI-KNOWLEDGE	4	STREP
AIRIAL CONSEIL	FRANCE	@HEALTH	3	SSA
AIRIAL CONSEIL	FRANCE	CARE-PATHS	1	STREP
AIRIAL CONSEIL	FRANCE	NOESIS	1	IP
AIRIAL CONSEIL	FRANCE	PALLIANET	1	STREP
AIRIAL CONSEIL	FRANCE	TACIT	1	STREP
AKADEMIA ROLNICZA IM HUGONA KOLLATAJA W. KRAKOWIE	POLAND	HEALTH-PLUS	4	STREP
AKADEMICKIE CENTRUM KOMPUTEROWE CYFRONET AKADEMII GORNICZO-HUTNICZEJ IM. STANISLAWA STASZICA W KRAKOWIE	POLAND	ViroLab	4	STREP
AKADEMISCH ZIEKENHUIS LEIDEN - LEIDEN UNIVERSITY MEDICAL CENTER	THE NETHERLANDS	DESSOS	4	STREP
AKTSIASELTS ASPER BIOTECH	REP. OF ESTONIA	Health-e-Child	4	IP
ALBERT-LUDWIGS-UNIVERSITAET FREIBURG	GERMANY	MicroActive	2	STREP
ALBERT-LUDWIGS-UNIVERSITAET FREIBURG	GERMANY	SemanticMining	1	NOE
ALIS EUROPE	FRANCE	TACIT	1	STREP
ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA	ITALY	ImmunoGrid	4	STREP
ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA	ITALY	OLDES	6	STREP
ALTEC INFORMATION AND COMMUNICATION SYSTEMS A.E.	GREECE	ARTEMIS	1	STREP
ALTEC INFORMATION AND COMMUNICATION SYSTEMS A.E.	GREECE	SAPHIRE	4	STREP
ANKO ANONYMOS ETAIREIA ANTIPROSOPEION EMPORIOU KAI VIOMICHANIAS	GREECE	AUBADE	1	STREP
ANKO ANONYMOS ETAIREIA ANTIPROSOPEION EMPORIOU KAI VIOMICHANIAS	GREECE	DOC@HAND	1	STREP
ANONYMI ETAIRIA SYSTIMATON ORGANOSIS LEITOURGIAS KAI EPIKOINONIAS EPICHEIRISEON	GREECE	COCOON	1	IP
ANONYMI ETAIRIA SYSTIMATON ORGANOSIS LEITOURGIAS KAI EPIKOINONIAS EPICHEIRISEON	GREECE	MATCH	4	STREP
ANSYS EUROPE LTD	UNITED KINGDOM	@neurIST	4	IP
APOLLONION PRIVATE HOSPITAL (CLINIC) LIMITED	CYPRUS	CARDITIS	1	STREP
APPLIED INSILCO LIMITED	UNITED KINGDOM	SmartHEALTH	2	IP
AQUITAINE EUROPE COMMUNICATION	FRANCE	COCOON	1	IP
ARISTOTLE UNIVERSITY OF THESSALONIKI	GREECE	ASSIST	4	STREP
ARISTOTLE UNIVERSITY OF THESSALONIKI	GREECE	BIOPATTERN	1	NOE
ART OF TECHNOLOGY AG	SWITZERLAND	EMERGE	6	STREP
ARTEVELDEHOGESCHOOL	BELGIUM	ALLADIN	1	STREP
ASD ADVANCED SIMULATION AND DESIGN GMBH	GERMANY	@neurIST	4	IP
ASOCIATIA PROREC ROMANIA - ASOCIATIA PENTRU EVIDENTA ELECTRONICA A DATELOR MEDICALE	ROMANIA	Q-REC	4	SSA
ASSISTANCE PUBLIQUE HOPITAUX DE PARIS	FRANCE	Health-e-Child	4	IP
ASSOCIATION DES ANCIENS ELEVES ET DES AMIS DE L'ECOLE SUPERIEURE D'INFORMATIQUE ELECTRONIQUE AUTOMATIQUE	FRANCE	INTREPID	1	STREP

LEGAL NAME	LEGAL COUNTRY	ACRONYM	CALL N°	CONTRACT TYPE
ASSOCIATION HOSPITALIERE DE BRUXELLES - CENTRE HOSPITALIER UNIVERSITAIRE BORDET - ASSOCIATION DE DROIT PUBLIC ASBL	BELGIUM	ACGT	4	IP
ASSOCIATION MEDICALE EUROPEENNE	BELGIUM	COCOON	I	IP
ASSOCIATION MEDICALE EUROPEENNE	BELGIUM	DICOEMS	I	STREP
ASSOCIATION OF FAMILY PHYSICIANS CLUJ	ROMANIA	RIGHT	4	STREP
ASSOCIATION PROREC BULGARIA	BULGARIA	Q-REC	4	SSA
ASSOCIATION REGIONALE EUROPEENNE SUR LA SOCIETE DE L'INFORMATION	BELGIUM	COCOON	I	IP
ASSOCIAZIONE IMPRESA POLITECNICO	ITALY	COCOON	I	IP
ASTON UNIVERSITY	UNITED KINGDOM	BIOPATTERN	I	NOE
ASTRAZENECA AB	SWEDEN	INFOBIOMED	I	NOE
ASTRAZENECA S.P.A.	ITALY	PIPS	I	IP
ATENA USLUGI INFORMATYCZNE I FINANSOWE SPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA	POLAND	PIPS	I	IP
ATOS ORIGIN ITALIA SPA	ITALY	PIPS	I	IP
ATOS ORIGIN S.P.A.	ITALY	PIPS	I	IP
AURELIA MICROELETTRONICA S.P.A.	ITALY	INTREPID	I	STREP
AUREUS PHARMA SA	FRANCE	SIMAP	4	STREP
AZIENDA OSPEDALERIA SAN GERARDO DI MONZA	ITALY	DICOEMS	I	STREP
AZIENDA OSPEDALIERA DI PARMA	ITALY	CARE-PATHS	I	STREP
AZIENDA UNITA SANITARIA LOCALE DI BOLOGNA	ITALY	OLDES	6	STREP
AZIENDA UNITA SANITARIA LOCALE DI MODENA	ITALY	AUBADE	I	STREP
AZIENDA UNITA SANITARIA LOCALE ROMA B	ITALY	K4CARE	4	STREP
B DIOLKISI YGEIONOMIKIS PERIFEREIAS ATTIKIS	GREECE	AMICA	I	STREP
B. BRAUN MELSUNGEN AG	GERMANY	CLINICIP	I	IP
BAY ZOLTAN ALKALMAZOTT KUTATASI KOZALAPITVANY	HUNGARY	EMERGE	6	
BENCHMARK PERFORMANCE LIMITED	UNITED KINGDOM	ASSIST	4	STREP
BEQUEST OF GEORGE MICHAELIDIS	GREECE	CARDITIS	I	STREP
BIODIVERSITY SPA	ITALY	WOUNDMONITOR	4	STREP
BIOELF LTD	UNITED KINGDOM	BIOPATTERN	I	NOE
BIOFLUIDIX GMBH	GERMANY	MicroActive	2	STREP
BIRKBECK COLLEGE (UNIVERSITY OF LONDON)	UNITED KINGDOM	ASSIST	4	STREP
BIRKBECK COLLEGE (UNIVERSITY OF LONDON)	UNITED KINGDOM	ImmunoGrid	4	STREP
BMT LIMITED	UNITED KINGDOM	DOC@HAND	I	STREP
BOEHRINGER INGELHEIM ITALIA - S.P.A.	ITALY	NOESIS	I	IP
BUDAPESTI MUSZAKI ES GAZDASAGTUDOMANYI EGYETEM	HUNGARY	ALLADIN	I	STREP
BUNDESANSTALT FUER MATERIALFORSCHUNG UND -PRUEFUNG	GERMANY	OFSETH	4	STREP
BUSINESS FLOW CONSULTING	FRANCE	NOESIS	I	IP
CANCER RESEARCH UK	UNITED KINGDOM	@neurIST	4	IP
CARDIFF UNIVERSITY	UNITED KINGDOM	ALLADIN	I	STREP
CARMEDA AB	SWEDEN	CLINICIP	I	IP
CEFRIEL - SOCIETA CONSORTILE A RESPONSABILITA LIMITATA	ITALY	COCOON	I	IP
CENTRE D'EXCELLENCE EN TECHNOLOGIES DE L'INFORMATION ET DE LA COMMUNICATION	BELGIUM	OLDES	6	STREP
CENTRE D'INFORMATIQUE POUR LA REGION BRUXELLOISE	BELGIUM	COCOON	I	IP
CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS	GREECE	ASSIST	4	STREP
CENTRE FRANCAIS POUR LA PROMOTION DE SYSTEMES DE DOSSIERS DE SANTE INFORMATISES EUROPEENS DE QUALITE	FRANCE			Q-REC 4 SSA
CENTRE HOSPITALIER REGIONAL ET UNIVERSITAIRE DE LILLE	FRANCE	OFSETH	4	STREP
CENTRE HOSPITALIER UNIVERSITAIRE GRENOBLE	FRANCE	NOESIS	I	IP
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	FRANCE	ACGT	4	IP
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	FRANCE	ImmunoGrid	4	STREP
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	FRANCE	NOESIS	I	IP

LEGAL NAME	LEGAL COUNTRY	ACRONYM	CALL N°	CONTRACT TYPE
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	FRANCE	SHARE	4	SSA
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	FRANCE	STEP	4	CA
CENTRE SCIENTIFIQUE ET TECHNIQUE DE L'INDUSTRIE TEXTILE BELGE ASBL	BELGIUM	OFSETH	4	STREP
CENTRE SUISSE D'ELECTRONIQUE ET DE MICROTECHNIQUE SA - RECHERCHE ET DEVELOPPEMENT	SWITZERLAND	MYHEART	1	IP
CENTRE SUISSE D'ELECTRONIQUE ET DE MICROTECHNIQUE SA - RECHERCHE ET DEVELOPPEMENT	SWITZERLAND	SmartHEALTH	2	IP
CENTRO DE TELEMEDICINA DE COLOMBIA LTDA	COLOMBIA	@HEALTH	3	SSA
CENTRO DI CULTURA SCIENTIFICA "A.VOLTA"	ITALY	MULTI-KNOWLEDGE	4	STREP
CENTRO NACIONAL DE TECNOLOGIAS DE INFORMACION	VENEZUELA	@HEALTH	3	SSA
CENTRO NAZIONALE PER I TRAPIANTI	ITALY	COCOON	1	IP
CESKE VYSOKE UCENI TECHNICKE V PRAZE	CZECH REP.	K4CARE	4	STREP
CESKE VYSOKE UCENI TECHNICKE V PRAZE	CZECH REP.	OLDES	6	STREP
CHARITE-UNIVERSITATSMEDIZIN BERLIN	GERMANY	ASSIST	4	STREP
CHARITE-UNIVERSITATSMEDIZIN BERLIN	GERMANY	DESSOS	4	STREP
CHARITE-UNIVERSITATSMEDIZIN BERLIN	GERMANY	SmartHEALTH	2	IP
CHRISTIAN-ALBRECHTS-UNIVERSITAET ZU KIEL	GERMANY	SemanticMining	1	NOE
CIAOTECH SRL	ITALY	@HEALTH	3	SSA
CITY UNIVERSITY	UNITED KINGDOM	SeaLife	4	STREP
CLALIT HEALTH SERVICES	ISRAEL	AMICA	1	STREP
COGENTA LIMITED	UNITED KINGDOM	TACIT	1	STREP
COMMISSARIAT A L'ENERGIE ATOMIQUE	FRANCE	MYHEART	1	IP
COMPUGEN LTD	ISRAEL	SIMAP	4	STREP
COMUNE DI BOLOGNA	ITALY	OLDES	6	STREP
COMUNE DI POLLENZA	ITALY	K4CARE	4	STREP
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS	SPAIN	SIMAP	4	STREP
CONSIGLIO NAZIONALE DELLE RICERCHE	ITALY	CLINICIP	1	IP
CONSIGLIO NAZIONALE DELLE RICERCHE	ITALY	e-Health ERA	3	CA
CONSIGLIO NAZIONALE DELLE RICERCHE	ITALY	HEARTFAID	4	STREP
CONSIGLIO NAZIONALE DELLE RICERCHE	ITALY	ImmunoGrid	4	STREP
CONSIGLIO NAZIONALE DELLE RICERCHE	ITALY	NEUROWEB	4	STREP
CONSIGLIO NAZIONALE DELLE RICERCHE	ITALY	RIDE	4	STREP
CONSIGLIO NAZIONALE DELLE RICERCHE	ITALY	SemanticMining	1	NOE
CONSIGLIO NAZIONALE DELLE RICERCHE	ITALY	WOUNDMONITOR	4	STREP
CONSORZIO DI BIOINGEGNERIA E INFORMATICA MEDICA	ITALY	MYHEART	1	IP
CONSORZIO INTERUNIVERSITARIO PER LA GESTIONE DEL CENTRO DI CALCOLO ELETTRONICO DELL'ITALIA NORD-ORIENTALE	ITALY	ImmunoGrid	4	STREP
CONSORZIO INTERUNIVERSITARIO PER LA GESTIONE DEL CENTRO DI CALCOLO ELETTRONICO DELL'ITALIA NORD-ORIENTALE	ITALY	LHDL	4	STREP
CONSORZIO PER L'INNOVAZIONE NELLA GESTIONE DELLE IMPRESE E DELLA PUBBLICA AMMINISTRAZIONE DENOMINATO ANCHE "MIP (MASTER IMPRESE-POLITECNICO)	ITALY	COCOON	1	IP
CONSORZIO PER L'INNOVAZIONE NELLA GESTIONE DELLE IMPRESE E DELLA PUBBLICA AMMINISTRAZIONE DENOMINATO ANCHE "MIP (MASTER IMPRESE-POLITECNICO)	ITALY	RIGHT	4	STREP
COOPERATIVA SOCIALE COOSS MARCHE ONLUS SOCIETA COOPERATIVA PER AZIONI	ITALY	CAALYX	6	STREP
CORPORA PLC	UNITED KINGDOM	TACIT	1	STREP
CORSCIENCE GMBH & CO KG	GERMANY	CAALYX	6	STREP
CUP 2000 SPA	ITALY	OLDES	6	STREP
CURE - CENTER FOR USABILITY RESEARCH AND ENGINEERING	AUSTRIA	TACIT	1	STREP
CUSTODIX NV	BELGIUM	ACGT	4	IP
CUSTODIX NV	BELGIUM	ASSIST	4	STREP
CUSTODIX NV	BELGIUM	INFOBIOMED	1	NOE

LEGAL NAME	LEGAL COUNTRY	ACRONYM	CALL N°	CONTRACT TYPE
CYBERFAB SARL	FRANCE	SAPHIRE	4	STREP
DAEDALUS INFORMATICS LTD	GREECE	BIOPATTERN	1	NOE
DANMARKS TEKNISKE UNIVERSITET	DENMARK	ImmunoGrid	4	STREP
DAP NOESIS BUSINESS SOLUTIONS LIMITED	CYPRUS	CARDITIS	1	STREP
DAP NOESIS BUSINESS SOLUTIONS LIMITED	CYPRUS	NOESIS	1	IP
DATAMED HEALTHCARE INTEGRATOR OLOKLIRONMENA SYSTIMTA PLIROFORIKIS STINYGEIA KAI PRONOIA ANONYMOS ETAIREIA	GREECE	MULTI-KNOWLEDGE	4	STREP
DBMOTION LTD	ISRAEL	AMICA	1	STREP
DEBRECENI EGYETEM	HUNGARY	RIGHT	4	STREP
DEPUY INTERNATIONAL LIMITED	UNITED KINGDOM	DESSOS	4	STREP
DIMAC A/S	DENMARK	I-KNOW	4	STREP
DISETRONIC MEDICAL SYSTEMS AG	SWITZERLAND	CLINICIP	1	IP
DR. HEIN GMBH	GERMANY	MYHEART	1	IP
DUBLIN CITY UNIVERSITY	IRELAND	SmartHEALTH	2	IP
E-BIOINTEL SL	SPAIN	ASSIST	4	STREP
ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE	SWITZERLAND	@neurIST	4	IP
EGESZSEGUGYI STRATEGIAI KUTATOINTEZET	HUNGARY	SemanticHEALTH	4	SSA
EGESZSEGUGYI STRATEGIAI KUTATOINTEZET	HUNGARY	SemanticMining	1	NOE
EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH	SWITZERLAND	MYHEART	1	IP
ELASTA IND NV	BELGIUM	OFSETH	4	STREP
ELLINIKI ETAIRIA TILEPIKOINONION KAI TILEMATIKON EFARMOGON AE	GREECE	BIOPATTERN	1	NOE
ELLINIKI ETAIRIA TILEPIKOINONION KAI TILEMATIKON EFARMOGON AE	GREECE	HEARTFAID	4	STREP
ELYROS S.A.	BELGIUM	COCOON	1	IP
ELYROS S.A.	BELGIUM	INTREPID	1	STREP
EMPHASIS SYSTEMS AE	GREECE	COCOON	1	IP
EMPHASIS SYSTEMS AE	GREECE	DOC@HAND	1	STREP
EMPIRICA GESELLSCHAFT FUER KOMMUNIKATIONS- UND TECHNOLOGIEFORSCHUNG MBH	GERMANY	e-Health ERA	3	CA
ENET SOLUTIONS LOGICOM COMMERCIAL INDUSTRIAL AEBE	GREECE	PALLIANET	1	STREP
ENTE PER LE NUOVE TECNOLOGIE, L'ENERGIA E L'AMBIENTE	ITALY	OLDES	6	STREP
EOTVOS LORAND TUDOMANYEGYETEM	HUNGARY	ViroLab	4	STREP
EPEKTASIS A.E.	GREECE	TACIT	1	STREP
ERASMUS UNIVERSITAIR MEDISCH CENTRUM ROTTERDAM	THE NETHERLANDS	@neurIST	4	IP
ERASMUS UNIVERSITAIR MEDISCH CENTRUM ROTTERDAM	THE NETHERLANDS	INFOBIOMED	1	NOE
ERASMUS UNIVERSITAIR MEDISCH CENTRUM ROTTERDAM	THE NETHERLANDS	NEUROWEB	4	STREP
ESI GROUP S.A.	FRANCE	DESSOS	4	STREP
EUROPAISCHES MICROSOFT INNOVATIONS CENTER GMBH	GERMANY	COCOON	1	IP
EUROPAISCHES MICROSOFT INNOVATIONS CENTER GMBH	GERMANY	EMERGE	6	STREP
EUROPEAN COMMISSION - JOINT RESEARCH CENTRE	BELGIUM	PIPS	1	IP
EUROPEAN DYNAMICS ADVANCED SYSTEMS OF TELECOMMUNICATIONS INFORMATICS AND TELEMATICS S.A.	GREECE	COCOON	1	IP
EUROPEAN DYNAMICS ADVANCED SYSTEMS OF TELECOMMUNICATIONS INFORMATICS AND TELEMATICS S.A.	GREECE	SemanticMining	1	NOE
EUROPEAN HEALTH MANAGEMENT ASSOCIATION	IRELAND	SHARE	4	SSA
EUROPEAN INSTITUTE FOR HEALTH RECORDS	FRANCE	Q-REC	4	SSA
EUROPEAN INSTITUTE FOR HEALTH RECORDS	FRANCE	RIDE	4	STREP
EUROPEAN MOLECULAR BIOLOGY LABORATORY	INTERNATIONAL ORGANISATION	SemanticMining	1	NOE
EUROPEAN MOLECULAR BIOLOGY LABORATORY	INTERNATIONAL ORGANISATION	SYMBIOmatics	3	SSA
EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH	INTERNATIONAL ORGANISATION	Health-e-Child	4	IP
EUROPEAN RESEARCH AND PROJECT OFFICE GMBH	GERMANY	K4CARE	4	STREP
EUROPEAN SPACE RESEARCH AND TECHNOLOGY CENTRE	THE NETHERLANDS	TMA-BRIDGE	1	SSA
EXPERT SYSTEM S.P.A.	ITALY	TACIT	1	STREP

LEGAL NAME	LEGAL COUNTRY	ACRONYM	CALL N°	CONTRACT TYPE
FACULDADE CIENCIAS E TECNOLOGIA DA UNIVERSIDADE DE COIMBRA	PORTUGAL	MYHEART	I	IP
FACULTES UNIVERSITAIRES NOTRE-DAME DE LA PAIX ASBL	BELGIUM	ACGT	4	IP
FACULTES UNIVERSITAIRES NOTRE-DAME DE LA PAIX ASBL	BELGIUM	SHARE	4	SSA
FEDERACION PANAMERICANA DE ASOCIACIONES DE FACULTADES DE ESCUELAS DE MEDICINA	INTERNATIONAL ORGANISATION	@HEALTH	3	SSA
FIBERWARE GENERALUNTERNEHMEN FUR NACHRICHTENTECHNIK GMBH	GERMANY	OFSETH	4	STREP
FINSBURY ORTHOPAEDICS LTD	UNITED KINGDOM	DESSOS	4	STREP
FONDAZIONE CENTRO SAN RAFFAELE DEL MONTE TABOR	ITALY	MYHEART	I	IP
FONDAZIONE CENTRO SAN RAFFAELE DEL MONTE TABOR	ITALY	PIPS	I	IP
FONDAZIONE EUROPEA PER LA GENETICA	ITALY	Health-e-Child	4	IP
FONDAZIONE GEROLAMO GASLINI	ITALY	Health-e-Child	4	IP
FONDAZIONE IARD	ITALY	COCOON	I	IP
FONDAZIONE IRCCS ISTITUTO NAZIONALE DEI TUMORI	ITALY	BIOPATTERN	I	NOE
FONDAZIONE IRCCS ISTITUTO NAZIONALE DEI TUMORI	ITALY	SIMAP	4	STREP
FONDAZIONE IRCCS ISTITUTO NEUROLOGICO CARLO BESTA	ITALY	NEUROWEB	4	STREP
FONDAZIONE ISTITUTO ONCOLOGICO DEL MEDITERRANEO	ITALY	MATCH	4	STREP
FONDAZIONE SALVATORE MAUGERI CLINICA DEL LAVORO E DELLA RIABILITAZIONE	ITALY	MYHEART	I	IP
FONDAZIONE SANTA LUCIA	ITALY	K4CARE	4	STREP
FORSCHUNGSZENTRUM KARLSRUHE GESELLSCHAFT MIT BESCHRAENKTER HAFTUNG	GERMANY	SmartHEALTH	2	IP
FOUNDATION FOR RESEARCH AND TECHNOLOGY - HELLAS	GREECE	ACGT	4	IP
FOUNDATION FOR RESEARCH AND TECHNOLOGY - HELLAS	GREECE	HEARTFAID	4	STREP
FOUNDATION FOR RESEARCH AND TECHNOLOGY - HELLAS	GREECE	INFOBIOMED	I	NOE
FOURSIGHT LIMITED	UNITED KINGDOM	TACIT	I	STREP
FOVAROSI ONKORMANYZAT SZENT JANOS KORHAZ ES RENDELOINTEZET	HUNGARY	K4CARE	4	STREP
FRATERNITA DI MISERICORDIA MILANO	ITALY	DICOEMS	I	STREP
FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.	GERMANY	@neurIST	4	IP
FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.	GERMANY	ACGT	4	IP
FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.	GERMANY	EMERGE	6	STREP
FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.	GERMANY	SmartHEALTH	2	IP
FRIEDRICH-SCHILLER-UNIVERSITAET JENA	GERMANY	SemanticMining	I	NOE
FRIEDRICH-SCHILLER-UNIVERSITAET JENA	GERMANY	SmartHEALTH	2	IP
FUJIREBIO DIAGNOSTICS AB	SWEDEN	SmartHEALTH	2	IP
FUNDACIO IMIM	SPAIN	@neurIST	4	IP
FUNDACIO IMIM	SPAIN	INFOBIOMED	I	NOE
FUNDACIO INSTITUT DE RECERCA DE L'HOSPITAL UNIVERSITARI VALL D'HEBRON	SPAIN	SIMAP	4	STREP
FUNDACIO PRIVADA INSTITUT DE RECERCA DE LA SIDA-CAIXA	SPAIN	ViroLab	4	STREP
FUNDACIO PRIVADA INSTITUT D'INVESTIGACIO BIOMEDICA DE GIRONA DOCTOR JOSEP TRUETA	SPAIN	I-KNOW	4	STREP
FUNDACIO PRIVADA PARC CIENTIFIC DE BARCELONA	SPAIN	PIPS	I	IP
FUNDACIO PRIVADA PER A LA INVESTIGACIO NUTRICIONAL	SPAIN	PIPS	I	IP
FUNDACION GAIKER	SPAIN	SmartHEALTH	2	IP
FUNDACION PARA LA INVESTIGACION DEL HOSPITAL UNIVERSITARIO LA FE	SPAIN	CARE-PATHS	I	STREP
FUNDACION VASCA DE INNOVACION E INVESTIGACION SANITARIAS	SPAIN	SmartHEALTH	2	IP
FUNDACION VODAFONE ESPANA	SPAIN	MYHEART	I	IP
FUNDATIA ANA ASLAN INTERNATIONAL	ROMANIA	K4CARE	4	STREP
FYNS AMT	DENMARK	@HEALTH	3	SSA

LEGAL NAME	LEGAL COUNTRY	ACRONYM	CALL N°	CONTRACT TYPE
FYNS AMT	DENMARK	INFOBIOMED	I	NOE
GAMBRO DIALYSATOREN GMBH	GERMANY	CLINICIP	I	IP
GAP INFOMEDIA LTD	UNITED KINGDOM	BIOPATTERN	I	NOE
GEIE ERCIM	FRANCE	ACGT	4	IP
GESELLSCHAFT ZUR FOERDERUNG DER ANALYTISCHEN WISSENSCHAFTEN E.V.	GERMANY	CLINICIP	I	IP
GFI BENELUX SA	BELGIUM	PALLIANET	I	STREP
GFI OIS S.P.A	ITALY	PALLIANET	I	STREP
GIP RESEAU DE CANCEROLOGIE D AQUITAINE	FRANCE	COCOON	I	IP
GL2006 EUROPE LTD	UNITED KINGDOM	CARE-PATHS	I	STREP
GL2006 EUROPE LTD	UNITED KINGDOM	COCOON	I	IP
GLAXOSMITHKLINE S.P.A	ITALY	PIPS	I	IP
GOTEBORGS UNIVERSITET	SWEDEN	SemanticMining	I	NOE
GOTTFRIED WILHELM LEIBNIZ UNIVERSITAET HANNOVER	GERMANY	ACGT	4	IP
GRID SYSTEMS S.A.	SPAIN	@neurIST	4	IP
GRIDWISE TECHNOLOGIES PAWEL PLASZCZAK	POLAND	ViroLab	4	STREP
GRIDWISETECH SP Z O O	POLAND	ViroLab	4	STREP
GUY' S AND ST. THOMAS' HOSPITAL NATIONAL HEALTH SERVICE TRUST	UNITED KINGDOM	CAALYX	6	STREP
GUY' S AND ST. THOMAS' HOSPITAL NATIONAL HEALTH SERVICE TRUST	UNITED KINGDOM	DICOEMS	I	STREP
GUY' S AND ST. THOMAS' HOSPITAL NATIONAL HEALTH SERVICE TRUST	UNITED KINGDOM	DOC@HAND	I	STREP
GUY' S AND ST. THOMAS' HOSPITAL NATIONAL HEALTH SERVICE TRUST	UNITED KINGDOM	PALLIANET	I	STREP
GUY' S AND ST. THOMAS' HOSPITAL NATIONAL HEALTH SERVICE TRUST	UNITED KINGDOM	TACIT	I	STREP
HALEVI DWECK & CO. ARTTIC ISRAEL COMPANY LTD	ISRAEL	SIMAP	4	STREP
HEALTH ON THE NET (HON)	SWITZERLAND	PIPS	I	IP
HEALTHGRID	FRANCE	ACGT	4	IP
HEALTHGRID	FRANCE	SHARE	4	SSA
HEINRICH-HEINE-UNIVERSITAET DUESSELDORF	GERMANY	INFOBIOMED	I	NOE
HELIDE TECNOLOGIA DE LA INFORMACION S.A.	SPAIN	Health-e-Child	4	IP
HELLENIC CARDIOLOGICAL SOCIETY	GREECE	NOESIS	I	IP
HERIOT-WATT UNIVERSITY	UNITED KINGDOM	SeaLife	4	STREP
HITECH SNT AE	GREECE	CARDITIS	I	STREP
HITECH SNT AE	GREECE	CARE-PATHS	I	STREP
HOEGSKOLAN I BORAS	SWEDEN	BIOPATTERN	I	NOE
HOKKAIDO UNIVERSITY	JAPAN	ACGT	4	IP
HOSPITAIS DA UNIVERSIDADE DE COIMBRA	PORTUGAL	MYHEART	I	IP
HOSPITAL CLINIC I PROVINCIAL DE BARCELONA	SPAIN	@neurIST	4	IP
HOSPITAL CLINIC I PROVINCIAL DE BARCELONA	SPAIN	DOC@HAND	I	STREP
HOSPITAL CLINICO SAN CARLOS DE MADRID INSALUD	SPAIN	MYHEART	I	IP
HOSPITAL DE CRUCES	SPAIN	SmartHEALTH	2	IP
HOSPITAL DONOSTIA	SPAIN	SmartHEALTH	2	IP
HOVEDSTADENS SYGEHUSFAELLESSKAB	DENMARK	INFOBIOMED	I	NOE
I.C.S.F. INTEGRATED CARE SYSTEMS FRANCE SA	FRANCE	COCOON	I	IP
IBM ISRAEL - SCIENCE AND TECHNOLOGY LTD	ISRAEL	EuResist	4	STREP
ICT TURKU OY AB	FINLAND	CARDITIS	I	STREP
IDAC IRELAND LTD	IRELAND	@neurIST	4	IP
IDS SCHEER CR, S.R.O	CZECH REP.	CARDITIS	I	STREP
IDS SCHEER CR, S.R.O	CZECH REP.	COCOON	I	IP
IDS SCHEER CR, S.R.O	CZECH REP.	HEALTH-PLUS	4	STREP

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IHE DEUTSCHLAND EV	GERMANY	RIDE	4	STREP
IKERLAN S. COOP	SPAIN	SmartHEALTH	2	IP
INESC PORTO - INSTITUTO DE ENGENHARIA DE SISTEMAS E COMPUTADORES DO PORTO	PORTUGAL	CAALYX	6	STREP
INFERMED LIMITED	UNITED KINGDOM	@neurIST	4	IP
INFERMED LIMITED	UNITED KINGDOM	COCOON	1	IP
INFOCUS HEALTH LIMITED	UNITED KINGDOM	INTREPID	1	STREP
INFORMA S.R.L.	ITALY	EuResist	4	STREP
INFORMA S.R.L.	ITALY	INFOBIOMED	1	NOE
INFORMATION MANAGEMENT GROUP LTD	UNITED KINGDOM	DICOEMS	1	STREP
INFORMATION MANAGEMENT GROUP LTD	UNITED KINGDOM	MULTI-KNOWLEDGE	4	STREP
INFORMATION SOCIETY OPEN TO IMPAIRMENTS E-ISOTIS	GREECE	EMERGE	6	STREP
INK MEDIA INC	CANADA	OLDES	6	STREP
INSTITUT FUER MIKROTECHNIK MAINZ GMBH	GERMANY	MicroActive	2	STREP
INSTITUT FUER MIKROTECHNIK MAINZ GMBH	GERMANY	SmartHEALTH	2	IP
INSTITUT MUNICIPAL D'ASSISTENCIA SANITARIA	SPAIN	@neurIST	4	IP
INSTITUT MUNICIPAL D'ASSISTENCIA SANITARIA	SPAIN	INFOBIOMED	1	NOE
INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE	FRANCE	@neurIST	4	IP
INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE	FRANCE	I-KNOW	4	STREP
INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE	FRANCE	SemanticMining	1	NOE
INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE	FRANCE	ACGT	4	IP
INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE	FRANCE	Health-e-Child	4	IP
INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE	FRANCE	SeaLife	4	STREP
INSTITUT NATIONAL DES SCIENCES APPLIQUEES DE RENNES	FRANCE	ACGT	4	IP
INSTITUT NATIONAL POLYTECHNIQUE DE GRENOBLE	FRANCE	NOESIS	1	IP
INSTITUT SUISSE DE BIOINFORMATIQUE	SWITZERLAND	ACGT	4	IP
INSTITUT ZA VAROVANJE ZDRAVJA	REP. OF SLOVENIA	RIGHT	4	STREP
INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	GREECE	ACGT	4	IP
INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	GREECE	AMICA	1	STREP
INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	GREECE	ASSIST	4	STREP
INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	GREECE	RIDE	4	STREP
INSTITUTO DE APLICACIONES DE LAS TECNOLOGIAS DE LA INFORMACION Y DE LAS COMUNICACIONES AVANZADAS - ITACA	SPAIN	@HEALTH	3	SSA
INSTITUTO DE APLICACIONES DE LAS TECNOLOGIAS DE LA INFORMACION Y DE LAS COMUNICACIONES AVANZADAS - ITACA	SPAIN	CARE-PATHS	1	STREP
INSTITUTO DE APLICACIONES DE LAS TECNOLOGIAS DE LA INFORMACION Y DE LAS COMUNICACIONES AVANZADAS - ITACA	SPAIN	HealthAgents	4	STREP
INSTITUTO DE APLICACIONES DE LAS TECNOLOGIAS DE LA INFORMACION Y DE LAS COMUNICACIONES AVANZADAS - ITACA	SPAIN	MYHEART	1	IP
INSTITUTO DE APLICACIONES DE LAS TECNOLOGIAS DE LA INFORMACION Y DE LAS COMUNICACIONES AVANZADAS - ITACA	SPAIN	PIPS	1	IP
INSTITUTO DE SALUD CARLOS III	SPAIN	e-Health ERA	3	CA
INSTITUTO DE SALUD CARLOS III	SPAIN	INFOBIOMED	1	NOE
INSTYTUT CHEMII BIOORGANICZNEJ PAN W POZNANIU	POLAND	ACGT	4	IP
INTERNATIONAL SYSTEM HOUSE KERESKEDELMI ES SZOFTVERFEJLESZTO KORLATOLT FELELOSSEGU TARSASAG	HUNGARY	HEALTH-PLUS	4	STREP
INTERNATIONAL TELECOMMUNICATION UNION	INTERNATIONAL ORGANISATION	TMA-BRIDGE	1	SSA
INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM VZW	BELGIUM	SmartHEALTH	2	IP
IRISH CENTRE FOR HEALTH TELEMATICS LIMITED	IRELAND	Q-REC	4	SSA
ISTITUTI ORTOPEDICI RIZZOLI	ITALY	LHDL	4	STREP
ISTITUTI ORTOPEDICI RIZZOLI	ITALY	STEP	4	CA
ISTITUTO AUXOLOGICO ITALIANO	ITALY	HEARTFAID	4	STREP

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ISTITUTO EUROPEO DI ONCOLOGIA S.R.L.	ITALY	ACGT	4	IP
ISTITUTO GIANNINA GASLINI	ITALY	Health-e-Child	4	IP
IXSCIENT LIMITED	UNITED KINGDOM	SmartHEALTH	2	IP
JOANNEUM RESEARCH FORSCHUNGSGESELLSCHAFT MBH	AUSTRIA	CLINICIP	1	IP
JUDEX DATASYSTEMER A/S	DENMARK	AMICA	1	STREP
KAROLINSKA INSTITUTET	SWEDEN	EuResist	4	STREP
KAROLINSKA INSTITUTET	SWEDEN	INFOBIOMED	1	NOE
KAROLINSKA INSTITUTET	SWEDEN	SemanticMining	1	NOE
KATHOLIEKE UNIVERSITEIT LEUVEN	BELGIUM	BIOPATTERN	1	NOE
KATHOLIEKE UNIVERSITEIT LEUVEN	BELGIUM	CLINICIP	1	IP
KATHOLIEKE UNIVERSITEIT LEUVEN	BELGIUM	HealthAgents	4	STREP
KATHOLIEKE UNIVERSITEIT LEUVEN	BELGIUM	ViroLab	4	STREP
KING'S COLLEGE LONDON	UNITED KINGDOM	@neurIST	4	IP
KING'S COLLEGE LONDON	UNITED KINGDOM	MULTI-KNOWLEDGE	4	STREP
KINGSTON UNIVERSITY	UNITED KINGDOM	EuResist	4	STREP
KITH AS - KOMPETANSESENTER FOR INFORMASJONSTEKNOLOGI I HELSEVESENET AS	NORWAY	SemanticMining	1	NOE
KLINIKUM DER UNIVERSITAET ZU KOELN	GERMANY	EuResist	4	STREP
KONRAD-ZUSE-ZENTRUM FUER INFORMATIONSTECHNIK BERLIN	GERMANY	DESSOS	4	STREP
KUNGLIGA TEKNISKA HOGSKOLAN	SWEDEN	@neurIST	4	IP
LABORATOIRE TIMC	FRANCE	NOESIS	1	IP
LANGUAGE AND COMPUTING NV	BELGIUM	ALLADIN	1	STREP
LANGUAGE AND COMPUTING NV	BELGIUM	COCOON	1	IP
LANGUAGE AND COMPUTING NV	BELGIUM	PALLIANET	1	STREP
LINEAPIU SPA	ITALY	MYHEART	1	IP
LINKOEPINGS UNIVERSITET	SWEDEN	SemanticMining	1	NOE
LITO HOSPITAL FOR WOMEN S.A.	GREECE	DICOEMS	1	STREP
LIVERPOOL JOHN MOORES UNIVERSITY HIGHER EDUCATION CORPORATION	UNITED KINGDOM	BIOPATTERN	1	NOE
LOGICOM PUBLIC LIMITED	CYPRUS	COCOON	1	IP
LUNDS UNIVERSITET	SWEDEN	ACGT	4	IP
LYNKEUS SRL	ITALY	Health-e-Child	4	IP
M.R.I. LEFKOTHEA MEDICAL SERVICES LTD.	CYPRUS	NOESIS	1	IP
MAAT G KNOWLEDGE SL	SPAIN	Health-e-Child	4	IP
MAGYAR TUDOMANYOS AKADEMIA SZAMITASTECHNIKAI ES AUTOMATIZALASI KUTATO INTEZET	HUNGARY	K4CARE	4	STREP
MANIFATTURE FILATI RIUNITE SPA	ITALY	MYHEART	1	IP
MARSH RISK CONSULTING B.V.	THE NETHERLANDS	PIPS	1	IP
MASERATI SPA	ITALY	AUBADE	1	STREP
MAX-PLANCK GESELLSCHAFT ZUR FOERDERUNG DER WISSENSCHAFTEN E.V.	GERMANY	EuResist	4	STREP
MAX-PLANCK GESELLSCHAFT ZUR FOERDERUNG DER WISSENSCHAFTEN E.V.	GERMANY	SIMAP	4	STREP
MAYO FOUNDATION	UNITED STATES	MYHEART	1	IP
MEDGATE AG	SWITZERLAND	MYHEART	1	IP
MEDIC4ALL (ISRAEL) LTD.	ISRAEL	PIPS	1	IP
MEDIQ A/S	DENMARK	Q-REC	4	SSA
MEDISELL CO LTD	CYPRUS	NOESIS	1	IP
MEDISELL CO LTD	CYPRUS	RIGHT	4	STREP
MEDIZINISCHE UNIVERSITAT GRAZ	AUSTRIA	CLINICIP	1	IP
MEDIZINISCHE UNIVERSITAT GRAZ	AUSTRIA	EMERGE	6	STREP
MEDTRONIC IBERICA SA	SPAIN	MYHEART	1	IP
MERRALL-ROSS INTERNATIONAL LIMITED	UNITED KINGDOM	SemanticMining	1	NOE

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METAWARE SOCIETA PER AZIONI	ITALY	TACIT	I	STREP
MICRO ART SL	SPAIN	HealthAgents	4	STREP
MICROFLUIDIC CHIPSHOP GMBH	GERMANY	SmartHEALTH	2	IP
MICROSYSTEMS SRL	ITALY	NEUROWEB	4	STREP
MIDDLE EAST TECHNICAL UNIVERSITY	TURKEY	ARTEMIS	I	STREP
MIDDLE EAST TECHNICAL UNIVERSITY	TURKEY	RIDE	4	STREP
MIDDLE EAST TECHNICAL UNIVERSITY	TURKEY	SAPHIRE	4	STREP
MILIOR S.P.A.	ITALY	MYHEART	I	IP
MIND MEDIA B.V.	THE NETHERLANDS	MYHEART	I	IP
MINIFAB (AUST) PTY LTD	AUSTRALIA	SmartHEALTH	2	IP
MTA KFKI RESZECSKE- ES MAGFIZIKAI KUTATOINTEZET	HUNGARY	EuResist	4	STREP
MULTITEL	BELGIUM	ALLADIN	I	STREP
MULTITEL	BELGIUM	OFSETH	4	STREP
NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS	GREECE	BIOPATTERN	I	NOE
NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS	GREECE	Health-e-Child	4	IP
NATIONAL CENTRE FOR SCIENTIFIC RESEARCH "DEMOKRITOS"	GREECE	EMERGE	6	STREP
NATIONAL UNIVERSITY OF IRELAND - GALWAY	IRELAND	RIDE	4	STREP
NEC EUROPE LTD	UNITED KINGDOM	@neurIST	4	IP
NEOVENTOR MEDICINSK INNOVATION AB	SWEDEN	BIOPATTERN	I	NOE
NEPALE	FRANCE	PALLIANET	I	STREP
NETHERLANDS ORGANISATION FOR APPLIED SCIENTIFIC RESEARCH - TNO	THE NETHERLANDS	Q-REC	4	SSA
NETHERLANDS ORGANISATION FOR APPLIED SCIENTIFIC RESEARCH - TNO	THE NETHERLANDS	SmartHEALTH	2	IP
NETVISION LIMITED	CYPRUS	NOESIS	I	IP
NEUROANGIOGRAFIA TERAPEUTICA SL	SPAIN	@neurIST	4	IP
NOKIA OYJ	FINLAND	MYHEART	I	IP
NORCHIP AS	NORWAY	MicroActive	2	STREP
NORCHIP AS	NORWAY	SmartHEALTH	2	IP
NOTTINGHAM TRENT UNIVERSITY	UNITED KINGDOM	BIOPATTERN	I	NOE
NYLSTAR CENTRO DIREZIONALE SRL	ITALY	MYHEART	I	IP
OBJECTIVE S.A. - TECHNOLOGIC CONSULTING & SOFTWARE DEVELOPMENT	BELGIUM	PALLIANET	I	STREP
OFFICE-LINE ENGINEERING N.V.	BELGIUM	RIDE	4	STREP
OFFIS E.V.	GERMANY	ARTEMIS	I	STREP
OFFIS E.V.	GERMANY	RIDE	4	STREP
OFFIS E.V.	GERMANY	SAPHIRE	4	STREP
OLIVETTI I - JET S.P.A.	ITALY	SmartHEALTH	2	IP
OREISON ANONYMI EMPORIKI EKDOTIKI EKPAIDEFTIKI SYMVOUL ETAIREIA EFARMOGIS NEON TECHNOLOGION KAI LOGISMIKOU	GREECE	RIGHT	4	STREP
ORSZAGOS ORVOSI REHABILITACIOS INTEZET	HUNGARY	ALLADIN	I	STREP
ORSZAGOS PSZICHIATRIAI ES NEUROLOGIAI INTEZET	HUNGARY	NEUROWEB	4	STREP
OSAKIDETZA	SPAIN	SmartHEALTH	2	IP
PANEPISTIMIO IOANNINON	GREECE	AUBADE	I	STREP
PANEPISTIMIO IOANNINON	GREECE	INTREPID	I	STREP
PANEPISTIMIO IOANNINON	GREECE	NOESIS	I	IP
PANNON EGYETEM	HUNGARY	NEUROWEB	4	STREP
PATMOS S.R.L.	ITALY	CARE-PATHS	I	STREP
PATMOS S.R.L.	ITALY	COCOON	I	IP
PCS PROFESSIONAL CLINICAL SOFTWARE GMBH	AUSTRIA	HEALTH-PLUS	4	STREP
PCS PROFESSIONAL CLINICAL SOFTWARE GMBH	AUSTRIA	MULTI-KNOWLEDGE	4	STREP
PECSI TUDOMANYEGYETEM	HUNGARY	@neurIST	4	IP
PERA INNOVATION LIMITED	UNITED KINGDOM	DESSOS	4	STREP

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PHARMA QUALITY EUROPE SRL	ITALY	HealthAgents	4	STREP
PHILIPS ELECTRONICS NEDERLAND B.V.	THE NETHERLANDS	ACGT	4	IP
PHILIPS ELECTRONICS NEDERLAND B.V.	THE NETHERLANDS	MYHEART	1	IP
PHILIPS ELECTRONICS UK LIMITED	UNITED KINGDOM	MYHEART	1	IP
PHILIPS INNOVATIVE TECHNOLOGY SOLUTIONS NV	BELGIUM	MYHEART	1	IP
PHILIPS INTERNATIONAL B.V.	THE NETHERLANDS	MYHEART	1	IP
PHILIPS MEDICAL SYSTEMS NEDERLAND BV	THE NETHERLANDS	@neurIST	4	IP
PHILIPS TECHNOLOGIE GMBH FORSCHUNGSLABORATORIEN AACHEN	GERMANY	MYHEART	1	IP
PLIROFORIKI EPIKOINONIES EPIS EPE	GREECE	HEALTH-PLUS	4	STREP
PLYMOUTH HOSPITALS NATIONAL HEALTH SERVICE TRUST	UNITED KINGDOM	BIOPATTERN	1	NOE
POLITECHNIKA GDANSKA	POLAND	PIPS	1	IP
POLITECNICO DI MILANO	ITALY	MYHEART	1	IP
POULIADIS KAI SYNERGATES ANONYMI VIOMICHANIKI KAI EMPORIKI ETAIREIA SYSTIMATON YPSILIS TECHNOLOGIAS	GREECE	ASSIST	4	STREP
PRECISION CONSULTING S.A.	BELGIUM	AUBADE	1	STREP
PROREC-BE VZW	BELGIUM	Q-REC	4	SSA
PROREC-DE E.V. DEUTSCHES REFERENZ ZENTRUM FUER DIE ELEKTRONISCHE KRAKENGESCHICHTE	GERMANY	Q-REC	4	SSA
PUSLAIDININKIU FIZIKOS INSTITUTAS*	REP. OF LITHUANIA	WOUNDMONITOR	4	STREP
QUALITY & RELIABILITY A.E.	GREECE	HEALTH-PLUS	4	STREP
R&S INFO S.R.L.	ITALY	HEALTH-PLUS	4	STREP
REFORM E.C., DRUZBA ZA MEDNARODNO TRGOVINO, D.O.O.	REP. OF SLOVENIA	RIGHT	4	STREP
REGION SYDDANMARK	DENMARK	@HEALTH	3	SSA
REGIONAL HEALTHCARE SYSTEMS OF EPIRUS	GREECE	COCOON	1	IP
REGIONE LOMBARDIA	ITALY	COCOON	1	IP
REGIONE LOMBARDIA	ITALY	NEUROWEB	4	STREP
RESEARCH IN ADVANCED MEDICAL INFORMATION AND TELEMATICS VZW	BELGIUM	ASSIST	4	STREP
RESEARCH IN ADVANCED MEDICAL INFORMATION AND TELEMATICS VZW	BELGIUM	Q-REC	4	SSA
ROYAL BROMPTON & HAREFIELD NHS TRUST	UNITED KINGDOM	CLINICIP	1	IP
RUDER BOSKOVIC INSTITUTE	REP. OF CROATIA	HEARTFAID	4	STREP
S.A.T.A. - S.R.L.	ITALY	MULTI-KNOWLEDGE	4	STREP
SACS MEDICAL GOETEBORG AB	SWEDEN	BIOPATTERN	1	NOE
SAINT GEORGE'S HOSPITAL MEDICAL SCHOOL	UNITED KINGDOM	SmartHEALTH	2	IP
SCHUECHTERMANN-SCHILLER'SCHE KLINIKEN BAD ROTHENFELDE VERWALTUNGSGESELLSCHAFT MBH	GERMANY	SAPHIRE	4	STREP
SCIONICS COMPUTER INNOVATION GMBH	GERMANY	SeaLife	4	STREP
SCS SRL	ITALY	@neurIST	4	IP
SCUOLA SUPERIORE DI STUDI UNIVERSITARI E DI PERFEZIONAMENTO SANT'ANNA	ITALY	ALLADIN	1	STREP
SENSLAB GESELLSCHAFT ZUR ENTWICKLUNG UND HERSTELLUNG BIOELEKTROCHEMISCHER SENSOREN MBH	GERMANY	CLINICIP	1	IP
SESA - COMMERCE HANDELSGMBH	AUSTRIA	NOESIS	1	IP
SHEFFIELD HALLAM UNIVERSITY	UNITED KINGDOM	BIOPATTERN	1	NOE
SHEFFIELD HALLAM UNIVERSITY	UNITED KINGDOM	MATCH	4	STREP
SHENYANG NEUSOFT CO., LTD.	CHINA	PIPS	1	IP
SHISHOO CONSULTING AB	SWEDEN	OFSETH	4	STREP
SIEMENS AKTIENGESELLSCHAFT	GERMANY	EMERGE	6	STREP
SIEMENS AKTIENGESELLSCHAFT	GERMANY	Health-e-Child	4	IP
SIEMENS IT SOLUTIONS AND SERVICES S.P.A.	ITALY	COCOON	1	IP
SIEMENS SA	SPAIN	AUBADE	1	STREP
SIEMENS SA	SPAIN	NOESIS	1	IP
SINEURA S.P.A.	ITALY	MATCH	4	STREP

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SINTEF - STIFTELSEN FOR INDUSTRIELL OG TEKNISK FORSKNING VED NORGES TEKNISKE HOEGSKOLE	NORWAY	MicroActive	2	STREP
SIRSE - NET S.P.A.	ITALY	NEUROWEB	4	STREP
SIVECO ROMANIA SA	ROMANIA	ACGT	4	IP
SMARTEX S.R.L.	ITALY	MYHEART	1	IP
SOCIALSTYRELSEN	SWEDEN	SemanticMining	1	NOE
SOCIETATEA COMERCIALA PENTRU CERCETARE, PROIECTARE SI PRODUCTIE DE ECHIPAMENTE SI INSTALATII DE AUTOMATIZARE	ROMANIA	SAPHIRE	4	STREP
SOSIAALI- JA TERVEYSALAN TUTKIMUS JA KEHITTAEMISKESKUS	FINLAND	e-Health ERA	3	CA
SOSIAALI- JA TERVEYSALAN TUTKIMUS JA KEHITTAEMISKESKUS	FINLAND	SemanticMining	1	NOE
SOUTH AND EAST BELFAST HEALTH AND SOCIAL SERVICES TRUST	UNITED KINGDOM	ARTEMIS	1	STREP
SPITALUL CLINIC DE URGENTA BUCURESTI-FLOREASCA	ROMANIA	SAPHIRE	4	STREP
SSM COMPUTER SYSTEMS LIMITED	CYPRUS	DICOEMS	1	STREP
SSM COMPUTER SYSTEMS LIMITED	CYPRUS	DOC@HAND	1	STREP
STICHTING KATHOLIEKE UNIVERSITEIT	THE NETHERLANDS	BIOPATTERN	1	NOE
STICHTING KATHOLIEKE UNIVERSITEIT	THE NETHERLANDS	SemanticHEALTH	4	SSA
SUNDHEDSSTYRELSEN	DENMARK	SemanticMining	1	NOE
SWISSLOG HOLDING AG	SWITZERLAND	AMICA	1	STREP
SWORD TECHNOLOGIES SA	LUXEMBOURG	ASSIST	4	STREP
SWORD TECHNOLOGIES SA	LUXEMBOURG	NOESIS	1	IP
SWORD TECHNOLOGIES SA	LUXEMBOURG	PALLIANET	1	STREP
SWORD TECHNOLOGIES SA	LUXEMBOURG	RIGHT	4	STREP
SYNAPSIS - SOCIETA A RESPONSABILITA LIMITATA	ITALY	BIOPATTERN	1	NOE
SYNAPSIS - SOCIETA A RESPONSABILITA LIMITATA	ITALY	HEARTFAID	4	STREP
SYNERGIA 2000 S.P.A.	ITALY	DICOEMS	1	STREP
SYNKRONIX INCORPORATION LIMITED	UNITED KINGDOM	CAALYX	6	STREP
SYSTEMATIC SOFTWARE ENGINEERING A/S	DENMARK	I-KNOW	4	STREP
TAM TELESANTE SARL	FRANCE	OFSETH	4	STREP
TAMPEREEN TEKNILLINEN YLIOPISTO	FINLAND	BIOPATTERN	1	NOE
TATAA BIOCENTER AB	SWEDEN	SmartHEALTH	2	IP
TBS G.B. TELEMATIC & BIOMEDICAL SERVICES LIMITED	UNITED KINGDOM	MATCH	4	STREP
TEAM CONSULTING POLSKA SPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA	POLAND	MATCH	4	STREP
TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY	ISRAEL	COCOON	1	IP
TECHNISCHE UNIVERSITAET DRESDEN	GERMANY	SeaLife	4	STREP
TECHNISCHE UNIVERSITAET GRAZ	AUSTRIA	CLINICIP	1	IP
TECHNISCHE UNIVERSITAET MUENCHEN	GERMANY	OFSETH	4	STREP
TECHNOLOGICAL EDUCATIONAL INSTITUTE OF CRETE	GREECE	BIOPATTERN	1	NOE
TELECOM ITALIA SPA	ITALY	COCOON	1	IP
TELECOM ITALIA SPA	ITALY	K4CARE	4	STREP
TELECOM ITALIA SPA	ITALY	SmartHEALTH	2	IP
TELECOMMUNICATIONS SYSTEMS INSTITUTE	GREECE	BIOPATTERN	1	NOE
TELEFONICA INVESTIGACION Y DESARROLLO SA UNIPERSONAL	SPAIN	CAALYX	6	STREP
TELIASONERA FINLAND OYJ	FINLAND	CARDITIS	1	STREP
TEPE TEKNOLOJIK SERVISLER ANONIM SIRKETI	TURKEY	ARTEMIS	1	STREP
TEPE TEKNOLOJIK SERVISLER ANONIM SIRKETI	TURKEY	SAPHIRE	4	STREP
THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF CAMBRIDGE	UNITED KINGDOM	CLINICIP	1	IP
THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF CAMBRIDGE	UNITED KINGDOM	I-KNOW	4	STREP
THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD	UNITED KINGDOM	@neurIST	4	IP
THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD	UNITED KINGDOM	ACGT	4	IP

LEGAL NAME	LEGAL COUNTRY	ACRONYM	CALL N°	CONTRACT TYPE
THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD	UNITED KINGDOM	STEP	4	CA
THE COOMBE WOMEN'S HOSPITAL	IRELAND	MicroActive	2	STREP
THE ENGINEERING AND PHYSICAL SCIENCES RESEARCH COUNCIL	UNITED KINGDOM	e-Health ERA	3	CA
THE LOWER SILESIA VOIVODSHIP	POLAND	RIGHT	4	STREP
THE NEXUS ASSOCIATION	SWITZERLAND	SmartHEALTH	2	IP
THE NEXUS ASSOCIATION	FRANCE	SmartHEALTH	2	IP
THE OPEN UNIVERSITY	UNITED KINGDOM	LHDL	4	STREP
THE OPEN UNIVERSITY	UNITED KINGDOM	SemanticMining	1	NOE
THE PROVOST FELLOWS AND SCHOLARS OF THE COLLEGE OF THE HOLY AND UNDIVIDED TRINITY OF QUEEN ELIZABETH NEAR DUBLIN	IRELAND	ALLADIN	1	STREP
THE RESEARCH INSTITUTE FOR THE CARE OF THE ELDERLY	UNITED KINGDOM	K4CARE	4	STREP
THE SOUTH MANCHESTER UNIVERSITY HOSPITALS NHS TRUST	UNITED KINGDOM	WOUNDMONITOR	4	STREP
THE THROMBOSIS RESEARCH INSTITUTE	UNITED KINGDOM	@neurIST	4	IP
THE UNIVERSITY OF BIRMINGHAM	UNITED KINGDOM	HealthAgents	4	STREP
THE UNIVERSITY OF EDINBURGH	UNITED KINGDOM	HealthAgents	4	STREP
THE UNIVERSITY OF EDINBURGH	UNITED KINGDOM	INFOBIOMED	1	NOE
THE UNIVERSITY OF GLASGOW	UNITED KINGDOM	SIMAP	4	STREP
THE UNIVERSITY OF MANCHESTER	UNITED KINGDOM	SeaLife	4	STREP
THE UNIVERSITY OF MANCHESTER	UNITED KINGDOM	WOUNDMONITOR	4	STREP
THE UNIVERSITY OF NEWCASTLE UPON TYNE	UNITED KINGDOM	OLDES	6	STREP
THE UNIVERSITY OF NEWCASTLE UPON TYNE	UNITED KINGDOM	SmartHEALTH	2	IP
THE UNIVERSITY OF NOTTINGHAM	UNITED KINGDOM	BIOPATTERN	1	NOE
THE UNIVERSITY OF NOTTINGHAM	UNITED KINGDOM	STEP	4	CA
THE UNIVERSITY OF QUEENSLAND	AUSTRALIA	ImmunoGrid	4	STREP
THE UNIVERSITY OF SHEFFIELD	UNITED KINGDOM	@neurIST	4	IP
THE UNIVERSITY OF SHEFFIELD	UNITED KINGDOM	STEP	4	CA
THE VICTORIA UNIVERSITY OF MANCHESTER	UNITED KINGDOM	INTREPID	1	STREP
THE VICTORIA UNIVERSITY OF MANCHESTER	UNITED KINGDOM	SemanticMining	1	NOE
THE WEIZMANN INSTITUTE OF SCIENCE LTD	ISRAEL	SIMAP	4	STREP
T-SERVICE S.R.L.	ITALY	RIGHT	4	STREP
TURUN YLIOPISTO	FINLAND	CARDITIS	1	STREP
TXT E-SOLUTIONS SPA	ITALY	DOC@HAND	1	STREP
TYTEX A/S	DENMARK	OFSETH	4	STREP
UNDEFINED	UNITED KINGDOM	CLINICIP	1	IP
UNDEFINED	UNITED KINGDOM	SmartHEALTH	2	IP
UNINOVA - INSTITUTO DE DESENVOLVIMENTO DE NOVAS TECNOLOGIAS	PORTUGAL	BIOPATTERN	1	NOE
UNIPATH LIMITED	UNITED KINGDOM	SmartHEALTH	2	IP
UNIVERSIDAD DE MALAGA	SPAIN	ACGT	4	IP
UNIVERSIDAD DE ZARAGOZA	SPAIN	DESSOS	4	STREP
UNIVERSIDAD POLITECNICA DE MADRID	SPAIN	@HEALTH	3	SSA
UNIVERSIDAD POLITECNICA DE MADRID	SPAIN	ACGT	4	IP
UNIVERSIDAD POLITECNICA DE MADRID	SPAIN	COCOON	1	IP
UNIVERSIDAD POLITECNICA DE MADRID	SPAIN	INFOBIOMED	1	NOE
UNIVERSIDAD POLITECNICA DE MADRID	SPAIN	MYHEART	1	IP
UNIVERSIDAD POLITECNICA DE MADRID	SPAIN	PIPS	1	IP
UNIVERSIDAD POLITECNICA DE VALENCIA	SPAIN	MYHEART	1	IP
UNIVERSIDAD POLITECNICA DE VALENCIA	SPAIN	SHARE	4	SSA
UNIVERSIDAD ROVIRA I VIRGILI	SPAIN	K4CARE	4	STREP
UNIVERSIDAD ROVIRA I VIRGILI	SPAIN	SmartHEALTH	2	IP

LEGAL NAME	LEGAL COUNTRY	ACRONYM	CALL N°	CONTRACT TYPE
UNIVERSIDADE DE AVEIRO	PORTUGAL	INFOBIOMED	I	NOE
UNIVERSITA "CAMPUS BIO-MEDICO" DI ROMA	ITALY	ALLADIN	I	STREP
UNIVERSITA "CAMPUS BIO-MEDICO" DI ROMA	ITALY	TACIT	I	STREP
UNIVERSITA CATTOLICA DEL SACRO CUORE	ITALY	AMICA	I	STREP
UNIVERSITA CATTOLICA DEL SACRO CUORE	ITALY	ViroLab	4	STREP
UNIVERSITA DEGLI STUDI DI BRESCIA	ITALY	ViroLab	4	STREP
UNIVERSITA DEGLI STUDI DI CATANIA	ITALY	ImmunoGrid	4	STREP
UNIVERSITA DEGLI STUDI DI FIRENZE	ITALY	BIOPATTERN	I	NOE
UNIVERSITA DEGLI STUDI DI FIRENZE	ITALY	MYHEART	I	IP
UNIVERSITA DEGLI STUDI DI GENOVA	ITALY	DOC@HAND	I	STREP
UNIVERSITA DEGLI STUDI DI GENOVA	ITALY	Health-e-Child	4	IP
UNIVERSITA DEGLI STUDI DI MILANO	ITALY	BIOPATTERN	I	NOE
UNIVERSITA DEGLI STUDI DI MILANO - BICOCCA	ITALY	HEARTFAID	4	STREP
UNIVERSITA DEGLI STUDI DI MILANO - BICOCCA	ITALY	NEUROWEB	4	STREP
UNIVERSITA DEGLI STUDI DI PADOVA	ITALY	MYHEART	I	IP
UNIVERSITA DEGLI STUDI DI PARMA	ITALY	HEALTH-PLUS	4	STREP
UNIVERSITA DEGLI STUDI DI PARMA	ITALY	MULTI-KNOWLEDGE	4	STREP
UNIVERSITA DEGLI STUDI DI PARMA	ITALY	PIPS	I	IP
UNIVERSITA DEGLI STUDI DI PERUGIA	ITALY	K4CARE	4	STREP
UNIVERSITA DEGLI STUDI DI SIENA	ITALY	EuResist	4	STREP
UNIVERSITA DEGLI STUDI DI TRENTO	ITALY	SmartHEALTH	2	IP
UNIVERSITA DEGLI STUDI MAGNA GRAECIA DI CATANZARO	ITALY	HEARTFAID	4	STREP
UNIVERSITA DELLA CALABRIA	ITALY	HEARTFAID	4	STREP
UNIVERSITA DI PISA	ITALY	BIOPATTERN	I	NOE
UNIVERSITA DI PISA	ITALY	MYHEART	I	IP
UNIVERSITA TA MALTA	MALTA	BIOPATTERN	I	NOE
UNIVERSITAET DES SAARLANDES	GERMANY	ACGT	4	IP
UNIVERSITAET DES SAARLANDES	GERMANY	RIDE	4	STREP
UNIVERSITAET DES SAARLANDES	GERMANY	SemanticMining	I	NOE
UNIVERSITAET GRAZ	AUSTRIA	CLINICIP	I	IP
UNIVERSITAET HAMBURG	GERMANY	ACGT	4	IP
UNIVERSITAET LEIPZIG	GERMANY	SemanticMining	I	NOE
UNIVERSITAET STUTTGART	GERMANY	ViroLab	4	STREP
UNIVERSITAET WIEN	AUSTRIA	@neurIST	4	IP
UNIVERSITAETSKLINIKUM AACHEN	GERMANY	MYHEART	I	IP
UNIVERSITAETSKLINIKUM FREIBURG	GERMANY	@neurIST	4	IP
UNIVERSITAETSKLINIKUM FREIBURG	GERMANY	AMICA	I	STREP
UNIVERSITAETSKLINIKUM FREIBURG	GERMANY	I-KNOW	4	STREP
UNIVERSITAETSKLINIKUM FREIBURG	GERMANY	SemanticMining	I	NOE
UNIVERSITAETSKLINIKUM HAMBURG-EPPENDORF	GERMANY	I-KNOW	4	STREP
UNIVERSITAIR MEDISCH CENTRUM UTRECHT	THE NETHERLANDS	@neurIST	4	IP
UNIVERSITAIR MEDISCH CENTRUM UTRECHT	THE NETHERLANDS	ViroLab	4	STREP
UNIVERSITAT AUTONOMA DE BARCELONA	SPAIN	HealthAgents	4	STREP
UNIVERSITAT DE VALENCIA	SPAIN	HealthAgents	4	STREP
UNIVERSITAT POMPEU FABRA	SPAIN	@neurIST	4	IP
UNIVERSITATII ECOLOGICE DIN BUCURESTI	ROMANIA	BIOPATTERN	I	NOE
UNIVERSITE CLAUDE BERNARD LYON I	FRANCE	I-KNOW	4	STREP
UNIVERSITE DE GENEVE	SWITZERLAND	@neurIST	4	IP
UNIVERSITE DE GENEVE	SWITZERLAND	SemanticMining	I	NOE
UNIVERSITE DE RENNES I	FRANCE	ACGT	4	IP
UNIVERSITE JEAN MONNET SAINT ETIENNE	FRANCE	SemanticHEALTH	4	SSA

LEGAL NAME	LEGAL COUNTRY	ACRONYM	CALL N°	CONTRACT TYPE
UNIVERSITE JOSEPH FOURIER GRENOBLE I	FRANCE	NOESIS	I	IP
UNIVERSITE LIBRE DE BRUXELLES	BELGIUM	LHDL	4	STREP
UNIVERSITE LIBRE DE BRUXELLES	BELGIUM	STEP	4	CA
UNIVERSITE PIERRE MENDES FRANCE	FRANCE	NOESIS	I	IP
UNIVERSITEIT VAN AMSTERDAM	THE NETHERLANDS	ACGT	4	IP
UNIVERSITEIT VAN AMSTERDAM	THE NETHERLANDS	INFOBIOMED	I	NOE
UNIVERSITEIT VAN AMSTERDAM	THE NETHERLANDS	ViroLab	4	STREP
UNIVERSITY COLLEGE LONDON	UNITED KINGDOM	Health-e-Child	4	IP
UNIVERSITY COLLEGE LONDON	UNITED KINGDOM	Q-REC	4	SSA
UNIVERSITY COLLEGE LONDON	UNITED KINGDOM	SemanticHEALTH	4	SSA
UNIVERSITY COLLEGE LONDON	UNITED KINGDOM	SemanticMining	I	NOE
UNIVERSITY COLLEGE LONDON	UNITED KINGDOM	STEP	4	CA
UNIVERSITY COLLEGE LONDON	UNITED KINGDOM	ViroLab	4	STREP
UNIVERSITY HEALTH NETWORK	CANADA	PIPS	I	IP
UNIVERSITY OF BEDFORDSHIRE	UNITED KINGDOM	@neurIST	4	IP
UNIVERSITY OF BEDFORDSHIRE	UNITED KINGDOM	LHDL	4	STREP
UNIVERSITY OF BEDFORDSHIRE	UNITED KINGDOM	STEP	4	CA
UNIVERSITY OF BRIGHTON	UNITED KINGDOM	SemanticMining	I	NOE
UNIVERSITY OF CRETE	GREECE	ACGT	4	IP
UNIVERSITY OF CRETE	GREECE	BIOPATTERN	I	NOE
UNIVERSITY OF DURHAM	UNITED KINGDOM	@neurIST	4	IP
UNIVERSITY OF LEICESTER	UNITED KINGDOM	INFOBIOMED	I	NOE
UNIVERSITY OF LIMERICK	IRELAND	CAALYX	6	STREP
UNIVERSITY OF LIVERPOOL	UNITED KINGDOM	BIOPATTERN	I	NOE
UNIVERSITY OF LIVERPOOL	UNITED KINGDOM	PIPS	I	IP
UNIVERSITY OF PATRAS	GREECE	MATCH	4	STREP
UNIVERSITY OF PATRAS	GREECE	NEUROWEB	4	STREP
UNIVERSITY OF PATRAS	GREECE	RIGHT	4	STREP
UNIVERSITY OF PLYMOUTH	UNITED KINGDOM	BIOPATTERN	I	NOE
UNIVERSITY OF PLYMOUTH	UNITED KINGDOM	CAALYX	6	STREP
UNIVERSITY OF SOUTHAMPTON	UNITED KINGDOM	ARTEMIS	I	STREP
UNIVERSITY OF SOUTHAMPTON	UNITED KINGDOM	DESSOS	4	STREP
UNIVERSITY OF SOUTHAMPTON	UNITED KINGDOM	HealthAgents	4	STREP
UNIVERSITY OF THE WEST OF ENGLAND, BRISTOL	UNITED KINGDOM	Health-e-Child	4	IP
UNIVERSITY OF THE WEST OF ENGLAND, BRISTOL	UNITED KINGDOM	SHARE	4	SSA
UNIVERZA V LJUBLJANI, FAKULTETA ZA ELEKTROTEHNIKO	REP. OF SLOVENIA	ALLADIN	I	STREP
UNIVERZITA KARLOVA V PRAZE	CZECH REP.	CLINICIP	I	IP
UNIVERZITA KARLOVA V PRAZE	CZECH REP.	HEALTH-PLUS	4	STREP
UNIVERZITA KARLOVA V PRAZE	CZECH REP.	OLDES	6	STREP
UNIWERSYTET JAGIELLONSKI	POLAND	e-Health ERA	3	CA
UNIWERSYTET JAGIELLONSKI	POLAND	HEARTFAID	4	STREP
UNIWERSYTET JAGIELLONSKI	POLAND	MATCH	4	STREP
UPDATE SOFTWARE LIMITED	UNITED KINGDOM	AMICA	I	STREP
UPPSALA UNIVERSITET	SWEDEN	SemanticHEALTH	4	SSA
UPPSALA UNIVERSITET	SWEDEN	SemanticMining	I	NOE
UST UMWELTSYSTEMTECHNIK GMBH	GERMANY	WOUNDMONITOR	4	STREP
USTANOVA PROREC.SI	REP. OF SLOVENIA	Q-REC	4	SSA
VAESTRA GOETALANDS LAENS LANDSTING	SWEDEN	SemanticMining	I	NOE
VASILEIOS TSIPAS KAI SIA O.E.	GREECE	INTREPID	I	STREP
VELTI ANONYMI ETAIREIA PROIONTON LOGISMIKOU & SYNAFON PRIONTON & PIRESION	GREECE	NEUROWEB	4	STREP

LEGAL NAME	LEGAL COUNTRY	ACRONYM	CALL N°	CONTRACT TYPE
VERENIGING VOOR CHRISTELIJK HOGER ONDERWIJS, WETENSCHAPPELIJK ONDERZOEK EN PATIENTENZORG	THE NETHERLANDS	INFOBIOMED	1	NOE
VIESOJI ISTAIGA KAUNO MEDICINOS UNIVERSITETO KLINIKOS	REP. OF LITHUANIA	WOUNDMONITOR	4	STREP
VIROLOGY EDUCATION B.V.	THE NETHERLANDS	ViroLab	4	STREP
VIRTUAL KNOWLEDGE S.A.	SPAIN	Health-e-Child	4	IP
VMW SOLUTIONS LTD	UNITED KINGDOM	HEARTFAID	4	STREP
VSEOBECNA FAKULTNI NEMOCNICE V PRAZE	CZECH REP.	K4CARE	4	STREP
W. ZIMMERMANN GMBH & CO KG	GERMANY	MYHEART	1	IP
WESTPFALZ-KLINIKUM GMBH	GERMANY	EMERGE	6	STREP
WILLIAM COOK EUROPE APS	DENMARK	@neurIST	4	IP
WORLD HEALTH ORGANIZATION	INTERNATIONAL ORGANISATION	SemanticHEALTH	4	SSA
WORLD HEALTH ORGANIZATION	INTERNATIONAL ORGANISATION	TMA-BRIDGE	1	SSA
WORLD MATCH LIMITED	MALTA	HEALTH-PLUS	4	STREP
WTC, WICHT TECHNOLOGIE CONSULTING - DR. HENNING WICHT	GERMANY	SmartHEALTH	2	IP
ZARLINK SEMICONDUCTOR LIMITED	UNITED KINGDOM	SmartHEALTH	2	IP
ZENON S.A. ROBOTICS AND INFORMATICS	GREECE	ALLADIN	1	STREP
		MULTI-KNOWLEDGE	4	STREP
		SHARE	4	SSA

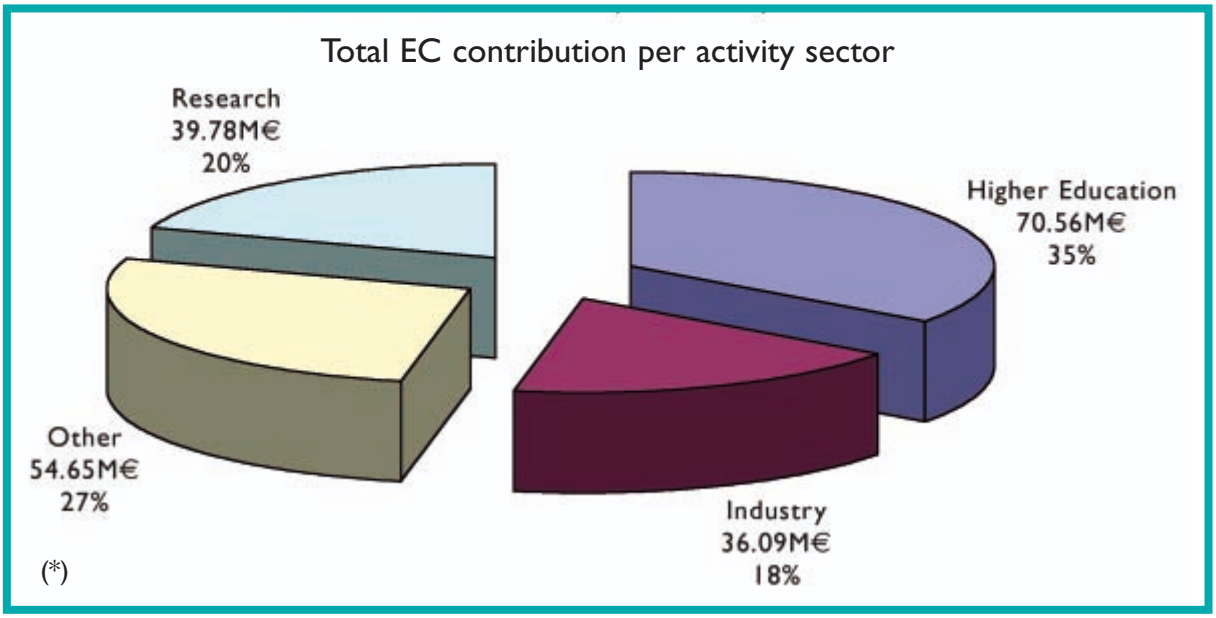
Annex IV - The portfolio of projects in figures

The following data are statistics describing the portfolio of projects of the ICT for Health unit for the FP6. These data represent a fair snapshot of the different calls.

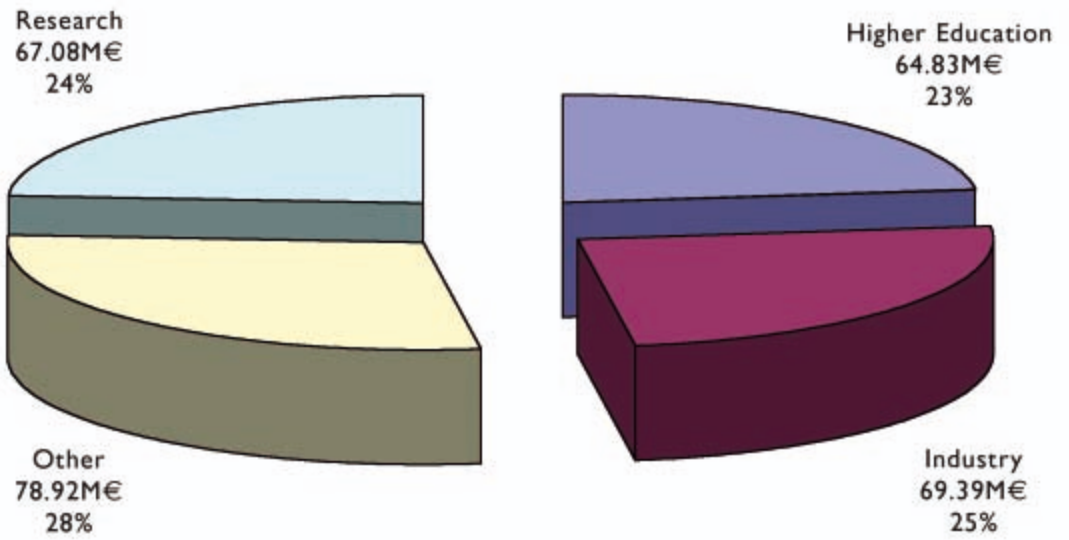
Furthermore, we would like to draw your attention to the fact that the Commission services have not yet attempted to draw any conclusion from the statistics represented.

Distribution of the EC contribution

Distribution per type of activity sector

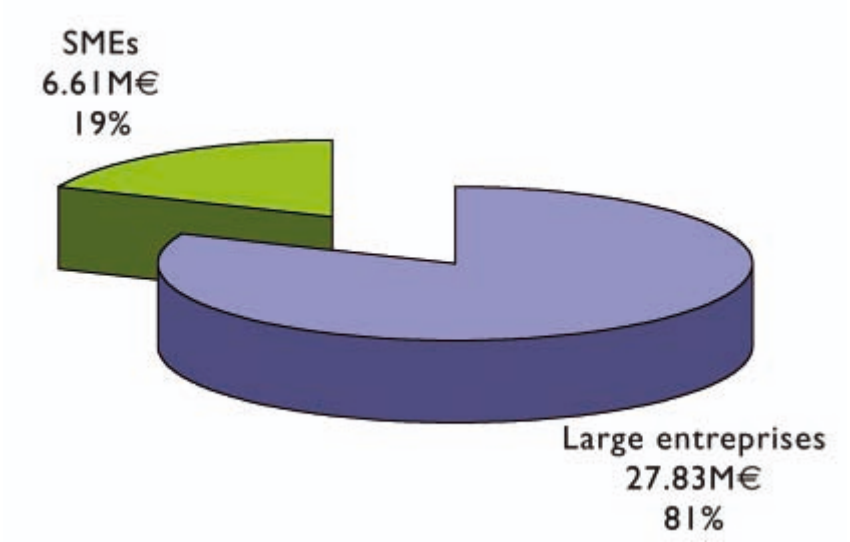


Total Participants costs / Organisation activity type

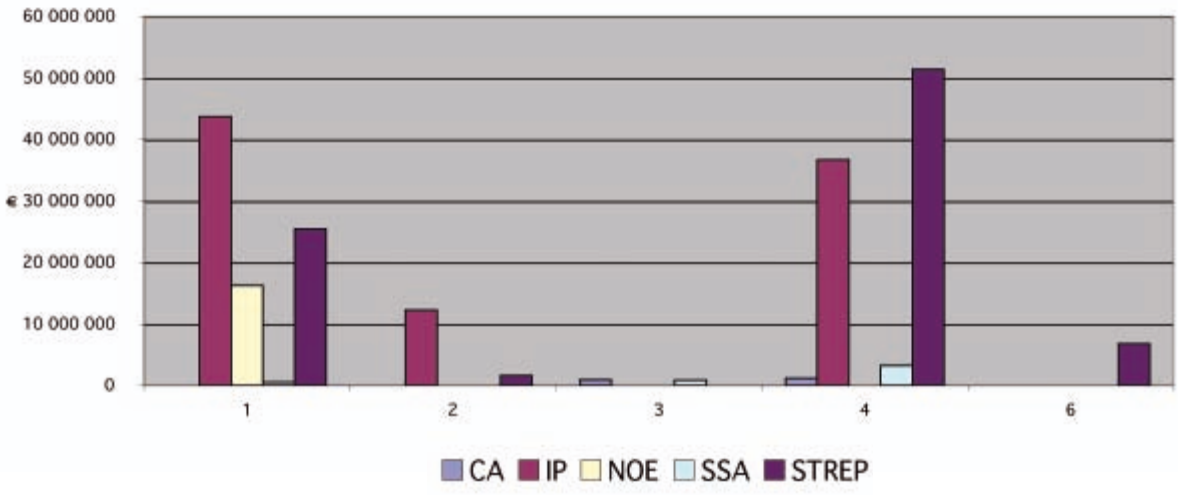


(*)

Total Industry particpation

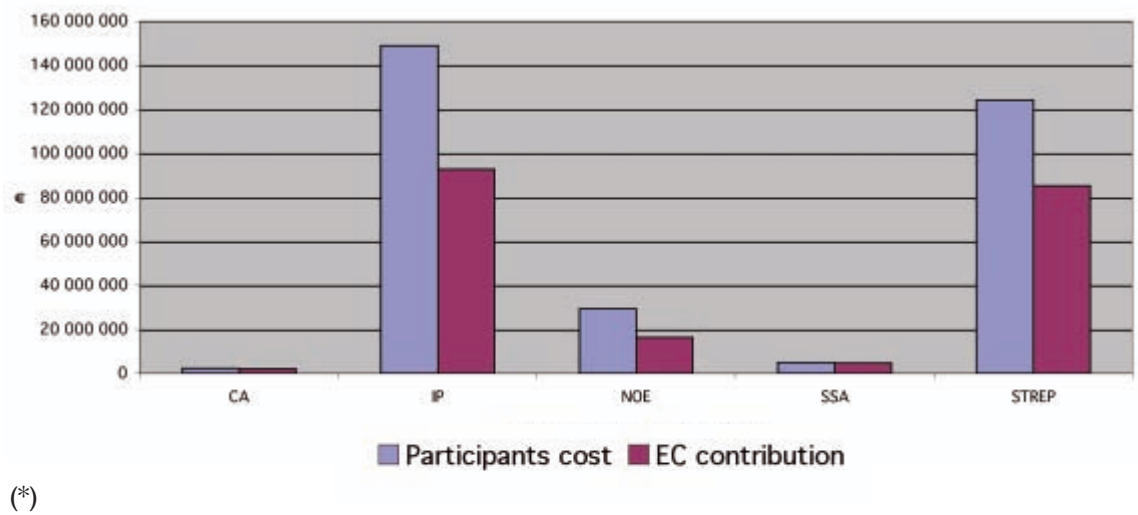


EC contribution per instrument per call



(*)

Total budget per instrument (all call)



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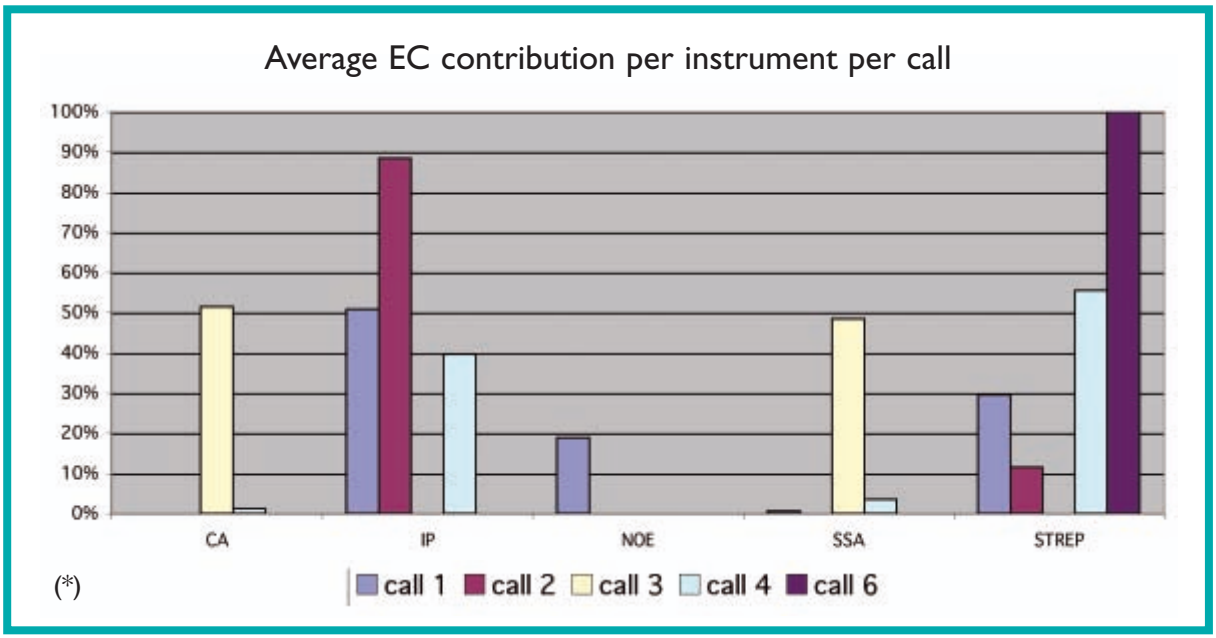

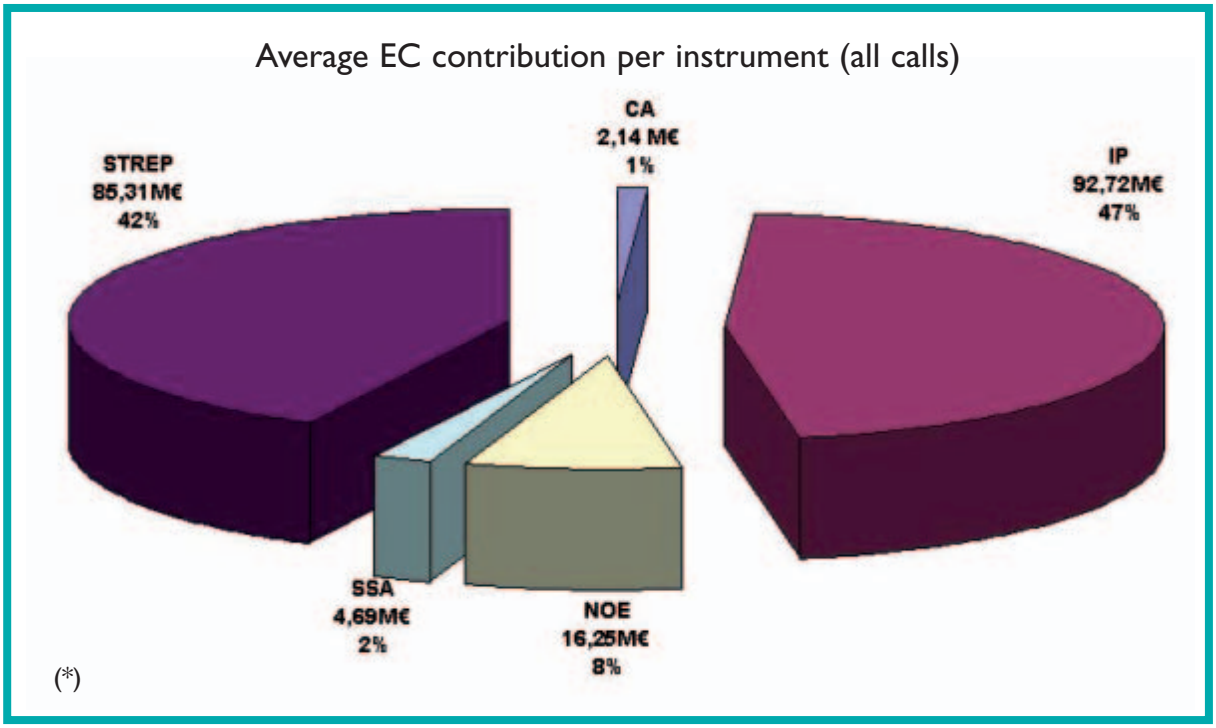

(*) Type of Instruments:

CA: Concerted Actions

IP: Integrated Projects

NOE: Networks of Excellence

STREP: Specific targeted research projects

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