

Luxembourg Ministry of Health eHealth Service Platform Study



Final report



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de la Santé

Table of contents

1	Executive summary	1
2	Context and objectives	8
2.1	International context of eHealth	8
2.2	Luxembourg eHealth context	11
2.3	Project objectives	14
3	Comparative analysis on selected eHealth initiatives	15
3.1	Potential eHealth services for Luxembourg	15
3.2	Comparison of similar eHealth initiatives	16
3.3	Conclusions	27
4	Prerequisites for Platform cost estimation	28
4.1	The need for a dedicated agency	28
4.2	List of potential workstreams to be carried out by the Agency	32
4.3	Decisions to be taken regarding setup and operating the Platform	32
4.4	Services to be implemented on the Platform	33
5	Cost and benefits of the Luxembourg Platform	38
5.1	Platform architecture for the years 2011 to 2015	38
5.2	Platform cost model	43
5.3	Benefits of the Platform	61
6	Conclusion and recommendations	73
6.1	Findings of the study	73
6.2	Recommendations	80
7	Appendix	95
7.1	Approach and methodology	95
7.2	Meetings	100
7.3	Strategy workshop results	101
7.4	Details of long listed projects	114
7.5	Details of short listed projects	166
7.6	Further cost model source data	220
7.7	Acknowledgements	224
7.8	Literature	225



Tables

Table 1: Socio-economic and demographic criteria related to healthcare and eHealth matters	18
Table 2: Strengths and weaknesses of a centralised vs. a decentralised approach.....	25
Table 3: Details of the Platform service lifecycle.....	36
Table 4: Differences between maximum and minimum budget scenario	47
Table 5: Budget by workstream.....	48
Table 6: Budget estimation for the workstream “National HCIMS strategy”	50
Table 7: Budget estimation for the workstream “Convergence and Interoperability”	54
Table 8: Budget estimation for the workstream “Technical platform and services setup”	55
Table 9: Budget estimation for the workstream “Data sharing and value-added services”	57
Table 10: Budget estimation for the workstream “Scope definition and solution outline”	58
Table 11: Budget estimation for the workstream “Other services”	59
Table 12: Budget estimation for the workstream “Upcoming projects”	60
Table 13: Budget by year	61
Table 14: Programme-related benefits by trigger.....	68
Table 15: Workstream-related benefits by trigger	70
Table 16: Generic services-related benefits by trigger.....	71
Table 17: Value-added services-related benefits by trigger	72
Table 18: Recommendations regarding a dedicated agency	82
Table 19: Stakeholder engagement recommendations.....	83
Table 20: Governance recommendations.....	85
Table 21: Architecture and sourcing recommendations	86
Table 22: Workstream recommendations	87
Table 23: Recommendations with regard to services	89
Table 24: Interoperability recommendations	90
Table 25: Recommendations regarding flawless Platform reputation	92
Table 26: Measurement recommendations	94
Table 27: Service needs identified in the eSanté-EFES study	96
Table 28: Long list of eHealth projects.....	97
Table 29: Comparison of short listed eHealth initiatives	168
Table 30: Salary table	220
Table 31: Agency staff evolution (minimum budget scenario).....	221
Table 32: Agency staff evolution (maximum budget scenario).....	221
Table 33: Platform ICT infrastructure setup and operations.....	222

Figures

Figure 1: Expected eHealth contribution, healthcare delivery impact.....	9
Figure 2: Luxembourg key services and their implementation status in similar eHealth initiatives .	19
Figure 3: Platform service lifecycle	34
Figure 4: Platform architecture	38
Figure 5: Roadmap for eSanté programme (maximum budget scenario, 2011 to 2015)	45
Figure 6: Roadmap for eSanté programme (minimum budget scenario, 2011 to 2015)	46
Figure 7: Benefits of the Swedish Strategy for eHealth for patients and users.....	129



1 Executive summary

This report analyses the opportunities for Luxembourg to implement an interoperability platform for electronic health services and provides recommendations for this platform as well as for related preliminary decisions to be taken.

Healthcare provision is becoming more and more expensive

Healthcare (HC) is globally impacted by a combination of powerful trends:

- The demographic shift towards an ageing population;
- A rise of chronic diseases;
- An increasing demand for quality healthcare services; and
- Difficulty to control expenditures and to assign incentives in a fair way.

Consequently, healthcare cost is continuously rising. If ignored, these trends will overwhelm health systems, creating massive financial burdens for countries, with the repercussions on the individuals.

Luxembourg cannot withdraw from these trends and is seeking sustainable solutions: interoperability between healthcare information management systems comes into focus

In 2006, the Government Council of Luxembourg approved a national eHealth plan¹ which was developed by a working group of stakeholders in the healthcare sector in Luxembourg. This national eHealth plan recommended² a number of measures with regard to interoperability such as the implementation of a common telematic platform to support sharing and exchange of medical information but also a number of healthcare specific applications.

Although a challenge, interoperability must be analysed

The national eHealth plan already pointed out that interoperability is a major challenge, as well as organisational challenges. However, the national eHealth plan was still too high-level, without a clearly defined and realistic implementation scenario. In particular, a specific interoperability roadmap was missing. Hence, this roadmap and the related interoperability platform have become a priority.

As the Ministry of Health of Luxembourg wishes to define the optimal way to move forward in the national eHealth programme, PwC has been requested to conduct a study on the costs and benefits of an interoperability platform for Luxembourg. This study comprises a comparative analysis of eHealth services in other countries and transposes the results – where applicable – to the Luxembourg healthcare context.

¹ http://www.sante.public.lu/fr/systeme-sante/programme-esante/esante_plan_actions_detail_060704_060926.pdf, accessed 24/06/2010

² eHealth ERA report - March 2007 - Overview of Luxembourg eHealth priorities and strategies, http://ec.europa.eu/information_society/activities/health/docs/policy/ehealth-era-full-report.pdf, accessed 24/06/2010

Other countries provide lessons learned

We have learned from the evaluated eHealth projects that

1. Governance definition should be one of the first steps when implementing eHealth services;
2. Continuous stakeholder involvement is a critical success factor, stakeholders need to be involved early on;
3. ICT³ solution providers, subcontractors and project managers should actively discuss stakeholder requirements with regard to eHealth services;
4. Key stakeholders should provide beta-testers for the ICT solutions enabling the eHealth services;
5. In order to facilitate user adoption:
 - a. ICT solutions should be easy to use;
 - b. Users need to be convinced that their data is protected at all times;
 - c. Patients need to be able to grant and revoke access on their data;
 - d. Sharing and exchange of crucial medical information should be enhanced in order to make HC professionals most comfortable in their diagnosis and treatment decisions. This could for example reduce adverse drug events.
6. Their scopes are limited to regional or national interoperability topics but that in the long term, pan-European interoperability solutions may come into focus.

A roadmap with workstreams, a dedicated institution, and an interoperability platform with its services are the building blocks of Luxembourg's future eHealth programme

The roadmap is the high-level plan for the activities with regard to interoperability over the budget period (the years 2011 to 2015). This roadmap contains a number of workstreams with regard to:

- National Healthcare Information Management Systems strategy;
- Convergence and Interoperability of healthcare information management systems in use in Luxembourg;
- Technical platform⁴ and generic services⁵ setup;
- Data sharing and value-added services⁶;
- Scope definition and solution outline of priority projects, for which technically mature solutions are yet not available;
- Other eHealth initiatives to materialise synergy effects and organisational efficiency;
- Upcoming projects.

³ Information and Communication Technology

⁴ The interoperability platform ("the Platform") is a secured infrastructure to facilitate the exchange and sharing of information between healthcare providers, patients and health administrations, by enclosing and providing a set of dedicated applications and functionalities (the "services")

⁵ Generic services aim at providing a communication infrastructure allowing a secure exchange of medical information and a controlled access to the services.

⁶ Value-added services are healthcare-specific services for sharing and exchanging medical information. They provide tangible added value from a stakeholder point of view and are enabled by generic services.

As the results from other projects show, a dedicated institution seems the most appropriate solution to manage these workstreams. We will call this institution “the Agency”.

For the Platform, we have considered a number of generic services such as a Trusted Third Party (TTP) service, consent management, and HC professional register to name a few. Among the value-added services, there is the Electronic Health Record (EHR) providing a patient-centric, a case-centric and an aggregated results view on patient data. The EHR consists of a number of sub-services, e.g. radiology and laboratory history results, medication dispense and medical summary. Other important value-added services are the Electronic prescription service (ePrescription) and a related Decision support service (DSS).

For the whole budget period (the years 2011 to 2015), the roadmap leads to funding needs ranging from 22,6 M€ to 37,2 M€.

As a number of uncertainties exist at this stage, we have derived two budget scenarios from the roadmap, a minimum and a maximum budget scenario. The budget scenarios differ in parameter values (such as annual ICT maintenance fee rate and salaries for Agency staff) but also in the implementation plan of some services⁷ and in technical change management support. In the minimum budget scenario, a number of services have been deferred for one to two years (ePrescription, basic DSS, COMR⁸, and Affiliation control⁹). The amounts mentioned above cover all activities with regard to interoperability for the years 2011 to 2015 in the respective scenario.

Benefits exceed the costs but it takes time and they are difficult to measure

Measuring expected benefits of such complex, multidimensional, long-term projects is anything but straightforward. As a report from the Congress of the United States indicates, “no aspect of health IT entails as much uncertainty as the magnitude of its potential benefits”¹⁰. In any case, the positive impact of ICT on quality of care is recognised and should be considered as one of the main objectives of every eHealth project. Benefits to society eventually exceed the costs, albeit quite often only after a considerable length of time, still justifying the investment. Substantial savings from EHR (and healthcare information exchange and interoperability) implementation are possible. Yet, it takes at least four, and more typically, up to nine years before initiatives produce their first positive annual socio-economic returns, and six to eleven years to achieve a cumulative net benefit.

We define a benefit as a direct or indirect positive effect initiated by the adoption and the use of eHealth services by concerned users. The most important benefits are:

⁷ For details, cf. section 5.2.1

⁸ Cancer-oriented medical record

⁹ Online verification of the patient's insurance status

¹⁰ Congress of the United States (2008): “Evidence on the Costs and Benefits of Health Information Technology”, a CBO Paper, Congressional Budget Office, May 2008, <http://www.cbo.gov/ftpdocs/91xx/doc9168/05-20-HealthIT.pdf>, accessed 24/07/2010

1. The establishment of a dedicated, empowered agency (“the Agency”) provides benefits to all stakeholders as this combines the forces of the HC sector, reduces risks of redundancy and provides synergy effects;
2. Engaging with stakeholders is the foundation to make all HC sector members collaborate and go into one direction under the lead of the Ministry of Health and the Ministry of Social Security;
3. The centralised/decentralised hosting approach provides organisational efficiency and makes the Platform less dependent from large-scale WAN¹¹. A number of connected applications need not be online 24/7 as the data can be centralised on the Platform;
4. The right sourcing strategy allows the Agency to focus on its core business. Pure technical infrastructure can be outsourced;
5. A Continuous Improvement Process (CIP) unites all HC stakeholders and improves HC sector communication. As all improvements are centrally managed by the CIP Working group reporting to the Agency’s Supervisory Board, the risk of redundant projects is reduced and Platform adoption should be enhanced;
6. The activities of the Convergence and Interoperability workstream provide the basis for seamless sharing and exchange of medical information. Financial incentives to HC professionals and ICT solution providers should motivate them to implement and use the Platform;
7. The Trusted Third Party (TTP) generic service leads to improved HC sector communication as it will be used by other stakeholders, too. It enables a better control environment, and provides the foundation to seamless sharing and exchange of medical information. TTP also provides efficiency, effectiveness and should thus enhance Platform adoption;
8. The EHR and its sub-services provide most of the benefits. It is the centrepiece of the Platform and the value-added services. Benefits range from improved HC sector communication, decision-making, efficiency, patient health as well as seamless sharing and exchange of medical information – just to name a few;
9. Integrating eHealth initiatives currently managed by other institutions into the Platform also achieves many benefits. This task should materialise synergy effects, improve the decision-making process and lead to better control environments and organisational efficiency.

¹¹ Wide Area Network

The government should take a number of important decisions

1. Create a dedicated empowered Agency

Although the current organisation of the eSanté programme (*Comité du Programme, Conseil National pour l'eSanté* and the eSanté team), has proven to be successful so far, this organisation form has reached its limits with regard to conducting the even more challenging projects of the future. In fact, the future projects will require more resources and a dedicated organisation for steering these complex projects. As many ICT solution components constitute the architecture for the future Platform and in order to perform proactive coaching for their users, a strong and close dialogue is needed with the commercial partners in this field.

A dedicated agency should therefore run the eSanté programme and operate the eHealth Platform. To do so, the Agency would need full political support by the supervising ministries of Health and of Social Security, a multi-year business plan, appropriate funding and staff.

A precise definition of the Agency's organisation as well as its steering and operational committees should exist prior to the establishment of the Agency. In this context, it is crucial that all the members of the healthcare sector are appropriately represented within the Agency's organisation.

2. Engage with stakeholders

Stakeholder engagement is crucial to make the Platform a successful endeavour. It is therefore necessary to take into account stakeholder needs and benefits at an early stage. This can be achieved by encouraging stakeholders to submit projects, and to involve them in the Platform definition and in the deployment phase. It is also important to coach users in the change management process from a technical and usage point of view. If the stakeholders' needs will be satisfied, a broad consensus in going forward with the national eHealth programme can be expected. This includes the users' willingness to share and exchange medical information using the Platform.

3. Define, setup and stick to governance rules

Clear governance is important to create a sustainable and efficient organisation and to leverage the empowerment assigned by the government. To successfully implement the eSanté programme, strong strategic and operational governance must support it.

4. Decide on Platform architecture and sourcing

We recommend a combined approach mainly using a centralised data repository and allowing the use of decentralised data repositories for special types of data such as medical images. We thus assume that medical imaging native data will be stored at the location where the images have been produced, but there will be a link repository pointing to those locations. Other data will be stored centrally in the ICT infrastructure of the Agency. This would avoid to develop costly 24/7 available decentralised data repositories.

In order to optimise budget use, a sourcing strategy should be defined with regard to Platform management. For the purpose of this study, we have assumed a Managed Services approach that outsources basic technical infrastructure management to a service provider. Only the management of healthcare-specific ICT infrastructure components remains in-house.

5. Setup workstreams and define services

The Agency should define and implement the workstreams mentioned above in order to support the strategic objectives of the government and the stakeholders of the health sector. In this context, the generic and value-added services should be implemented on the Platform. Depending on their current conceptual and technical maturity, we recommend that these services are hence defined, transferred into a pilot phase/Proof of Concept, deployed and maintained according to the roadmap.

6. Promote interoperability

To promote national interoperability, a dedicated working group as part of the Agency should be established. This group should elaborate the strategy and the reference models with regard to interoperability.

An incentive programme for healthcare professionals and ICT solution providers may be needed in order to accelerate the convergence of the healthcare information management systems to the adopted reference models for interoperability.

With regard to international interoperability, the specific situation of Luxembourg within the Greater Region, e.g. high proportion of cross-border commuters in the workforce, tourists, and a high patient affinity to cross-border healthcare services, should not be left out: For the period after 2015, international interoperability should become therefore more and more important. Architectural platform design thus has to take this into account already now.

7. Ensure flawless Platform reputation

If the users shall adopt the Platform and the services hosted thereon, it is essential that the Platform should strive to become a role model with regard to:

- Information security;
- Time to market;
- Usability/ICT solution ergonomics;
- Technical stability;
- Continuous improvement.

To achieve this, the Platform, the generic and the value-added services have to be thoroughly tested before go-live.

8. Measure progress

In order to support the Continuous Improvement Process, measurement systems should be defined and implemented. In this context, it is important to:

- Establish baseline measurements;
- Regularly follow-up on important metrics such as costs, benefits, and on other agreed success metrics.

2 Context and objectives

2.1 International context of eHealth

Healthcare is globally impacted by a combination of powerful trends:

- The demographic shift towards an ageing population;
- A rise of chronic diseases;
- An increasing demand for quality healthcare services; and
- Difficulty to control expenditures and to assign incentives in a fair way.

Consequently, healthcare cost is continuously rising. If ignored, these trends will overwhelm health systems, creating massive financial burdens for countries, with the repercussions on the individuals.

Healthcare organisations and governments in the EU Member states are thus urgently seeking solutions to both effectively and efficiently develop strategies to cope with the above-mentioned trends, and face the challenges of sustainability around cost, quality and consumer trust. Developing a sustainable health system hence remains the main challenge of the next decade.

According to Ljubisav Matejevic, founder and director of the Global E-Health Forum, new cost-efficient, reliable and interconnected systems can deal with the many challenges “as budgets are becoming more and more limited, and demand for high-quality healthcare services is increasing”¹².

Governments, networks of affiliated health-related organisations, and individual organisations will have to develop innovative solutions. Seven key goals, published in a previous PwC study¹³, should be considered:

1. Quest for Common Ground: a vision and strategy is needed to balance public versus private interests in building an infrastructure and in providing basic health benefits within the context of societal priorities;
2. A Digital Backbone: better use of technology and interoperable electronic networks accelerate integration, standardisation, and knowledge transfer of administrative and clinical information;
3. Incentive Realignment: incentive systems ensure and manage access to care while supporting accountability and responsibility for healthcare decisions;
4. Quality and Safety Standardisation: defined and enforced clinical standards establish mechanisms for accountability and enhanced transparency, thereby, building consumer trust;
5. Strategic Resource Deployment: resource allocation appropriately satisfies competing demands on systems to control costs while providing sufficient access to care for the most people;

¹² <http://www.ehealthnews.eu/events/2119-global-e-health-forum-to-present-strategies-solutions-and-services-for-sustainable-healthcare-delivery>, accessed 24/06/2010

¹³ Healthcast 2020: Creating a Sustainable Future, PriceWaterhouseCoopers Health Research Institute, 2005

6. Climate of Innovation: innovation, technology and process changes are a means to continuously improve treatment, efficiency and outcomes;
7. Adaptable Delivery Roles and Structures: flexible care settings and expanded clinical roles provide avenues for care that are centred on the needs of the patient.

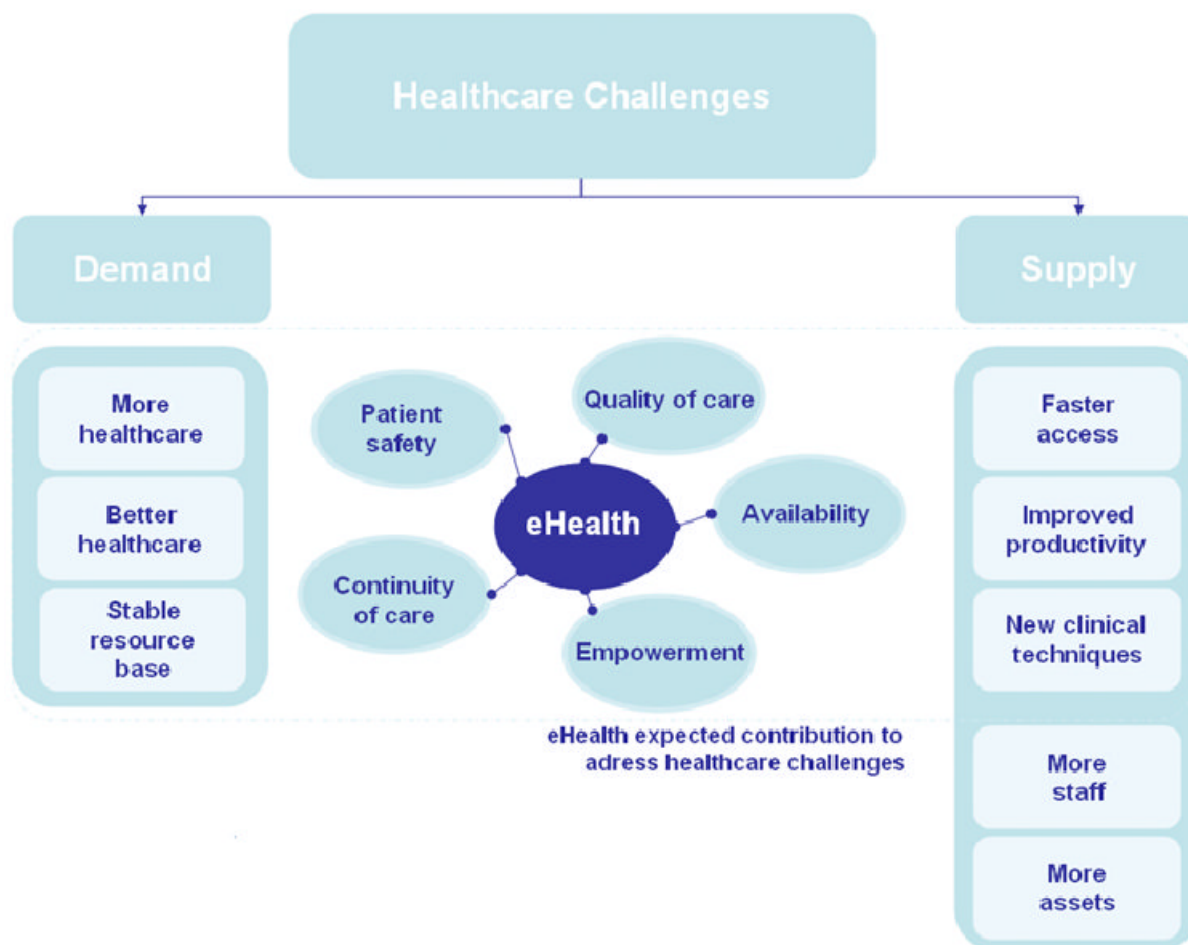


Figure 1: Expected eHealth contribution, healthcare delivery impact

The continuous development of the Internet, the ageing-issues and the growing shortage of doctors (especially, nurses in healthcare) will also foster the needs for dedicated healthcare ICT¹⁴ development. By developing availability, quality and appropriate use of data in the whole healthcare system, eHealth tools and solutions will contribute to improve health delivery, but also efficiency in the overall healthcare organisation, including with health authorities and professionals. This will

¹⁴ Information and Communication Technology

also lead to a new form of healthcare with other roles and responsibilities for physicians, health insurers and patients. IT, in general, and eHealth, in particular, can therefore lead to a paradigm shift in the healthcare sector.

For the purpose of the study, the ICT application of the healthcare sector will encompass the term eHealth, which can be defined as an “emerging field of medical informatics, referring to the organisation and the delivery of health services and information, using Internet and related technologies¹⁵”. In a broader sense, the term characterises not only a technical development, but also a new way of working, an attitude, and a commitment to improve healthcare locally, regionally, and globally by using information and communication technology (Eysenbach’s¹⁶ definition adapted by Pagliari).

Healthcare, by nature, has been delivered independently and in different ways (e.g. physician’s office, hospital, nursing station and patients’ homes). Concurrently, there is a greater focus on the delivery of primary healthcare through multidisciplinary teams. Coordination of this multidisciplinary care is critical to achieve optimal results. Traditionally, information regarding the care provided for patients is held by the facility where the care was delivered or by the provider who delivered the care. The information is not readily available to other authorized care providers. A significant number of the eHealth initiatives are intended to digitise healthcare information and make it more readily available at different points of care; these initiatives include the Electronic Health Record (EHR), Electronic Medical Record (EMR), clinical data repositories and registries at the national and regional levels¹⁷.

In order to overcome barriers for adoption of selected eHealth applications, some governments have developed incentive programmes. For instance, in the United States of America (USA), the concept of “meaningful use” of certified EHR technology has been introduced in 2009. Health professionals and hospitals are successfully making efforts to adopt, implement or upgrade certified EHR technology to receive incentive payments. This programme aims at improving health care quality, efficiency and patient safety, reducing health disparities, engaging patients and their families, and guaranteeing privacy rights and security protection for personal health information. The certification of “meaningful user” is given to health professionals and hospitals using EHR technology which accomplishes objectives, such as, using a Computerised Physician Order Entry (CPOE), drug and allergy checks, e-prescribing, generating lists of patients by specific condition, checking insurance eligibility electronically, or protecting electronic health information. The certification gives right to be eligible for payments of 40 000 USD to 60 000 USD for meaningful users starting in 2011. However, no incentive payments will be available for late adopters who first become eligible after 2014.

¹⁵ Pagliari et al. (2005): “What Is eHealth (4): A Scoping Exercise to Map the Field”, Journal of Medical Internet Research 2005;7(1):e9, <http://www.jmir.org/2005/1/e9>, accessed 29/06/2010,

¹⁶ Eysenbach G.: “What is e-health?”, Journal of Medical Internet Research 2001; Jun 18;3(2):e20, <http://www.jmir.org/2001/2/e20>, accessed 29/06/2010

¹⁷ http://www2.inforoute.ca/Documents/Telehealth%20Workshop_Converging%20Silos%20Report_EN.pdf, accessed 18/07/2010

Developments in information technology capabilities over recent decades are considered to have a significant potential to accomplish the goals in relation to aspects of quality healthcare provisions in the future¹⁸.

2.2 Luxembourg eHealth context

In 2005, the European Commission published an action plan “eEurope 2005” covering the following three aspects:

1. eHealth cards;
2. Health information networks;
3. Online health services.

To respond to this plan, in 2006, the Government Council of Luxembourg approved a national eHealth plan¹⁹ which was developed by a working group of stakeholders in the healthcare sector in Luxembourg. This national eHealth plan recommended²⁰:

- The creation of a permanent national eHealth Advisory Board, with specific thematic sub-groups or project groups;
- The implementation of a common telematic platform;
- The development of support for integrated healthcare and better sharing of information, through the definition of a common framework for:
 - Patient identification and consent;
 - Data security and data protection, to be achieved mainly by implementing an electronic health card solution;
 - Common guidelines and rules for data exchange;
 - Shared eHealth applications;
 - Interoperability, quality and codification of data, to be achieved mainly through certification of applications and adoption of international standards.
- The development of healthcare (HC) specific applications to run on such a platform, e.g.²¹:
 - Health records;
 - Electronic prescriptions;
 - Telemedicine;
 - Telemonitoring;
 - eHealth portal (Portail Santé)²²;

¹⁸ <http://healthit.hhs.gov/portal/server.pt?open=512&objID=1325&mode=2>, accessed 29/06/2010

¹⁹ http://www.sante.public.lu/fr/systeme-sante/programme-esante/esante_plan_actions_detail_060704_060926.pdf, accessed 24/06/2010

²⁰ eHealth ERA report - March 2007 - Overview of Luxembourg eHealth priorities and strategies, http://ec.europa.eu/information_society/activities/health/docs/policy/ehealth-era-full-report.pdf, accessed 24/06/2010

²¹ Présentation du programme national eSanté : <http://www.sante.public.lu/fr/systeme-sante/programme-esante/index.html>, accessed 15/07/2010

- eSanté-CARA (electronic exchange of medical summaries in radiology and medical images)²³;
- eSanté-LABO (application for storing and exchanging clinical biology results)²⁴;
- HealthNet (a secure communication network for the healthcare sector);
- Electronic transmission of mammography data.

The national eHealth plan already pointed out that interoperability is a major challenge, as well as organisational challenges. However, the national eHealth plan was still too high-level, without a clearly defined and realistic implementation scenario. In particular, a specific interoperability roadmap was missing.

Interoperability²⁵ is a key factor needed to enable sharing and exchange of medical data between healthcare information management systems (HCIMS). Secondly, secure patient and healthcare professional identification need to be implemented. However, this is not a new idea in Luxembourg. Several projects have already demonstrated Luxembourg's will to be a forerunner in this regard, e.g. CR Santec, with its projects LUXIS (Luxembourg Information Strategy) and the ISIS study, (Inventory of Health Informatics systems) that focused on acute Care Delivery Organisations (CDOs) and on Luxembourg hospitals, in particular.

Also, a common interoperability context had not yet been defined, except for the usage of HealthNet as a technical communication network. The existing eHealth projects had been defined prior to the adoption of the eHealth plan and therefore focussed on their specific needs. At the time, a global strategy or coordination of all of the eHealth projects had not been implemented. Common reference models (technical norms, terminologies, etc.) with regard to electronic medical data had not been defined, thus representing an important obstacle to interoperability and medical data sharing and exchange.

In order to overcome these obstacles a national eHealth programme (*programme eSanté*) of commonly steered projects was more precisely determined and a roadmap²⁶ and an action plan were defined in 2008.

The *programme eSanté* integrated eSanté-CARA as a project focussing on radiological and imaging data already. That project had been launched before as "*Carnet radiologique*

²² *Portail Santé* offers patients and healthcare professionals online access to useful health and social information, such as a disease dictionary, a presentation of the healthcare system in Luxembourg, as well as preventive advice and counselling on healthy diet, tobacco, AIDS, cancer, etc.

²³ eSanté-CARA aims to implement a national EMR of each patient. This record would contain medical images together with their reports, accessible to medical imaging providers (e.g. radiologists) in order to share data via a shared patient folder. The eSanté-CARA project currently works on a national standard catalogue of prescribable radiology examinations, the content and the format of radiology prescriptions as well as a common radiology reporting standard. For further information on eSanté-CARA, cf. www.santec.lu/project/esante/cara/start (accessed 15/07/2010)

²⁴ eSanté-LABO shall renew the current application in charge of storing and securely exchanging clinical biology results between laboratories and prescribers online, based on the international LOINC® standard. In this context, a LOINC® Luxembourg committee is currently being established and aims to develop and promote the LOINC® standard in Luxembourg. LOINC® stands for Logical Observation Identifiers Names and Codes, a database and universal standard for identifying medical laboratory observations.

²⁵ For further information on the types of interoperability cf. section 5.2.3.

²⁶ Luxembourg Ministry of Health (2010): "Livre Blanc sur l'Interopérabilité des Systèmes d'Information de Santé au Luxembourg", Whitebook, Draft v0.8, 28/01/2010

électronique". In the domain of clinical biology results, an application is in use since 2003, which enables secure sending of those results between laboratories and prescribers. However, the data exchanged is not shared in an EHR. The redefined projects eSanté-LABO and eSanté-CARA were hence defined as the first services of the future EHR²⁷ in Luxembourg.

The eSanté-EFES study (*Etude de l'existant, des besoins et de faisabilité pour l'eSanté*, performed by CR Santec²⁸) to illuminate the current situation, needs and priorities of the main users, as well as current data exchange practices. The study also analysed standards, reference models and best practices abroad, with a view to technical, functional and organisational concepts for the platform and its major applications.

The conceptual parts of the eSanté-EFES study enabled the Ministry of Health to obtain a clearer implementation perspective. The study more profoundly analysed use cases and technical aspects of the eSanté-CARA and -LABO projects. Initially, the idea was to launch a pilot with limited actors and a scaled down, but robust "quick win" application. This initial scenario included building a prototype platform for eSanté-CARA and -LABO by CR Santec, with limited features, but including all relevant security aspects. Building such a quick win prototype at CR Santec, respecting security, data protection and operational requirements, to be able to operate a pilot with real patient data, turned out not to be realistic. This was due to two reasons: The assigned resources were insufficient and the additional investment required was deemed too important for a provisional solution not meant to be rolled out at large scale. This changed the whole perspective as this brought forth the option to leave out the intermediate step of a prototype platform, and to immediately focus on a version 1.0 platform with a commercial partner.

Other projects in healthcare ICT that have recently been implemented in Luxembourg:

- A dedicated ICT solution (BioMap) for the Integrated Biobank of Luxembourg (IBBL): a Java-based ICT infrastructure to support management of tissue sample collection and conservation;
- A Trusted Third Party (TTP) solution within the IBBL context and potentially the future eHealth platform. The aim of the TTP is to ensure the anonymity of the patient and information security, while creating individual data for research purposes. The concepts used for building the TTP infrastructure with a commercial partner were elaborated as a joint effort of IBBL and eSanté teams by CR Santec. This aimed to obtain synergy effects and converging solutions;
- The sectorial IT centre (CIS, *Centre Informatique Sectoriel*) for hospitals is a Shared Service Centre for members of the Luxembourg hospital association (EHL, *Entente des Hôpitaux Luxembourgeois*). The CIS aims to contribute to the convergence of the EHL members, leveraging economies of scale by defining common requirements, and selecting, deploying and operating shared ICT solutions;

²⁷ <http://www.santec.lu/project/esante/labo/start>, accessed 15/07/2010

²⁸ <http://www.santec.lu/project/esante>, accessed 22/07/2010

- The initiative, supported by the eSanté team, to develop a Luxembourg HL7²⁹ affiliation, aims to facilitate interoperability and cooperation within the Luxembourg community and exchange with the international HL7 community.

2.3 Project objectives

Due to the findings of the eSanté-EFES study and of other research conducted by the Ministry of Health, an interoperability platform for Luxembourg - hereafter the “Platform” - has become a priority.

As the Ministry of Health of Luxembourg wishes to define the optimal way to move forward in the national eHealth programme using the Platform, PwC has been requested to conduct a study on its costs and benefits. It is expected that the Platform will reduce cost in the long term and will optimise the annual budget allocation process.

The study therefore has two main objectives:

1. To determine good practices in eHealth services implementation and management, and to analyse other eHealth initiatives with regard to the Luxembourg context;
2. To carry out a cost and benefit analysis related to the implementation (initial investment) and operations (recurrent costs) of an interoperability platform in Luxembourg.

As a result, this study provides:

1. An overview of selected eHealth initiatives regarding their implementation, management, cost and financing, implemented by regional or national healthcare authorities outside Luxembourg;
2. A comparative analysis of those initiatives with regard to the specific context in Luxembourg, in order to position Luxembourg as compared with other countries and regions;
3. A budget for investments and operations related to the future Luxembourg Platform and its services, that have been determined by the Luxembourgish healthcare stakeholders;
4. A list of benefits expected from the Platform and its services.

The comparative analysis of international eHealth initiatives leads to recommendations to the Luxembourg Ministry of Health regarding the organisational, functional and technological basis of the Platform. The cost model based on architecture and governance recommendations shall make eHealth-related costs more transparent and thus, optimise annual budget allocation. In conclusion, this study aims to provide a basis for political decision making with regard to the future of the eSanté programme.

²⁹ Health Level 7 (HL7), a group of international standards for data exchange between healthcare organisations and healthcare information systems.

3 Comparative analysis on selected eHealth initiatives

3.1 Potential eHealth services for Luxembourg

The participants of the Strategy Workshop strongly urged that the Platform should enable medical data sharing and exchange among different users (e.g. between patients and their CDOs, between CDOs and health authorities, etc.) through appropriate ICT solutions. The right access should be granted to the right user, at the right time. Each user should be given comprehensible information. For example, patients should be able to easily understand the health information provided by the ICT solution. Furthermore, a better quality of care should be achieved by aggregating anonymised information for public health purposes, and by implementing clinical decision support applications for healthcare (HC) providers³⁰.

During the Strategy Workshop, a draft list of services made up of the responses to a questionnaire was discussed and is listed below:

- Hosting a patient-centred, longitudinal Electronic Health Record (EHR), including: Electronic medical record (EMR), health information and data (from clinicians, health professionals and patients), results (for lab tests, imaging, other diagnostic tools), order entry (computerised physician order entry, CPOE) and a decision support system (clinical and prescribing support);
- Electronic communication and connectivity with patients, providers, health insurance, and public health authority;
- Patient support (access to case management, education, ...);
- Administrative processes (e.g. eligibility for procedures, case management, ...);
- Reporting system/population health management;
- Electronic prescriptions (as a pilot with voluntary candidates);
- Sharing clinical information about cancer patients by various healthcare providers (oncologists, radiotherapists, nurses, psychologists, radiologists, ...);
- A common medical summary (*résumé médical*), including basic but essential information such as allergies, medications or current treatments.

A further suggestion for the Strategy Workshop based on the survey conducted by the eSanté-EFES project³¹ was a list of services. In that survey, Luxembourg HC professionals were asked to identify and prioritise needs related to the future eHealth platform. According to the survey, the top six necessities are:

- 1) Sharing of national medical summaries of the patient (*partager un résumé médical national du patient*);
- 2) Online patient affiliation verification (*faire la vérification en ligne de l'affiliation du patient*);

³⁰ Strategy Workshop, see appendix 7.3

³¹ eSanté-EFES Rapport WP3-3, Rapport d'analyse des besoins et des contraintes en ce qui concerne l'échange et le partage de données, Mars 2010, <http://www.santec.lu/project/esante/efes/start>, accessed 06/07/2010

- 3) Sharing of EHR-related information to ensure multidisciplinary care (*partager des informations sur un dossier médical commun dans le cadre d'une prise en charge commune pluridisciplinaire avec leurs confrères*);
- 4) Online access to national health insurance forms (*accéder à des formulaires en ligne de la caisse de maladie*);
- 5) Securely sending or receiving correspondence electronically (*envoyer ou recevoir électroniquement des correspondances de manière sécurisée*);
- 6) Electronic transfer of clinical laboratory analysis results (*Transfert électronique des résultats d'analyses médicales biologiques*).

Participants of the Strategy Workshop were asked to rank the services by order of priority leading to the following six key services³²:

- Electronic prescription;
- Decision support;
- Statistics;
- Affiliation control services;
- Result server;
- Electronic Health Record.

This list will be used in the comparative analysis and in the cost model scenarios (see section 5.2).

3.2 Comparison of similar eHealth initiatives

3.2.1 Comparison of socio-economic and demographic criteria

Having agreed with the Luxembourg Ministry of Health on the projects to be shortlisted and further analysed³³, the first step of the study consisted in comparing socio-economic and demographic criteria among the countries and regions of the short-listed projects and Luxembourg to confirm whether the healthcare contexts were comparable and rather similar³⁴. As health and eHealth data were not available at the regional level, we researched information at a national level.

Table 1 shows that, even if disparities exist in terms of total expenditure on healthcare between rich countries such as France, Germany and Luxembourg, they allocate more money for health care on a per capita PPP³⁵ basis: respectively 2 497 €, 2 416 € and 3 861 €, compared to less wealthy countries such as Estonia (748 €). However, the percentage of total health expenditure on eHealth is similar for all analysed countries (between 1,04 % and 1,66 %). In 2008, Luxembourg has invested 1,32 % (31 M€) of its total health expenditure on eHealth matters. Luxembourg thus ranks

³² This ranking is debatable as a set of comprehensive definitions and a common understanding of the services among the participants was not achieved at that time.

³³ See appendix 7.1 for further information on the approach followed to select the short-listed projects

³⁴ See appendix 7.5 for further information on the short-listed projects

³⁵ Evaluated by Purchasing Power Parity

between Estonia (1,66 %) and France, Germany and Spain (1,04 %, 1,12 % and 1,17 % respectively).

The ICT Take-Up indicator, which shows the utilisation and penetration rates of ICT in a country, is nearly identical in all analysed countries, except for Spain, which is catching up thanks to the Avenza Plan³⁶.

The eGovernment Take-Up indicator, which shows the capacity in a country to transform public administration through the use of ICT or new forms of government built around ICT, is also rather similar. Luxembourg's eGovernment Take-Up indicator is the highest one among the selected countries. This is mainly due to the recent launch of the new internet portal "*de Guichet*"³⁷, which enlarges the internet offerings of the Luxembourg Government³⁸. A high eGovernment Take-Up indicator together with a high general ICT take-up may indicate a quicker adoption of eHealth services in Luxembourg.

Furthermore, the density of practising physicians (around 3 per 1 000 inhabitants) and the insurance systems in use in the analysed countries (supported up to 80 % or 100 % by the government) are nearly identical.

As these indicators were quite similar between the countries of the short-listed projects and Luxembourg, we considered that healthcare contexts were comparable and agreed together with the Luxembourg Ministry of Health to further analyse the short-listed national and regional initiatives.

³⁶ The coverage of broadband and mobile network communications has amplified in Spain since 2000. Consequently, ICT take-up amongst citizens and firms has risen. However, despite growing availability of public services online, ICT take-up has recently plateaued, and some ICT tools have remained under-appreciated and under-used. Increasing the Spanish ICT Take-Up Indicator is thus one of the objectives of the Avenza Plan.

Source: OECD (2009): "Information Society Strategies: From Design to Implementation - The case of Spain's Plan Avanza", http://www.oecd.org/dataoecd/9/15/44242867.pdf?bcsi_scan_24DE0A96D2B59F70=0&bcsi_scan_filename=44242867.pdf, accessed 23/07/2010

³⁷ www.guichet.lu, accessed 23/07/2010

³⁸ European Commission, DG For Information Society and Media (2009): "Smarter, faster, better eGovernment", 8th Benchmark Measurement, November 2009, http://ec.europa.eu/information_society/eeurope/i2010/docs/benchmarking/egov_benchmark_2009.pdf, accessed 23/07/2010

Table 1: Socio-economic and demographic criteria related to healthcare and eHealth matters³⁹

Project	Country (region)	Number of inhabitants*	GDP per capita EUR€ *	Total expenditure on healthcare M€* (per capital PPP in €) **	Total expenditure on eHealth M€ (% of total healthcare expenditures) *	ICT Take-up ***	eGovernment take-up *****	Insurance system ***	Practising physicians density per 1 000 population ****
Dossier Médical Personnel	France	61 840 270	33 090	193 119 (2 497,6)	2 003 (1,04 %)	50	59	Compulsory public health insurance	3,37
SIS-RA platform and its services	Rhône Alpes (France)	6 065 959						Compulsory public health insurance	3,36 ***
Franche Comté regional eHealth platform	Franche Comté (France)	1 195 244						Compulsory public health insurance	2,87 ***
Digital Health Record in Estonia	Estonia	1 341 389	20 648	1204 (744,8)	20 (1,66 %)	45	56	Compulsory public health insurance	
	Spain	44 310 870	31 455	99 001 (1 798,6)	1 156 (1,17 %)	43	47	Mix of public (80%) and private insurances	3,65
Strategic eHealth projects in Catalonia	Catalonia (Spain)	7 467 423						Mix of public (80%) and private insurances	
	Germany	82 772 160	35 432	255 034 (2 416,2)	2 861 (1,12 %)	54	45	Mix of public (88%) and private insurances	3,50
EPA 2015	Nordrhein-Westfalen (NRW) (Germany)	17 933 086						Mix of public (88%) and private insurances	
ELGA (Electronic Health Record Initiative)	Austria	8 333 109	37 858	26 661 (2 534,0)	309 (1,16 %)	54	60	Compulsory social insurance	3,75
eHealth platform	Luxembourg	471 052	84 713	2 344 (3 861,3)***	31 (1,32 %)	51	69	Compulsory public health insurance	2,87

³⁹

Sources:

* OECD Data 2008, <http://www.oecd.org>, accessed 01/07/2010,

** Figures from www.tradingeconomics.com, accessed 23/07/2010, PPP = Purchasing power parity,

*** Figures from 2008 provided or estimated by the "Business models for eHealth" report,

http://ec.europa.eu/information_society/activities/health/docs/studies/business_model/business_models_eHealth_report.pdf, accessed 01/07/2010

**** http://www.insee.fr/fr/themes/theme.asp?theme=6&sous_theme=1&nivgeo=0&type=2, accessed 01/07/2010,

***** European Commission, DG For Information Society and Media (2009): "Smarter, faster, better eGovernment", 8th Benchmark Measurement, November 2009,

http://ec.europa.eu/information_society/eeurope/i2010/docs/benchmarking/egov_benchmark_2009.pdf, accessed 23/07/2010



3.2.2 Key services comparison

This section provides a comparison of the key services required by Luxembourg, and services implemented or planned in the short-listed projects.

For each short-listed project, it is indicated in Figure 2 whether the respective key service:

- Has already been developed (Yes);
- Is currently being developed (Under Dvt) or
- Has not yet been developed (No).

Project \ Top 6 services required by Luxembourg	Electronic Prescription	Decision support	Statistics	Affiliation control services	Result server	Shared and Distributed Patient Record
Dossier Médical Personnel	No	No	Under Dvt	Under Dvt	Under Dvt	Under Dvt
Plate-forme régionale Franc-Comtoise / Franche Comté regional eHealth platform	Yes	Yes	Yes	Yes	Yes	Yes
Plate-forme régionale Rhône Alpes / SIS-RA platform and its services (DPPR, PEPS, Trajectoire, ...)	No	No	No	No	Yes	Yes
Elektronische Gesundheitsakte - ELGA (Electronic Health Record Initiative)	No	No	No	No	Under Dvt	Under Dvt
Elektronische Patientenakten - EPA 2015 (NRW)	No	No	No	No	No	No
Digital Health Record in Estonia	Yes	Under Dvt	Under Dvt	Yes	Under Dvt	Yes
Strategic eHealth projects in Catalonia	Yes	Yes	Yes	Yes	Yes	Yes

Figure 2: Luxembourg key services and their implementation status in similar eHealth initiatives

Six out of seven short-listed projects have already developed, or are currently developing, at least one of the services required by Luxembourg HC authorities and professionals. Four of them (Franche Comté, Rhône-Alpes, Catalonia and Estonia) are well advanced in the implementation of eHealth services for patients and HC professionals. Three projects (DMP, ELGA and Estonia) are currently implementing eHealth services. The EPA project (Germany) is the only one that has not implemented any service, but it has developed specifications and regulations for an interoperable, institution-spanning electronic patient record and a reference architecture with defined interoperability definitions and migration concepts.

As a result, the implementation of eHealth services does not depend on the country's size or wealth: Estonia has developed an important eHealth initiative, as well as Franche-Comté and Catalonia, whereas Germany, Austria and Rhône-Alpes do not offer many eHealth services yet. The following section gives a detailed analysis of the projects and best practices, as well as key parameters and key success factors.

3.2.3 Comparison between short-listed projects and identification of best practices

Below summarises the information provided by the different eHealth initiatives related to:

- Stakeholder management;
- Key success factors;
- Project risks;
- Governance structure;
- Key information related to the platform;
- Information security rules;
- Development or acquisition of an interoperability framework;
- Reference model.

A detailed presentation of the related information is given in appendix 7.5.

3.2.3.1 Stakeholder management

Information provided by the short-listed projects points out the following matters which should be taken into account to define the future project governance structure:

- Patients, HC professionals and CDOs, ICT solution providers, subcontractors for project management, and the project management team itself, should be involved from the very beginning of the project (DMP, Rhône-Alpes, ELGA, EPA 2015 and Catalonia);

- A collaborative working group (or project management board) with representatives of the core stakeholders (especially patients and HC professional associations) should be setup. The board should meet on a regular basis and make decisions for the whole project (DMP, Rhône-Alpes, ELGA, EPA 2015, Estonia and Catalonia);
- Project teams should be established for each sub-project. Each team leads and makes operational decisions for the respective sub-project and reports to the board (DMP, Rhône-Alpes, EPA 2015, Estonia, Catalonia);
- Stakeholders not previously involved should participate in the project via information or working group meetings (DMP, Rhône-Alpes and Estonia);
- While developing pilots, voluntary beta testers (ideally from many stakeholders) should be invited to give feedback on the functionalities of the ICT solution (Estonia).

3.2.3.2 Key success factors

Interviewed project managers have mentioned the following key success factors:

- High involvement and cooperation between all stakeholders (DMP, Catalonia);
- Strong political and financial support to avoid budget bottlenecks in the coming years (Franche-Comté);
- Involvement of HC professionals and the local population from the beginning to ensure user acceptance, and avoid resistance to change, and to generate a feeling of trust. HC professionals should own and launch the projects affecting them. This is to motivate the affected users and to ensure the newly implemented services produce tangible added value (Rhône-Alpes, EPA 2015, ELGA, Estonia);
- Quick deployment of services that can provide a minimum number of functionalities for field tests and adoption (prototype) in order to facilitate roll-out later (DMP, EPA 2015);
- Separation of operating the ICT structure from processing of patient information. The latter should remain under the supervision of public authorities in order to protect confidential patient data (DMP).

3.2.3.3 Project risks

The project management team should monitor and mitigate the following risks mentioned by the interviewees:

- Lack of Platform and eHealth service adoption can be due to insufficient stakeholder involvement. This risk should be monitored closely. Thus, it is important to determine stakeholder requirements, and to agree on them using a well-defined communication and management process (DMP, Rhône-Alpes, EPA 2015). It is also important to receive obtain constructive criticism and feedback from HC professionals and patients (Estonia);



- An insufficient incentive policy: The right budget should be allocated, either to give incentives for healthcare providers (DMP) or for the project itself (Franche-Comté, Estonia);
- Security issues, such as confidentiality and data protection (DMP, Rhône-Alpes);
- The project itself should not be complex in terms of software interfaces, medical data retrieval and deployment. Short-term projects (3 to 5 years) should be preferred to long-term ones (DMP, Rhône-Alpes);
- A risk analysis has been conducted for each sub-project for ELGA and Catalonia.

3.2.3.4 Governance structure

Governance structure is quite similar among all short-listed projects:

- Most of the management boards are composed of national/regional public authorities (DMP, Rhône-Alpes, ELGA, EPA 2015, and Estonia). Some of these include health stakeholders, such as physicians, patients' associations, and public health insurance (Rhône-Alpes, Austria);
- Operations are usually conducted by external participants (DMP, Rhône-Alpes, EPA 2015, Estonia, and Catalonia).

3.2.3.5 Key Information related to the platform

In terms of Platform implementation, the situation varies considerably among the short-listed projects:

- EPA2015 does not implement any Platform, but defines standards, recommendations and implementation concepts. Platform implementation is still under development for DMP and exists already for Franche-Comté, Rhône-Alpes, Estonia and Catalonia;
- All the French projects (DMP, Franche-Comté and Rhône-Alpes) are operated by an external provider;
- ELGA has a centralised document registry and a decentralised document repository;
- The Estonian platform is a technical infrastructure used for all eGovernment services, and connects all public sector databases. The Estonian eHealth Foundation is in charge of the EHR central system, while the government is responsible for the infrastructure;
- The Catalanian platform gathers human resources, technologies and materials related to eHealth that were previously dispatched in several departments and institutions. The platform has a ring architecture on which all professionals of the healthcare sector must connect to use the available services.

3.2.3.6 Information Security rules

Security rules have been defined for several projects, but their level of sophistication varies according to the project:

- For DMP and Estonia, data is secured by the application itself, with authentication processes (electronic certificates or professional cards for the physicians, or a username-password combination for patients). The patients grant and revoke access rights to their data;
- For EPA 2015, security rules shall comply with German data protection laws. As for DPM and Estonia, written confirmation of the patients/users should be mandatory before granting access to any other HC professional. Confidentiality, integrity and availability of data shall be assured at all times. It is also important to define the scope of permitted data utilisation, to manage an audit trail/modification log and to prevent a non-deniability of communication⁴⁰;
- In Catalonia, all the services should respect the data protection rules and regulations. A Technical Office of Security assures ICT security. Security risks are also reported monthly to build and follow up on an action plan for mitigation.

3.2.3.7 Development or acquisition of an interoperability framework

It is interesting to note that all frameworks were not designed to be as interoperable as possible. Only one project seeks to be interoperable on the European level:

- As the regional platforms have been built before the national platform, they are interoperable on a regional level, but not yet on a national level;
- Regional EPA 2015 and Catalonia projects apply or should become interoperable nationwide;
- National interoperability is developed for DMP and Estonia. Catalonia is developing a framework that will be interoperable in Europe;
- The use of an interoperability framework is recommended for DMP, EPA 2015 and Catalonia, but mandatory for Rhône-Alpes and Estonia.

⁴⁰ It must be ensured that the sender of patient-related information can be sure that it has reached the receiver. Yet, it must be impossible for the sender to deny that this has been done. On the other hand, the receiver must be sure that the information was sent by the particular sender. It must also be impossible for the receiver to deny the receipt of this information.

3.2.3.8 Standardisation

By analysing the different projects abroad, there are some trends that can be observed today in large scale eHealth projects:

- Usage of HL7, especially the XML-based Clinical Document Architecture Release 2 (CDA R2) as document standard (used in Estonia, Catalonia, recommended by EPA 2015);
- Usage of LOINC® as a common reference for describing clinical biology results (used by DMP, ELGA, Catalonia);
- ICD-10⁴¹ and SNOMED⁴² as basic nomenclatures and terminologies;
- EN13606 as standard to define a rigorous and stable information architecture for communicating part or all of the Electronic Health Record (EHR) of a single patient;
- The usage of Integrating Healthcare Enterprise (IHE⁴³) profiles:
 - Cross-Enterprise Document Sharing (XDS) and its specialisations (XD-LAB; XDS-I, XDS-SD,...) as basic platform model for structured and flat and scanned documents;
 - IHE ATNA for Audit Trails;
 - IHE Patient Identifier Cross Referencing for federation of different patient IDs;
 - used by DMP, ELGA and Catalonia and recommended by EPA 2015.
- DICOM⁴⁴ is a common standard used by DMP, ELGA and Catalonia;
- Other standards are used, such as
 - x509 v3 and IAS for DMP;
 - OASIS and ICD-10 for ELGA;
 - SOAP, DIGIDOC for Estonia; and
 - SNOMED, NANDA, ICPC and EQPF in Catalonia.

⁴¹ International Statistical Classification of Diseases and Related Health Problems

⁴² Systematized Nomenclature of Medicine

⁴³ Integrating the Healthcare Enterprise

⁴⁴ Digital Imaging and Communications in Medicine

3.2.4 Data hosting: centralised or decentralised approach

One of the decisions to be made is whether health data should be hosted centrally or not. In this context, two models are comparable: the Franche-Comté model and the Rhône-Alpes model. An analysis of the strengths and weaknesses of those two models is shown in Table 2:

Table 2: Strengths and weaknesses of a centralised vs. a decentralised approach

Model	Strengths	Weaknesses
Centralised hosting	<ul style="list-style-type: none"> • Possibility to create a data vault • Enhanced mutualisation: better use of scarce resources • The eHealth infrastructure can include agreed upon reference models, which leads to reduced deployment, maintenance and support cost • Centralising data can reduce the dependence of a WAN broadband infrastructure in case of large scale deployment 	<ul style="list-style-type: none"> • Risk to create a data graveyard if the workflow of data (e.g. by tracking changes) is not well organised • Risk of losing all data if the centralised organisation is physically destroyed and if there is no operational resilience solution • High cost and complexity (with regard to the central infrastructure part)
Decentralised/ Distributed hosting	<ul style="list-style-type: none"> • Smaller technical infrastructure of the Platform, however higher complexity on a decentralised level • No need to reconcile medical information with local records • Data ownership stays within the local systems 	<ul style="list-style-type: none"> • The HC professional may not be aware of crucial information such as allergies or existing medical treatment if one component of the decentralised system is down. This may lead to wrongful diagnosis and adverse drug events. • Need to provide a solution for HC information systems that do not operate 24/7. • Complex implementation of system security • Overall cost of decentralised systems higher than in centralised architecture

A “Google like” User Interface can be used for management of medical record data. In this case, the patients could use a medical search engine to gain access to distributed medical information approved by their HC professional. This approach could leverage the retrieval of information, very often spread over different health structures or professionals.

Once the consent of the patient is obtained, the system could allow the HC professional to retrieve information stored in different CDOs. The HC professional could view this information and create and update his local copy as needed. He could also share and exchange it with other HC professionals when the patient is transferred. All the information would be stored in a decentralised information system, but remain accessible to the HC professional. To have access to the information, the HC professional would have to authenticate using e.g. a LuxTrust card and a password.

The information must be available for querying and retrieval, and Google-type technology could enable searches for any data published in secured HC information systems. The underlying grid technology could secure distributed medical data according to personal access rights. Grid technology is already used for management of medical, paediatric and radiology data management, thanks to grid middleware services (e.g. Medical Data Manager, Globus Medicus). Grids can also store data near or far from the origin of production.⁴⁵

In a centralised model, data registries and data repositories are stored on one platform. The most accurate choice however seems to be a mixed model (centralised/decentralised) for health data hosting, such as centralised hosting for the patient medical summary, and decentralised hosting for medical imaging. In the latter case, only one register is hosted on the central Platform. When access is required to medical images, a bridge is opened between the two information systems to allow the image exchange.

⁴⁵ Quantin et al. (2009): “Centralised versus Decentralised Management of Patients’ Medical Records”, in K.-P. Adlassnig et al. (Eds.): “Medical Informatics in a United and Healthy Europe”, IOS Press <http://www.hst.aau.dk/~ska/MIE2009/papers/MIE2009p0700.pdf>, accessed 21/07/2010

3.3 Conclusions

The first step of the Platform implementation should be to define its governance. It is, therefore, crucial to involve HC stakeholders and to make them collaborate from the beginning of the project. ICT solution providers, subcontractors and the project managers should determine together, with the HC stakeholders, the requirements and the most important features of the eHealth service. For each project, representatives of the HC stakeholders should be involved in making decisions. Obtaining feedback from various beta-testers is important to improve functionalities and facilitate large-scale adoption.

To this end, it is also essential to use a simple software interface in order to ensure stakeholder adoption. It is also important to make all users (HC professionals and patients) feel comfortable with system confidentiality and data protection. This could be achieved by using electronic certificates and complex login-password combinations. Security risks should also be regularly monitored to improve the overall system security. Several interviewees described the necessity of access rights and restriction by the patients themselves. Some data should not be subject to modification by the patients, e.g. data not entered by the patients themselves. However, the patient should be allowed to comment on their data, for instance, medication adherence: “I did not take all the medication because I felt better after two days”. This is to prevent adverse drug events and legal risks for the HC professionals.

A conclusion cannot be drawn as to whether the platform should be purely operated by a third party (DMP project), by the government itself (Estonia and Catalonia projects) or by co-sourcing approach (Franche-Comté and Rhône-Alpes projects). A more detailed analysis of the cost and value should be performed to clarify this issue. Although priority should be given to services for residents, European interoperability should be analysed in the long run, particularly for commuters who could be interested in eHealth services like cross-border clinical biology results. In the context of the Greater Region, this should be one of Luxembourg's long-term objectives.



4 Prerequisites for Platform cost estimation

In order to estimate the cost and identify the benefits of the Platform, scenarios have to be determined on important aspects such as:

1. The priorities of the eSanté programme;
2. The roadmap of the eSanté programme and its main activities;
3. The requirements for the Platform;
4. The services to be implemented.

Therefore, the cost estimation takes into account existing results of the eSanté programme but considers also good practices from other countries as described in chapter 3.

Based on this input, we have used the following recommendations as assumptions for the cost model:

- Recommendation 1: The need for a dedicated agency;
- Recommendation 2: List of potential workstreams to be carried out by the Agency;
- Recommendation 3: Decisions to be taken regarding setup and operating the Platform;
- Recommendation 4: Services to be implemented on the Platform.

4.1 The need for a dedicated agency

4.1.1 General description and objectives of the Agency

For the purpose of this study, we assume that a dedicated agency - hereafter “the Agency” - will run the eSanté programme and operate the Platform.

This agency as described in this study is inspired by good organisational and governance practices from eHealth initiatives in several countries. In particular the organisational model and the tasks of ASIP Santé⁴⁶ in France have been taken into consideration. The ASIP Santé is a government agency that is in charge of managing the Personal Health Record in France (since its relaunch in 2008) and elaborating recommendations for the French eHealth programme.

We also assume that the Agency has a multi-year plan containing specific objectives and a dedicated budget. The Agency will also have its own staff. Service providers will take over some of the tasks that are not part of the core business.

To successfully implement the eSanté programme, strong strategic and operational governance must support it. A precise definition of the Agency's organisation as well as its steering and operational committees should exist prior to the establishment of the Agency. In this context, it is

⁴⁶ Agence des Systèmes d'Information Partagés de santé, <http://esante.gouv.fr>, accessed 07/07/2010

crucial that all the members of the healthcare sector are appropriately represented within the Agency's organisation.

A precise definition of the Agency, with regard to its strategic objectives, governance principles and precise tasks, is not part of this study. However, based on our analysis, we have made a certain number of recommendations (see chapter 6) which will be taken into account for the design of the Platform cost model.

In order to elaborate this model, it should be considered that the Agency is not limited to conceptualising, implementing, operating and maintaining the Platform and its services. At the same time, other objectives have to be foreseen, such as

- Leading the national interoperability initiative with regard to HCIMSS;
- Developing a sustainable ICT strategy with regard to HCIMSS; and
- Establishing a continuous improvement process covering changes and improvements over time.

4.1.2 Tasks of the Agency

To elaborate the cost model, we have considered the following tasks:

- Participate, coordinate and mutually collaborate an organised national strategy on HCIMSS;
- Conceptualise, implement, deploy the national Electronic Health Record (EHR) and other value-added services and provide these services to the users of health sector;
- Establish the development, implementation and continuous improvement of:
 - Healthcare (HC) professional and patient identification;
 - Trusted services;
 - National registry of HC professionals and Care Delivery Organisations (CDOs).
- Conduct further eHealth and other projects, assigned by the Agency Supervisory Board (see below);
- Integrate other national information system projects currently under responsibility of the Ministry of Health and other institutions, for example:
 - Activities of GIE HealthNet;
 - Day-to-day management of the eHealth Portal (Portail Santé);
 - Mammography systems.
- Define, promote and approve the reference models which contribute to interoperability, security and use of HCIMSS in Luxembourg;
- Coaching and assistance for the implementation of any project promoting eHealth in Luxembourg, including change management;

- In the context of European eHealth projects:
 - Support cross-border interoperability and participate and follow-up on such projects;
 - Establish a technology and methodology watch.

4.1.3 Basic organisational structure of the Agency

For the cost model and to fulfil the tasks mentioned above, we assume the following roles will be specified in the Agency and staffed with experienced resources:

1. The **Director**: The director is in charge of strategy definition and implementation, as well as the operational management of the Agency. The director is also accountable for the successful implementation of the eSanté programme, the Platform, its services and the related continuous improvement process;
2. The **ICT⁴⁷ infrastructure and information security manager**: This role is in charge of any technical issues related to the exchange of health data. Their responsibility is to define the concept of the Platform, its connectors for exchanging data, the technical reference models and the implementation of Trusted Services;
3. The **Value-added services manager**: This manager takes responsibility for the definition and implementation of the Electronic Health Record (EHR) and other value-added services⁴⁸. The tasks of this role are comprised of the identification, the definition and the implementation for the value-added services;
4. The **Deployment and service promotion manager**: This role assists all members of the healthcare sector in deploying the services. Their job is to also define, in collaboration with the HC sector members, the type of coaching needed to enable optimal service adoption. Finally, this role is accountable for the deployment of the patient and HC professional identification solutions;
5. The **Project managers**: Project managers control the implementation of the services deployed on the Platform on an operational level. For the purpose of the cost model, we assume that one project manager is responsible for two projects. The project managers report to the Value-added services manager;
6. The **Platform manager**: The Platform manager is in charge of the Platform and monitoring generic administration services. His or her responsibility is to follow up on the concept, architectural definition, implementation and operations of the Platform and its generic services. To this end, this manager is the Single Point of Contact (SPOC) with the external ICT service provider (cf. chapter 3). The Platform manager reports to the ICT infrastructure and information security manager;
7. The **System administrator/webmaster**: This role is in charge of maintaining the value-added services and managing related applications. The System administrator/webmaster reports to the Value-added services manager;

⁴⁷ Information and Communication Technology

⁴⁸ Cf. section 5.1.4

8. The **Service Desk Analysts**: The Service Desk Analysts provide first-level user support by taking calls and handling the resulting incidents or service requests. They report to the Deployment and service promotion manager and operate the Service Desk. The Service Desk is a functional unit made up of a dedicated number of staff responsible for dealing with a variety of service events, often made via telephone calls, web interface, or automatically reported infrastructure events. It should be the SPOC for IT users on a day-by-day basis. The Service Desk is under the responsibility of the Platform manager.

Further roles are needed to staff the administrative roles of the Agency:

1. The **Legal counsel**: This role reports to the Director and has two main responsibilities. The legal counsel:
 - a. Ensures that purchases within the eSanté programme are compliant with rules and regulations;
 - b. Deals with any legal issues in the context of the eSanté programme and those related to implementing and operating the Agency.
2. The **Financial controller**: The Financial controller establishes and follows up on the investment and the operations budget of the Agency. This role reports to the Director;
3. The **Administrative officer**: As office staff, the administrative officer is in charge of operational administrative tasks, such as book keeping and filing. This role reports to the Director.

The brief role descriptions aim to outline the main roles needed inside the Agency. They are by no means fully exhaustive.

In order to efficiently supervise and operate the Agency and the Platform, we assume the following with regard to governing the Agency:

1. A **Supervisory Board** within the Agency that includes key stakeholders of the Luxembourg healthcare sector (e.g. Ministry of Health, Ministry of Social Security, long term care facilities, CNS⁴⁹, EHL, AMMD⁵⁰, COPAS⁵¹, healthcare professional associations, patient associations...). The Supervisory Board takes strategic decisions with regard to the Agency;
2. An **Interoperability Commission** for Healthcare Information Management Systems (*Commission pour l'Interopérabilité des Systèmes d'Information de Santé*, CISIS), a dedicated working group developing interoperability. CISIS should elaborate further priorities and a detailed interoperability roadmap to implement the different services. CISIS is composed of representatives of all main national HC stakeholders and reports to the Supervisory Board of the Agency;

⁴⁹ National health insurance, *Caisse Nationale de Santé*

⁵⁰ Association of physicians and dentists in Luxembourg, *Association des Médecins et Médecins-Dentistes*,

⁵¹ Federation of service providers in assistance and care, *Confédération des organismes prestataires d'aides et de soins*

3. A **Continuous Improvement Group** acts as a working group, defining and carrying out a Continuous Improvement Process. This process can be derived from ITIL V3⁵². The group suggests reference models and standards for the Platform and suggests changes to improve its usability and performance. The group may consist of Agency staff, staff from the Ministry of Health, the CNS, staff delegated by the Supervisory Board and representatives of HC stakeholders. For the latter, the Supervisory Board will decide on their participation based on the knowledge and skills of the participants with regard to the issues tackled in the working group. Finally, this group reports to the Supervisory Board;
4. **Technical Operations** for ICT infrastructure management are outsourced to an external service provider. Healthcare-specific IT operations are covered by the internal resources (see also chapter above for the roles). Technical Operations reports to the Supervisory Board.

4.2 List of potential workstreams to be carried out by the Agency

We have defined the following workstreams for the Agency for the next five years:

- National HCIMS strategy;
- Convergence and Interoperability;
- Technical platform and generic services setup;
- Data sharing and value-added services;
- Scope definition and solution outline;
- Other eHealth initiatives;
- Upcoming projects.

The workstreams and their associated cost are described in section 5.2.

4.3 Decisions to be taken regarding setup and operating the Platform

4.3.1 Data hosting: centralised vs. decentralised approach

For this study and inspired by a similar architecture in the DMP and in the ELGA project, we assume a mixed approach mainly using a centralised data repository and allowing the use of decentralised data repositories for special types of data such as medical images. The ELGA approach includes a central register for patient-related documents, pointing to decentralised data sources. We thus assume that medical imaging native data (DICOM images) will be stored at the location where the images have been produced, but there will be a link repository pointing to those locations. Other data will be stored centrally in the ICT infrastructure of the Agency.

⁵² Information Technology Infrastructure Library, version 3, a set of best practices in IT Service Management

The rationale behind this approach is as follows⁵³:

- As medical summaries mainly consist of text data, they do not need much storage space and can be centralised easily;
- Radiology images, especially when using many slices together with the history of previous radiology examinations can quickly produce high volumes of data. By pointing to those images only, one can prevent periodic mirroring of the image data and thus significantly reduce traffic and storage space;
- An existing IHE⁵⁴ profile, XDS-I⁵⁵, centralises the pointers to the image storage locations and its use should be further analysed. For further information on IHE profiles, see section 5.2.3.

4.3.2 Operating the Platform

For the study, we assume that the Agency becomes the owner of the Platform while the underlying technical infrastructure is operated by a Managed Services provider. In any case, the Agency acts as the service provider to its users.

4.4 Services to be implemented on the Platform

4.4.1 Scope of the To-Be services

The priority services to be implemented are based on the results from the eSanté-EFES study and from the Strategy Workshop. They are described in detail in section 5.1.

As we consider a budget period from 2011 to 2015 only, the following services are out of scope of this study. They may however be implemented at a later stage:

- A central long-term archiving solution for medical data, particularly medical images;
- General social security requests: This service allows social security institutions to receive various requests regarding, for example, a patient transfer abroad, an evaluation by CEO (*Cellule d'Evaluation et d'Orientation*) or a request to the *Contrôle Médical* (medical council of the CNS). A dedicated, secured website or a module in the information system used by the requesting HC professional will allow secure input, electronic signing and transfer of the related information. Some requests may become parts of the ePrescription services;
- Electronic billing and payments: This service enables the transfer of billing data to the CNS and the payment authorisation by the CNS. Data is signed electronically and its transportation/billing process will be secured;

⁵³ Cf. also: Carestream Health – SNR (2008): “ADPIM – Premier Health, Dossier fonctionnel et technique”, Volume 2.1, p. 53

⁵⁴ Integrating the Healthcare Enterprise, an initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information, www.ihe.net, accessed 21/07/2010

⁵⁵ XDS-I extends XDS to share images, diagnostic reports and related information across a group of care sites

- Push and pull alerts: The push and pull alert service allows the sending notifications from HC professionals to other HC professionals and patients via e-mail or SMS. The service could be used for reminders (e.g. appointments, vaccinations), to notify availability of a document (medical imaging or medical biology results) or an event such as appointments for in home treatment.

4.4.2 Integrating new services and changes to existing services

Taking into account the complexity of their implementation, we recommend initiating a maximum of two projects per year. Other reasons to impose this restriction are the availability of project management resources and limited change management capacities. Financial resources are also scarce.

For the study, we assume the following five-step lifecycle of services for the Platform:

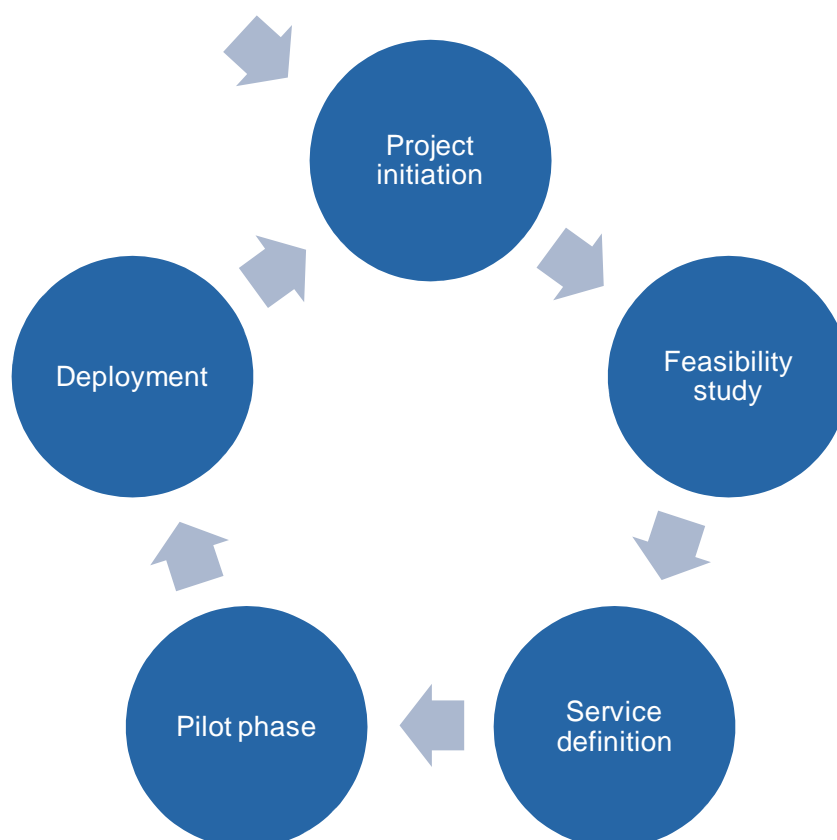


Figure 3: Platform service lifecycle

Corrective and adaptive maintenance are part of a general Continuous Improvement Process and are therefore not explicitly covered in this model.

The detail of the lifecycle steps is outlined below:



Table 3: Details of the Platform service lifecycle

Step no.	Step description	Timeline
1	<p>HC needs identification/project initiation/change request:</p> <p>As part of the Continuous Improvement Process and complementary to HC strategy-triggered projects by the Agency, any member of the HC sector can initiate a project. We recommend to setup a process that defines how to proceed, e.g. the requestor uses a formal request to be sent to the Agency. Details with regard to content and format of this request have yet to be developed. The Agency may decide on project prioritisation if resources are too limited for all proposals.</p>	t0
2	<p>Feasibility study:</p> <p>This phase describes a detailed scope of the project and evaluates the feasibility of the project. Thus, the following have to be considered:</p> <ul style="list-style-type: none"> • The Maturity of existing concepts in the scope domain; • Skills of ICT solution providers to deliver a stable solution; • Availability of semantic and technical reference models. 	t1 = Within one year after t0
3	<p>Service definition:</p> <p>The service definition phase consists of the following actions:</p> <ul style="list-style-type: none"> • Definition the content to be shared or exchanged; • Select or elaborate reference models used by the service; • Develop detailed functional requirements including use-cases; • Develop detailed technical requirements including a service architecture⁵⁶, the integration into the Platform and any interfaces/connectors; • Develop a detailed test concept for the service; • Develop a deployment strategy. 	t2 = within two years after t1

⁵⁶ This may not be needed for many services, while they are part of the EHR.

Step no.	Step description	Timeline
4	<p>Pilot phase:</p> <p>The pilot phase comprises the actions outlined below:</p> <ul style="list-style-type: none"> • Define the service architecture; • Select ICT solution provider; • Test the service; • Deploy service on select sites. 	t3 = within one year after t2
5	<p>Deployment:</p> <ul style="list-style-type: none"> • Develop a release and deployment plan; • Service go-live on the Platform. 	t4 = within two years after t3

The timeline data is only indicative and can vary depending on the complexity of the projects, the available functional and technical knowledge, and the maturity of existing ICT solutions.

5 Cost and benefits of the Luxembourg Platform

5.1 Platform architecture for the years 2011 to 2015

5.1.1 Overview

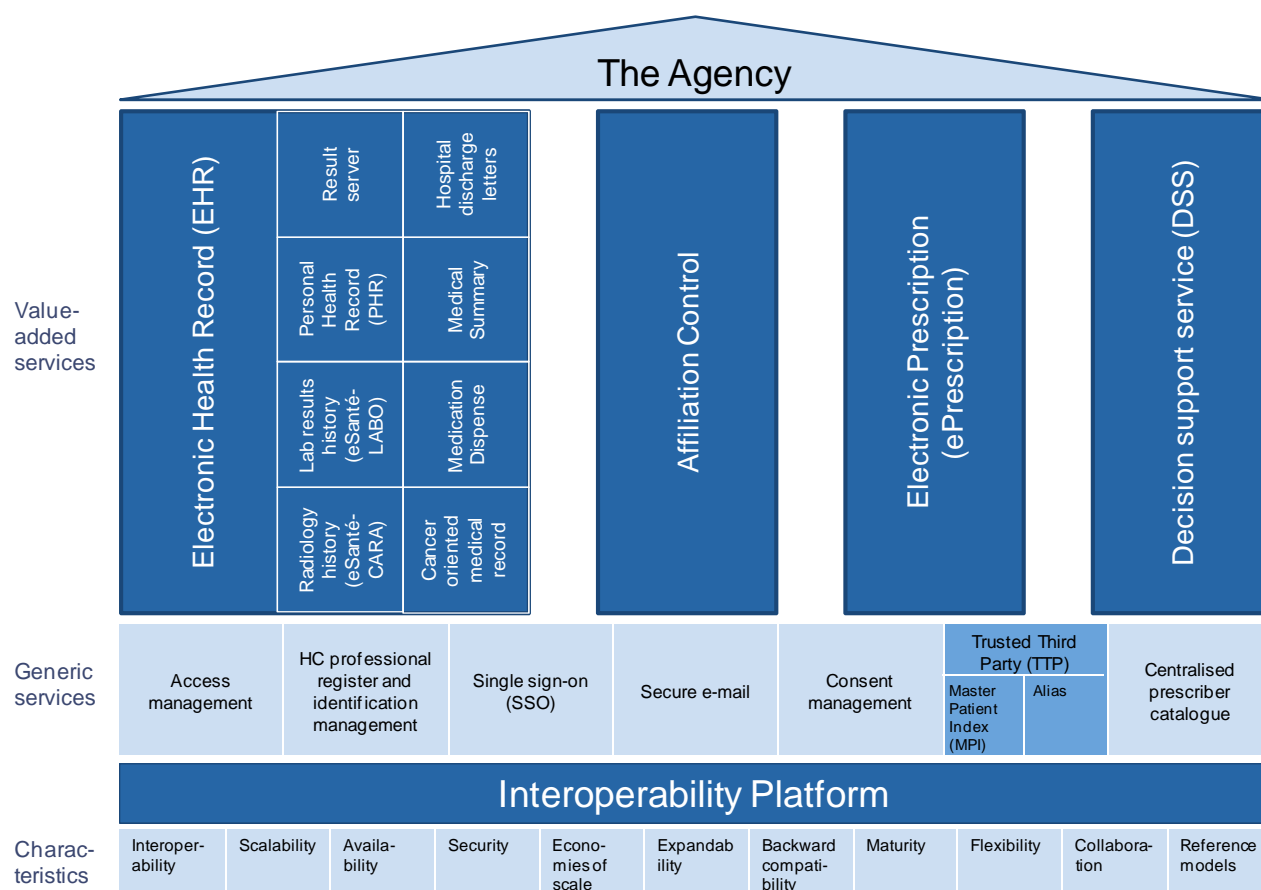


Figure 4: Platform architecture

Figure 4 shows the general architecture of the Platform for the budget period (2011 to 2015). At the bottom, the different characteristics of the Platform are illustrated, and they are described in more detail in section 5.1.2. The generic services act as the main drivers for any HC specific applications, and are outlined in section 5.1.3. The HC specific services build on the Platform and the generic services. They are described further in section 5.1.4.

5.1.2 Platform characteristics

We assume that the Platform will be built on a structure that has the following characteristics:

- **Interoperability:** The Platform must be easy to integrate with existing HCIMSs used by the different stakeholders in the HC sector;
- **Scalability:** Processing of large amounts of medical data for a growing population needs application architectures, databases and storage capacity that are scalable;
- **Availability:** In medical environments, a system failure can put lives at risk. A platform hosting medical patient data must, therefore, be resilient and withhold against Single Points of Failure, in order to be highly available;
- **Security:** By their nature, medical patient data is highly sensitive. Therefore, patients want to make sure that their data is only disclosed to HC professionals for a specific treatment purpose. The ICT infrastructure must enable this through flexible configuration, and strict access rules and monitoring;
- **Economies of scale:** New services should be based on existing modules in order to leverage the related Platform investment. To a certain extent, the required investment for new services could be less, and operating costs may be reduced;
- **Expandability:** The Platform must keep up the pace with the progression of relevant ICT to support a smooth Continual Improvement Process. It must be feasible to upgrade single Platform ICT components without needing to reconfigure all other Platform ICT components;
- **Backward compatibility:** The Platform will manage medical information for several years to come. Therefore, it is important that the Platform assures that technological advancements will not interfere with accessing data on the older ICT solutions;
- **Maturity:** In order to obtain skilled and available resources easily, and to limit maintenance costs, technology utilised by the Platform should also be commonly and widely used within the industry;
- **Flexibility:** The ICT of the Platform represents more than just a simple database. As the Platform covers structured and unstructured data, it must enable storage, communication, data analysis, and reporting using both data types, in a straightforward manner;
- **Collaboration:** The aim of the Platform is to enable HC professionals to share and exchange information efficiently. Therefore, the underlying ICT infrastructure must support real-time information exchange, and secure messaging to facilitate knowledge transfer between HC professionals;
- **Reference models:** The Platform should support different sets of health and eHealth reference models such as ICD 10, HL7, SNOMED, LOINC®, and OPCS, as well as reconciliation, e.g. regarding terminology: SNOMED with LOINC.

5.1.3 Generic services

Generic services provide a secure communication infrastructure enabling secure exchanges of medical information, and controlled access to the services with functions, such as identification, authentication, communication, and security. Generic services enable value-added services (healthcare-specific services for sharing and exchanging medical information). Those services could be made available more widely to the sector, e.g. the TTP service (see below).

We assume the following generic services are to be implemented:

- **HC professional register and identification management:** This service stores all data related to HC professional users of the Platform in one central register for identification purposes (HC professional master data, user roles, etc.);
- **Access management:** This generic service manages user roles and access rights for the Platform. Every potential Platform user, who may be a patient, an HC professional, a Care Delivery Organisation (CDO) or a legal representative of them, obtains a user profile with access rules to the different services of the Platform. This includes a complete audit trail for access tracking, and a modification log on data managed throughout the Platform. The latter functionality is particularly important for patients to control who has accessed and/or modified their data;
- **Single sign-on (SSO):** This service allows using multiple, related, but independent ICT solutions. With SSO, a user logs in once and gains access to all Platform services for which he or she is authorised, without being prompted to log in again at each of them. SSO can be implemented with a User ID and a password and/or token;
- **Consent management:** The patients, or their legal representatives, can manage the scope of their consent in order to determine to which extent HC professionals can obtain access to their individual health data. Although there is a default profile for each HC professional defined by the generic service Access management, the patient can grant or revoke specific rights to their individual medical data via a web interface;
- **Trusted Third Party (TTP):** The generic service TTP consists of two complementary and interdependent services:
 1. **The Master Patient Index (MPI) sub-service:** The MPI sub-service enables the federation of different patient identities from several HCIMs under one master identifier;
 2. **Alias sub-service:** The Alias sub-service allows patient data anonymity by replacing patient identifier data with a random alias.

Although the TTP service is foreseen to be a key component of the infrastructure, it should be hosted in a different infrastructure and under control of a different legal entity for data protection reasons. This service should be made available to a wider user community (IBBL, research use, public health statistics ...) to obtain synergy effects.

- **Secure e-mail:** This service aims to provide a secure, encrypted message service to allow quick confidential communication between HC professionals, CDOs and their patients;
- **Centralised catalogues:** This service aims to federate different catalogues and databases used for prescribing drugs, medical services, products, etc. This catalogue is a prerequisite for the basic Decision support service (for more on DSS, see below) that offers medical and economic advice to the provider, during the prescription process. The centralised catalogue service may also have an export function to allow CDOs and HC professionals to download and import the centralised catalogue into their HCIMS.

5.1.4 Value-added services

Value-added services use the Platform and its generic services for healthcare-specific functions, thus providing tangible added value from a stakeholder point of view.

We assume the following value-added services to be implemented on the Platform:

1. **Electronic Health Record (EHR):** The EHR service shall allow HC professionals to share information with all authorised users regarding the medical treatment of a patient (follow-up and coordination). In particular, the service allows exchanging medical summaries and results from medical imaging, clinical biology, and anatomical pathology between HC professionals. The level of detail, the format of the EHR, and standards used must be adapted to the needs of the authorised user. The EHR up to 2015 would consist of:
 - a. **Radiology history (eSanté-CARA):** a solution for radiology digital imaging and exchanging related data, see description in section 2.2;
 - b. **Laboratory results history (eSanté-LABO):** a service for clinical biology results and exchanging related data, see description in section 2.2;
 - c. **A Personal Health Record (PHR):** a personal secured space for patients where they can enter health information such as allergies, previous surgery, or registration as an organ donor, etc. The PHR also allows patients to grant or revoke access rights to specific PHR sections for HC professionals. This supports a proactive partnership between the HC professionals and their patients, as well as patient self-care strategies. Both are recognized to improve health outcomes and quality of life, especially among the chronically ill⁵⁷;
 - d. **Medication Dispense:** This service allows pharmacists to share information about drug distribution to patients with all authorised users;
 - e. **A Medical Summary sub-service:** the Medical Summary service provides a mechanism to exchange medical summaries between HC professionals;
 - f. **Hospital discharge letters;**

⁵⁷ Aymé S. et al. (2008): "Empowerment of patients: lessons from the rare diseases community", Lancet, Jun 14;371 (9629):2048-2051.

- g. **Result server:** The result server aims to securely and quickly exchange results from medical exams or analysis between a requesting user and a healthcare provider. This includes different patient electronic consent handling and additional views of the data and especially work lists which differ from the EHR views such as the patient-centric record, the case centric-record and electronic results viewing;
 - h. **Cancer oriented medical record (COMR)** and its associated services: The purpose of the COMR is to ensure that patients diagnosed with cancer can benefit from information gathering and viewing related specifically to the disease, including oncology-based follow up information. These specific records, accessible only to authorised HC professionals, shall also support multidisciplinary committees in oncology;
 - i. Other important documentation yet to be identified.
2. **Affiliation Control:** This service aims to verify the patients' identity and affiliation status with the CNS. Information security must be assured at all stages of the affiliation control process. This service is a prerequisite for a solution that enables payment of medical treatment cost by the CNS, directly to the HC professional (third party payer, *tiers payant*);
 3. **Electronic Prescription (ePrescription):** This service aims to use the Platform to exchange prescriptions between the prescriber and the institution carrying it out;
 4. **Decision support service (DSS):** Within the scope of this study, is a basic decision support service that describes the brand-name vs. generic drugs based on quality information, availability and price in order to support the prescription process. This service can be extended to clinical biology and radiology prescriptions, showing the prescriber the overall cost associated with the prescribed treatments. For the time after 2015, the DSS may also assist physicians with decision-making by providing drug-dosing assistance, checks for drug allergies and drug interactions, access to the latest evidence-based protocols, reminders about preventive medicine tests, and guidance for complex antibiotic management programs.

An interesting option promoting the secondary use of the data available on the platform could be to implement a value-added service that provides the available standardised medical data. This could support secondary use such as health education and health promotion, specialised systems for researchers for public health data collection and analysis as well as support systems (supply chain management, scheduling systems, billing systems, administrative and management systems), the latter supporting clinical processes but that are not used directly by patients or healthcare professionals. However, the broad scope of such a value-added service makes it too complex to evaluate in the context of this study.

5.2 Platform cost model

5.2.1 Roadmap and cost scenarios

The Platform cost model is based on a roadmap for the eSanté programme. The roadmap covers the budget for the years 2011 to 2015, hereafter, known as the “budget period”. For the study, we have developed maximum and minimum budget scenarios.

An overview of the maximum budget scenario roadmap is presented in Figure 5 below.

Figure 5 shows that 2011 will focus on the workstream “National HCIMS strategy” and on defining reference models for interoperability, user identification and information security. For the EHR service, we have foreseen two Proofs of Concept (POC) in 2010 and 2011, one for eSanté-CARA and -LABO in 2010, and one for the remaining EHR sub-services. Due to the progress with eSanté-CARA and LABO, we assume the pilot phase for these services will still take place in 2011. For ePrescription, we have estimated that the Feasibility phase will start in 2011. As we assume the Agency to be established on July 1, 2011 at the latest, we also expect the integration of the “Other eHealth services” into the Platform from this date.

In 2012 and 2013, the reference models will be deployed, and maintenance will start beginning in 2013. The change management programme will also commence in 2012, with its definition phase. The Platform will be built in 2012 and should be available for operations at the start of 2013, which would include the generic services. Regarding the EHR, a call for tender will be issued in 2012, so that the pilot phase can begin in 2013. ePrescription goes into definition phase in 2012, as well as the Affiliation control service. For upcoming projects suggested by members of the HC sector, the Agency shall be able to perform support in 2012. The Service Desk should also be fully operational in 2012.

In 2013, the change management programme would go live for all the specified parties. In that same year, COMR goes into the definition phase, and Affiliation control into the pilot phase. The feasibility study phase for the basic DSS will also start in 2013.

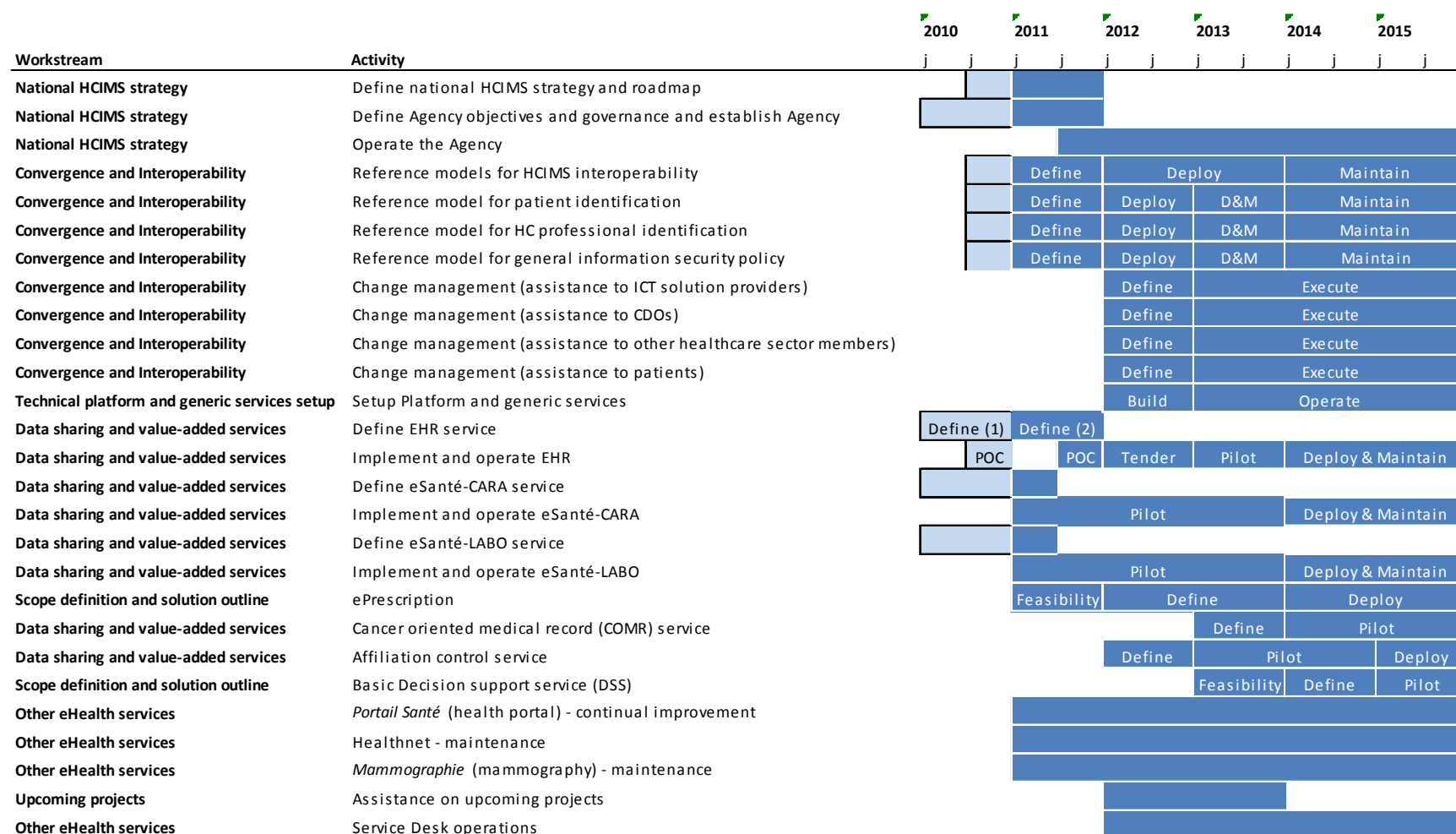
By 2014-2015, many of the services should be fully deployed and already be subject to maintenance and continuous improvement, except COMR and DSS, which would still be in the pilot phase.

The project management cost for external resources has been assigned to the Investment budget, whereas the cost of internal resources is in the Operations cost category. The latter hence includes internal project management cost.

Figure 6 below shows the minimum budget scenario. For this scenario, we have deferred a number of services for one to two years. We also assume that ICT infrastructure maintenance and human resources cost less. Furthermore, there is no financing of HC and patient identifier cards in the minimum budget scenario.



Table 4 outlines the details of the differences between the minimum and maximum budget scenarios.



(1) CARA and LABO, (2) other sub-services, D&M = Develop and maintain

Figure 5: Roadmap for eSanté programme (maximum budget scenario, 2011 to 2015)



(1) CARA and LABO, (2) other sub-services, D&M = Develop and maintain

Figure 6: Roadmap for eSanté programme (minimum budget scenario, 2011 to 2015)

The minimum budget scenario differs from the maximum budget scenario as follows:

Table 4: Differences between maximum and minimum budget scenario

Item	Minimum budget scenario	Maximum budget scenario
Patient and HC professional identification	1 FTE	2 FTE ⁵⁸
	No cost, we assume that the patients will reuse their existing LuxTrust certificate	10 M€ for patient for programming and dispatching of 400 000 cards
	37,5 K€ for 1 500 LuxTrust certificate vouchers for 25 € each	125 K€ for HC professional cards (5 000 cards)
	N/A ⁵⁹	50 K€ for external implementation assistance regarding patient and HC identifier card deployment
Default annual maintenance fee for ICT infrastructure (except managed services)	15 %	20 %
Deferred services	ePrescription starts in 2013	ePrescription starts in 2011
	COMR starts in 2014	COMR starts in 2013
	Affiliation control starts in 2013	Affiliation control starts in 2012
	Basic decisions support starts in 2014	Basic decisions support starts in 2013
Staff	4 Service Desk Analysts from 2013 to 2015	5 Service Desk Analysts from 2013 to 2015
	Minimum salary table	Maximum salary table ⁶⁰

⁵⁸ FTE = Full Time Equivalent, employee working 40 hours per week

⁵⁹ N/A = not applicable

⁶⁰ See appendix 7.6

Table 5 provides an overview of the cost estimation by workstream – differentiated for the minimum and maximum budget scenarios – over the budget period. For the minimum budget, we have estimated an investment budget of 10 M€ and an operations budget of 12,6 M€, totalling 22,6 M€. In the case of the maximum budget, the estimation for the investment budget is 21,3 M€ and for operations 15,9 M€, giving a total of 37,2 M€. The different workstream budgets are explained in the following sections.

Table 5: Budget by workstream

Workstreams	Investment (min. sc.)	Operations (min. sc.)	Total (min. sc.)	Investment (max. sc.)	Operations (max. sc.)	Total (max. sc.)
National HCIMS strategy	335 000 €	3 947 400 €	4 282 400 €	335 000 €	4 927 500 €	5 262 500 €
Convergence and Interoperability	1 887 500 €	363 900 €	2 251 400 €	12 725 000 €	963 000 €	13 688 000 €
Technical platform and generic services setup	1 830 000 €	1 626 300 €	3 456 300 €	1 830 000 €	1 626 300 €	3 456 300 €
Data sharing and value-added services	5 435 000 €	1 485 000 €	6 920 000 €	5 715 000 €	2 170 000 €	7 885 000 €
Scope definition and solution outline	20 000 €	210 000 €	230 000 €	240 000 €	480 000 €	720 000 €
Other eHealth services	- €	4 921 500 €	4 921 500 €	- €	5 577 500 €	5 577 500 €
Upcoming projects	500 000 €	84 000 €	584 000 €	500 000 €	120 000 €	620 000 €
Grand Total	10 007 500 €	12 638 100 €	22 645 600 €	21 345 000 €	15 864 300 €	37 209 300 €

5.2.2 Workstream “National HCIMS strategy”

This workstream intends to define a strategic plan that takes into account the evolution of healthcare information management systems, and particularly, eHealth systems. This is composed of the following activities:

- a. The information system strategy (ISS): The ISS must be aligned to the national health policy, and must support the strategic objectives of the Luxembourg government. This strategy should also take into account the needs of the HC stakeholders;
- b. A national roadmap for HCIMSs: This document aspires to create a roadmap for the next five years, agreed by all members of the Luxembourg health sector. This roadmap should centralise all workstreams, where national coordination makes sense. This roadmap could be developed by a Steering Committee that reports to the Supervisory Board. An indicative roadmap has been developed to estimate cost as presented in Figure 5 and Figure 6;
- c. Governance setup as outlined in section 4.1.3.

Table 6 indicates the budget for the workstream, “National HCIMS strategy”, for the budget period. As this workstream would pave the way for the Platform, the activities of this workstream are estimated as follows:

- Define national IS strategy and roadmap: 125 K€ have been estimated for one-shot consulting fees;
- Define Agency objectives and governance and establish Agency: 75 K€ are needed for one-shot consulting fees;
- Operate the Agency: In both the minimum and the maximum budget scenarios, 135 K€ has been estimated for external legal advice, covering the period of July 1, 2011 through December 31, 2015. This may be required for assistance in calls for tenders and other legal verifications. In the minimum budget scenario, the 3,9 M€ operations cost covers 10 K€ monthly for building occupancy and human resource costs, using the minimum salary table⁶¹. The maximum budget scenario differs in terms of operations cost (4,9 M€) due to the use of the maximum salary table.

⁶¹ See appendix 7.6

Table 6: Budget estimation for the workstream “National HCIMS strategy”

Workstream	Minimum budget scenario			Maximum budget scenario		
	Investment	Operations	Total	Investment	Operations	Total
National HCIMS strategy	335 000 €	3 947 400 €	4 282 400 €	335 000 €	4 927 500 €	5 262 500 €
• Define national IS strategy and roadmap	125 000 €	0 €	125 000 €	125 000 €	0 €	125 000 €
• Define Agency objectives and governance and establish Agency	75 000 €	0 €	75 000 €	75 000 €	0 €	75 000 €
• Operate the Agency	135 000 €	3 947 400 €	4 082 400 €	135 000 €	4 927 500 €	5 062 500 €

5.2.3 Workstream “Convergence and Interoperability”

To put the patient in the centre of healthcare service delivery, the HC members involved must be able to exchange health information seamlessly. To enable this, information systems used by these HC members must support interoperability, i.e. it must be technically feasible to read, use, exchange and share information stored in these information systems.

Interoperability intends to enable communication and make it comprehensible. It is the capacity to collaborate between technological solutions, organisations and different systems.

Several levels of interoperability apply⁶²:

- The definition of content to be shared and exchanged, in order to identify necessary information, and the right level of detail;
- Semantic interoperability: implement classifications, as well as medical and other terminologies known and shared amongst all affected actors (e.g. LOINC® for clinical biology results);
- Syntactic interoperability: implement document formats such as HL7 CDA and technical solutions allowing the exchange or sharing of information (containers, services and transport protocols), such as HTTPS.

Interoperability in the context of eHealth has to consider:

- The unique identification of the **patient** in order to ensure that data is linked to the right person. Within the Luxembourg context, the national *matricule*⁶³ and the national patient

⁶² Dogac et al. (2006): “Key issues of technical interoperability solutions in eHealth”, in: Proceedings of eHealth 2006, High LevelConference Exhibition, Spain, www.srdc.metu.edu.tr/webpage/projects/ride/publications/DogacMalaga-eHealthPaperApril14.doc, accessed 22/07/2010

identifier card/social security card of the CNS have to be taken into account. However, experience abroad has shown that it is not enough to rely on a social security number. To uniquely identify patients, the MPI federating the patient identities is important. Therefore, the *matricule* may just be one part of the identity solution;

- The unique identification of the **HC professional** in order to ensure appropriate information contains security management with regard to access rights and non-repudiation of the exchanged information. In this context, an HC registered professional and the implication of LuxTrust can be helpful;
- The rules regarding the security of data storage and exchange.

With regard to syntactic interoperability, a number of reference models and initiatives exist, such as:

- DICOM (Digital Imaging and Communications in Medicine): a standard in digital imaging;
- HL7 (Health Level 7): HL7 defines a low-level message standard to exchange structured data amongst software components. Moreover, the HL7 group defined the HL7 Reference Information Model (HL7 RIM) and HL7 Clinical Document Architecture (HL7 CDA). Basically, RIM is a recommended data model which is highly compatible to comply with the HL7 message standards. CDA is a XML-based document standard to exchange structured medical documents, such as discharge letters;
- IHE (Integrating the Healthcare Enterprise): The IHE initiative defines integration profiles in the context of existing standards to enable information exchange among different software solution providers. These profiles are based on the corresponding medical workflows. Solution providers meet annually at so-called “Connectathon” events to test the interoperability of their products using the IHE integration profiles. Examples of commonly used profiles are:
 - Scanned Documents (XDS-SD): This profile allows handling of non-structured medical data (raw text and images);
 - Sharing Laboratory Reports (XD-LAB): Designed to allow sharing of laboratory reports among a community of healthcare settings and care providers;
 - Cross-Enterprise Documents Sharing (XDS): Designed to enable registration, distribution and access of patient electronic health records across care delivery organizations (CDOs). Hence, XDS can serve as a protocol to manage centralized/decentralized EHR architectures;
 - The Patient Identifier Cross Referencing (PIX) integration profile supports cross-referencing of patient identifiers from multiple Patient Identifier Domains. PIX allows the transfer of patient identity information from an identity source to the Patient Identifier Cross-reference Manager, and enables access to lists of cross-referenced patient identifiers either via query or update notification.

Other profiles not presented in this list may also be considered.

⁶³ A unique resident identification number for inhabitants officially registered in Luxembourg

- Continua Health Alliance: This initiative of 200 affiliates suggests a reference model for portable patient devices.

Many classifications exist and vary with regard to their level of detail; classifications are often more detailed for clinical use, and less detailed for public health and administrative statistics use. As examples, SNOMED (Systematized Nomenclature of Medicine) and UMLS (Unified Medical Language System) have been developed for clinical items and semantic medical concepts. ICD (International Classification of Diseases) and ICPM (International Classification of Procedures in Medicine) can be used to document diagnosis and procedures. The French CCAM⁶⁴, initially elaborated for clinical situations, has later been adopted by the French public health insurance for billing.

Generally, semantic interoperability is a complex goal as it requires assigning heterogeneous information to semantic "meanings" which have to be interpreted the same way within all participating systems. The appropriate definition and adoption of classifications, terminologies and concepts are highly challenging but yet mandatory for semantic interoperability. Moreover, the implementation of interoperability depends on a number of national and international influential factors that can hinder its progress.

Therefore, it is necessary to define the purpose for which a classification shall be used. To make this decision, several questions must be asked:

- How easy is it to maintain the classification?
- How easy is it to follow up on its evolution?
- How easy is it to match it with other classifications?
- How has it been adopted and implemented into ICT solutions?
- How much does it cost (license fees)?

From these questions, it is clear that choosing a classification is a decision made for the long term and thus, needs profound consideration.

From the above-mentioned high-level questions, further clarification is needed:

- Regarding the reference models: What is the purpose? What is the level of detail needed? What constraints may apply (e.g. translation)? How can maintenance be handled?
- What ICT solutions exist that use the reference models?
- What is the investment and operational budget regarding the reference models?
- What operational constraints can be expected? With regard to semantic interoperability, if there is no advantage for the HC professional in charge of data input, and if there is no import from existing systems, data will not be entered. This raises the question of how to coach the HC professional with regard to HC-specific, as well as technical issues.

⁶⁴ A common classification of medical treatments (*Classification commune des actes médicaux*)

It is important that Luxembourg develops its own strategy and answers the questions mentioned above. The eSanté programme should therefore concentrate on two key tasks:

1. The Agency should involve all members of the national HC sector and draw up a whitepaper including a roadmap for HCIMS interoperability in Luxembourg;
2. Create an interoperability framework for HCIMSs, taking into account common reference models that can be suggested to ICT solution providers, and that are compatible with HCIMSs implemented in Luxembourg.

In order to do this, the reference models must become a part of functional specifications for ICT to be deployed in Luxembourg in the future. At first, this should cover:

1. Information security (includes the HC professional authentication process): encryption, electronic signature, secure data transfer and data exchange architecture;
2. Patient authentication and consent management;
3. Semantic interoperability;
4. Standards and syntactic interoperability.

Table 7 shows the budget for the workstream, “Convergence and Interoperability”, for the budget period. This workstream covers the various reference models needed to setup and operate the Platform. A second group of activities deals with change management activities that are supposed to facilitate adoption of the Platform and its services by all affected members of the HC sector and the ICT solution providers.

The activities have been estimated as follows:

- Reference model for general information security policy: 145 K€ has been estimated for consulting fees;
- Reference model for HC professional identification: In the minimum budget scenario, the 152 K€ investment covers consulting fees, an identity server solution and LuxTrust vouchers for HC professionals. For the 107 K€ operations cost in the minimum budget scenario, this amount covers 0,5 FTE for a project manager and maintenance on the identity server solution. In the maximum budget scenario, the 265 K€ investment covers an HC identifier card and consulting fees for its definition and rollout. In that scenario, the 273 K€ operations cost is made up of 1 FTE for project management and maintenance on the identity server solution;
- Reference model for patient identification: In the minimum budget scenario, we estimate 115 K€ for consulting fees and an identity server solution. We assume in this scenario that patients use their existing CNS patient identifier card, as well as a LuxTrust certificate they obtain on their own for identification and authentication. Another option may be the usage of the future ID card. Both solutions may be combined, ID Card and LuxTrust Card for residents with Luxembourgian nationality, and LuxTrust Card only for commuters, non-Luxembourgian

residents and EU-agents. As for the 106 K€ operations cost, this amount is composed of 0,5 FTE for a project manager and maintenance on the identity server solution. In the maximum budget scenario, we assume that the current CNS card will be replaced by a basic chip card with a LuxTrust certificate for all patients in the country, hence, the 10,3 M€ investment. Operations cost in the maximum budget scenario is about four times that of the minimum budget scenario. This is due to the cost for replacing the cards (estimation: 8 ‰ annual replacement rate, 400 000 cards issued initially, 25 €/card), 1 FTE for a project manager and maintenance on the identity server solution;

- Reference models for health information system interoperability: In both cost scenarios, an investment of 175 K€ is foreseen for consulting fees. Operations cost amounts to 150 K€ in the minimum budget scenario for the Platform manager (0,5 FTE). In the maximum budget scenario, operations cost is estimated at 180 K€ due to the use of the maximum salary table;
- For change management activities regarding CDOs, ICT solution providers and HC sector members, 150 K€ each have been estimated for consulting fees (both budget scenarios). The consultant's role will be to coach the different parties in implementing the reference models into their ICT infrastructure. In the minimum budget scenario, a further 250 K€ each have been allocated for subsidies to ICT solution providers and HC professionals. These subsidies shall motivate ICT solution providers to adopt and integrate interoperability into their solutions. On the other hand, HC professionals shall be motivated towards Platform use. In the maximum budget scenario, the subsidies are 500 K€ each;
- Regarding change management for patients, we have estimated an amount of 350 K€ as we assume a considerable effort to be placed on patient awareness campaigns and mass communications.

Table 7: Budget estimation for the workstream “Convergence and Interoperability”

Workstream	Minimum budget scenario			Maximum budget scenario		
	Investment	Operations	Total	Investment	Operations	Total
Convergence and Interoperability	1 887 500 €	363 900 €	2 251 400 €	12 725 000 €	963 000 €	13 688 000 €
• Reference model for general information security policy	145 000 €	0 €	145 000 €	145 000 €	0 €	145 000 €
• Reference model for HC professional identification	152 500 €	107 400 €	259 900 €	265 000 €	273 000 €	538 000 €
• Reference model for patient identification	115 000 €	106 500 €	221 500 €	10 340 000 €	510 000 €	10 850 000 €
• Reference models for health information system interoperability	175 000 €	150 000 €	325 000 €	175 000 €	180 000 €	355 000 €
• Change management (assistance to CDOs)	150 000 €	0 €	150 000 €	150 000 €	0 €	150 000 €
• Change management (assistance to ICT solution providers)	400 000 €	0 €	400 000 €	650 000 €	0 €	650 000 €
• Change management (assistance to other healthcare sector members)	400 000 €	0 €	400 000 €	650 000 €	0 €	650 000 €
• Change management (assistance to patients)	350 000 €	0 €	350 000 €	350 000 €	0 €	350 000 €

5.2.4 Workstream “Technical platform and generic services setup”

The successful execution of this workstream is crucial to the overall success of the Luxembourg eSanté programme. In fact, this workstream covers the setup of all ICT solutions to operate the Platform, together, with the generic services.

The estimated budget for “Technical platform and generic services setup” shows an investment budget of 1,8 M€ and an operations cost budget of 1,6 M€, for both cost scenarios. The investment budget is composed of the setup of the ICT infrastructure of the Platform on two sites for resilience purposes. Within the setup budget, an amount of 175 K€ has been assigned for functional evolution and volume upgrading of the Trusted Third Party (TTP) solution. The TTP will already be implemented by a Third Party by end of 2010 as requested by the Integrated Biobank of Luxembourg. This common external TTP would host the Master Patient Index to hold and federate the patient identities and provide pseudonyms for external patient data use (alias, see section 5.1). These services could be made more widely available, thus leveraging economies of scale

The other generic services are also covered by the investment budget. We assume that the technical ICT infrastructure (hardware, network, telephony) is managed by an external service provider, whereas, healthcare-specific ICT solutions (such as the eSanté-CARA application) are managed by Agency staff.

The estimated operations cost (1,6 M€) also includes maintenance and continuous improvement of the ICT infrastructure of the platform. This amount is composed of the annual managed services fee, Disaster Recovery Centre/resilience service fee, and the annual maintenance on the TTP solution.

More details on the ICT infrastructure setup can be found in appendix 7.6.

Table 8: Budget estimation for the workstream “Technical platform and services setup”

Workstream	Minimum budget scenario			Maximum budget scenario		
	Investment	Operations	Total	Investment	Operations	Total
Technical platform and generic services setup	1 830 000 €	1 626 300 €	3 456 300 €	1 830 000 €	1 626 300 €	3 456 300 €
Setup Platform and generic services	1 830 000 €	1 626 300 €	3 456 300 €	1 830 000 €	1 626 300 €	3 456 300 €

5.2.5 Workstream “Data sharing and value-added services”

Table 9 shows the budget estimation for data sharing and value-added services. Within this workstream, there is the EHR service with all its sub-services (e.g. eSanté-CARA, see list in section 5.1.4).

In both cost scenarios, the 365 K€ investment budget covers consulting fees for EHR service definition. The operations budget for EHR service definition contains 0,5 FTE for a project manager, totalling 42 K€ (minimum budget scenario) and 60 K€ (maximum budget scenario). The difference is due to the different salary tables.

For implementing and operating the EHR, we have estimated a 3,8 M€ investment in both cost scenarios. This amount includes 1,8 M€ for purchasing an ICT solution for the EHR and 100 K€ for the connectors and integration. Another 1,9 M€ is for consulting fees, with regard to implementation and continuous improvement of the platform within the budget period. Finally, 20 K€ is assigned to external assistance in calls for tenders.

The operations budget (570 K€ in the minimum budget scenario, 760 K€ in the maximum budget scenario) covers maintenance costs on the EHR service. The difference is due to the different maintenance fee rates: 15 % in the minimum budget scenario, 20 % in the maximum budget scenario).

With regard to defining the eSanté-CARA and -LABO service, we have estimated a 25 K€ investment of each in both cost scenarios. This is due to the fact that the conceptual phase for both services should be complete by the end of Q1 2011. This keeps operations cost related to service definition fairly low. In fact, it covers 0,5 FTE for a project manager until the end of Q1 2011. The different amounts for these budget items are due to the use of the different salary tables (see appendix 7.6).

Implementing and operating eSanté-CARA needs an estimated investment of 510 K€ in both cost scenarios. The investment is related to the ICT solution (POC, implementation and continuous improvement). The operating cost (300 K€ in the minimum budget scenario, 420 K€ in the maximum budget scenario) contains 0,5 FTE for a project manager and annual maintenance fees on the eSanté-CARA ICT solution.

eSanté-LABO, in its implementation and operating phase, requires an estimated investment of 510 K€ in both cost scenarios. The investment is related to the ICT solution (POC, implementation and continuous improvement). The operating cost (342 K€ in the minimum budget scenario, 480 K€ in the maximum budget scenario) contains 0,5 FTE for a project manager and annual maintenance fees on the eSanté-LABO ICT solution.

As illustrated in the roadmap in section 5.2.1, the Affiliation control service will be deferred by one year in the minimum budget scenario. The missing deployment phase in the minimum budget

scenario explains the considerable difference in the estimated investment between the two cost scenarios. The 120 K€ investment (min. budget scenario) contains consulting fees for service definition and a POC. Operations cost (126 K€, minimum budget scenario) consists of 0,5 FTE for a project manager. In the maximum budget scenario, the Affiliation control service will be deployed in 2015. Therefore, it has an investment budget of 370 K€ which includes the related ICT solution and consulting fees for service setup. An amount of 240 K€ for operations cost in the maximum budget scenario is needed for a 0,5 FTE project manager.

As with the Affiliation control service, the COMR service is also deferred for a year. In the minimum budget scenario, 110 K€ is needed for the definition and the POC of the COMR service. As the budget period covers the two-year pilot phase only partially, an additional investment will be necessary after 2015. The 84 K€ for operations contains a 0,5 FTE project manager evaluated at a lower salary. In the maximum budget scenario, the COMR service pilot phase is completely covered, which requires a higher investment, and triggers more operational costs. The difference in operations cost is due to salary costs for the project manager (one more year, higher salary).

Table 9: Budget estimation for the workstream “Data sharing and value-added services”

Workstream	Minimum budget scenario			Maximum budget scenario		
	Investment	Operations	Total	Investment	Operations	Total
Data sharing and value-added services	5 435 000 €	1 485 000 €	6 920 000 €	5 715 000 €	2 170 000 €	7 885 000 €
• Define EHR service	365 000 €	42 000 €	407 000 €	365 000 €	60 000 €	425 000 €
• Implement and operate EHR	3 770 000 €	570 000 €	4 340 000 €	3 770 000 €	760 000 €	4 530 000 €
• Define eSanté-CARA service	25 000 €	10 500 €	35 500 €	25 000 €	15 000 €	40 000 €
• Implement and operate eSanté-CARA	510 000 €	300 000 €	810 000 €	510 000 €	420 000 €	930 000 €
• Define eSanté-LABO service	25 000 €	10 500 €	35 500 €	25 000 €	15 000 €	40 000 €
• Implement and operate eSanté-LABO	510 000 €	342 000 €	852 000 €	510 000 €	480 000 €	990 000 €
• Affiliation control service	120 000 €	126 000 €	246 000 €	370 000 €	240 000 €	610 000 €
• Cancer oriented medical record (COMR) service	110 000 €	84 000 €	194 000 €	140 000 €	180 000 €	320 000 €

5.2.6 Workstream “Scope definition and solution outline”

This workstream deals with complementary studies regarding the scope and the outline of priority projects, for which technically mature solutions are not available. In this study, we have predicted the work for the ePrescription service and for decision support systems. For these services, additional analysis is needed before moving forward with the implementation process.

This workstream contains the basic Decision support service (DSS) and ePrescription. These services require a detailed strategy upfront, which is not the case with the other value-added services. Therefore, the DSS and the ePrescription have been integrated into a separate workstream.

In the minimum budget scenario, the DSS has an investment budget of 10 K€ needed for external assistance and coaching, in order to elaborate a strategy and to define the service. However, we assume that most of the work will be done in-house by the project manager in charge (0,5 FTE). This is covered by the operations cost budget of 84 K€. In the maximum budget scenario, the DSS will start one year earlier. Thus, the budget period also covers the POC, which alone, accounts for 100 K€ of the 120 K€ investment budget. The remaining 20 K€ is required for further external assistance. The operations cost budget in the maximum budget scenario (180 K€) contains 3 years of 0,5 FTE project manager salaries (high salary table).

The ePrescription service has been deferred from 2011 to 2013 in the minimum budget scenario. The 10 K€ investment only covers some assistance in strategy development and basic service definition. As in the DSS, we assume that most of the work will be done in-house by the project manager (0,5 FTE from 2013 to 2015, covered by the 126 K€ operations cost budget). In the maximum budget scenario, the investment (120 K€) additionally contains the POC. DSS Operations are far more costly as the project starts earlier in 2011. The 300 K€ amount thus covers salary cost for a project manager (0,5 FTE, high salary table, 5 years).

Table 10: Budget estimation for the workstream “Scope definition and solution outline”

	Minimum budget scenario			Maximum budget scenario		
Workstream	Investment	Operations	Total	Investment	Operations	Total
Scope definition and solution outline	20 000 €	210 000 €	230 000 €	240 000 €	480 000 €	720 000 €
• Basic Decision support service (DSS)	10 000 €	84 000 €	94 000 €	120 000 €	180 000 €	300 000 €
• ePrescription	10 000 €	126 000 €	136 000 €	120 000 €	300 000 €	420 000 €

5.2.7 Workstream “Other eHealth services”

The objective of this workstream is to identify and integrate existing eHealth solutions progressively into the Agency. Other solutions identified at this stage are HealthNet, the Mammography programme and *Portail Santé*. These solutions are currently being managed by other organisations. In order to maximise synergy effects and optimise resources, these solutions should be migrated to the ICT infrastructure of the Agency. This workstream also covers day-to-day operations of the Service Desk.

For the “Other services” workstream, we assume that the Agency will take over accountability for several eHealth projects by 2011. As investments are not foreseen in the budget period, we have focussed on operations costs only. Due to missing information regarding the further development of the other services, we have assumed that the budget for 2011 will be carried forward for the remainder of the budget period.

The *Portail Santé* service has an annual budget of 380 K€ (minimum budget scenario) totalling 1,9 M€, for the whole budget period. The 380 K€ annual amount contains 350 K€ covering staff costs (0,25 FTE for a project manager, 1,5 FTE for system administration) as well as maintenance for minor improvements at 30 K€. The maximum budget scenario is higher due to an annual amount of 100 K€ for those improvements.

For HealthNet, an annual hosting and maintenance fee of 350 K€ is estimated as well as 0,25 FTE for a project manager and 0,75 FTE for system administration. Due to the differences in the salary tables, HealthNet costs in the minimum budget scenario is estimated at 2 M€ and at 2,1 M€ in the maximum budget scenario.

The mammography operations budget only covers 50 K€ and 0,5 FTE for a project manager. As the salary tables differ in the two cost scenarios, the operations cost totals to 460 K€ in the minimum budget scenario, and to 550 K€ in the maximum budget scenario.

The Service Desk operational costs consists of staff costs and differs due to the deferral of services and the different salary tables in the two cost scenarios. For further details, see appendix 7.6.

Table 11: Budget estimation for the workstream “Other services”

Workstream	Minimum budget scenario			Maximum budget scenario		
	Investment	Operations	Total	Investment	Operations	Total
Other services	0 €	4 921 500 €	4 921 500 €	0 €	5 577 500 €	5 577 500 €
• Portail Santé (health portal) - continual improvement	0 €	1 900 000 €	1 900 000 €	0 €	2 250 000 €	2 250 000 €
• HealthNet - maintenance	0 €	2 057 500 €	2 057 500 €	0 €	2 147 500 €	2 147 500 €
• Mammography (mammography) - maintenance	0 €	460 000 €	460 000 €	0 €	550 000 €	550 000 €
• Service Desk operations	0 €	504 000 €	504 000 €	0 €	630 000 €	630 000 €

5.2.8 Workstream “Upcoming projects”

The objective of this workstream is to support Platform enhancing projects initiated by members of the Luxembourg HC sector. In this context, the Agency can offer financial and methodological support, as well as implementation assistance. The idea is to promote new value-added services to run on the Platform that supports national healthcare objectives. The new projects must be compatible with the reference models used on the Platform and in the eSanté programme.

This workstream is complementary to projects triggered by the Agency. In the latter case, the Agency should have a strong collaboration with the affected HC sector members.

As the Agency aims to encourage the members of the HC sector to come up with ideas to enhance adoption and further development of the Platform, a 500 K€ investment budget has been predicted. Operations costs differ in the two scenarios due to the different salaries regarding the project manager (0,5 FTE) dedicated to this workstream.

Table 12: Budget estimation for the workstream “Upcoming projects”

Workstream	Minimum budget scenario			Maximum budget scenario		
	Investment	Operations	Total	Investment	Operations	Total
Upcoming projects	500 000 €	84 000 €	584 000 €	500 000 €	120 000 €	620 000 €
Assistance on upcoming projects	500 000 €	84 000 €	584 000 €	500 000 €	120 000 €	620 000 €

5.2.9 Annual budgets

Table 13 shows the budget by year. In the minimum budget scenario, the budget starts off with 2,8 M€ in 2011, and varies between 4,7 M€ and 5,2 M€ in each of the following years. The maximum budget scenario has a budget of 3,1 M€ in 2011, and reaches a peak value of 11,1 M€ in 2013. For the remainder of the budget period, the annual budget is less, and varies between 6,1 M€ to 6,4 M€.

Table 13: Budget by year

Budget	2011	2012	2013	2014	2015	Total
<i>Minimum budget scenario</i>						
Investment	1 300 000 €	2 618 750 €	2 103 417 €	1 962 667 €	2 022 667 €	10 007 500 €
Operations	1 469 100 €	2 042 700 €	2 786 100 €	3 170 100 €	3 170 100 €	12 638 100 €
Total (min sc.)	2 769 100 €	4 661 450 €	4 889 517 €	5 132 767 €	5 192 767 €	22 645 600 €
<i>Maximum budget scenario</i>						
Investment	1 300 000 €	7 802 500 €	7 518 833 €	2 214 333 €	2 509 333 €	21 345 000 €
Operations	1 807 000 €	2 708 500 €	3 549 600 €	3 899 600 €	3 899 600 €	15 864 300 €
Total (max sc.)	3 107 000 €	10 511 000 €	11 068 433 €	6 113 933 €	6 408 933 €	37 209 300 €

5.3 Benefits of the Platform

The objective of the benefits section is to perform a high-level analysis how benefits can be achieved through the implementation and adoption of services of the Platform. The benefits section does not intend to provide an overall evaluation and quantification of all benefits linked to the programme, the platform and the services that may be achievable.

eHealth initiatives are seen as enablers for healthcare improvement and potential weapons against rising costs and other systemic problems in healthcare. This reason to invest in interoperable information systems for clinical purposes is supported by many different types of benefits. ICT can furthermore serve as an enabler to change clinical and working practices, which in turn, directly improve quality and efficiency.

Although eHealth has long term benefits, it entails significant effort and change in the areas of work processes, organisational and system culture, and capacity. eHealth has a number of technical components and human factors that must work seamlessly together if the promise of higher quality, safer, more timely and efficient access to health information and care is to be realised. Unless the

various components work well together as they begin to be rolled out and mature, there will be gaps, overlaps and potential conflicts that will mitigate the optimal benefits of eHealth⁶⁵.

5.3.1 The challenge of evaluating and achieving benefits

Measuring expected benefits of such complex, multidimensional, long-term projects is anything but straightforward. Even if a large number of publications intend to answer inherent questions linked to evaluation of eHealth and ICT in healthcare have already been published, building an accurate model to evaluate qualitative and quantitative benefits remains difficult to establish.

Our approach is based on an empirical approach transposing successful models, best practices, and inherent results identified in other countries, into the specific Luxembourg context, where applicable. The approach has the following steps:

1. Get evidence, proven and robust facts about benefits from services of the Platform. To this end, we have analysed medical, institutional and professional studies;
2. Design a model to capture and evaluate expected benefits;
3. Detect items that trigger the benefits (see below), determine the related benefits, their beneficiaries and how the benefits support the strategic objectives of the government.

The methodology however may present limitations:

1. The problem of transferability and replicability of one successful model to another contextual framework;
2. The problem of data limitations, coherent definition of issues and the lack of a strong monitoring and evaluation approach.

As a report from the Congress of the United States indicates, “no aspect of health IT entails as much uncertainty as the magnitude of its potential benefits”⁶⁶. Issues of profitability, savings and benefits of healthcare ICT investments are still widely debated. However, there are three different views, based on different methodologies, of the impact of ICT on healthcare:

1. The adoption of such systems could provide substantial savings by lowering the cost of providing health care, eliminating unnecessary health care services (such as redundant diagnostic tests), and improving the quality of care in ways that might reduce costs (by diminishing the likelihood of adverse drug events, for example);
2. ICT may provide a limited impact on costs only, but trigger a significantly positive impact on quality of care;
3. ICT could bolster the quality of care but also increase expenditures on health care services because improvements in quality would stimulate demand for additional services.

⁶⁵ Canada Health Infoway (2007): “Converging the Silos of Telehealth and eRecords (e.g. EHR’s, EMR’s) - A Workshop on the Challenges, Issues and Strategies”, Workshop report v3.0, http://www2.infoway-inforoute.ca/Documents/Telehealth%20Workshop_Converging%20Silos%20Report_EN.pdf, accessed 25/07/2010

⁶⁶ Congress of the United States (2008): “Evidence on the Costs and Benefits of Health Information Technology”, a CBO Paper, Congressional Budget Office, May 2008, <http://www.cbo.gov/ftpdocs/91xx/doc9168/05-20-HealthIT.pdf>, accessed 24/07/2010

In any case, the positive impact of information technologies on quality of care is obviously recognised and should be considered as one of the main objectives of every eHealth project. However, the EHR Impact study has shown that⁶⁷:

- The socio-economic gains to society from interoperable EHR and ePrescription systems eventually exceed the costs, albeit quite often only after a considerable length of time. This is why investment in such systems is worthwhile, and justifies their net financial boost;
- All cost-benefit analyses predicted substantial savings from EHR (and healthcare information exchange and interoperability) implementation. Yet, it takes at least four, and more typically, up to nine years before initiatives produce their first positive annual socio-economic returns, and six to eleven years to achieve a cumulative net benefit.

5.3.2 The benefits model

To evaluate benefits, we have defined the following building blocks of the evaluation model:

- Strategic objectives of the government;
- Benefits, their contribution to the strategic objectives of the government and their triggers;
- Beneficiaries.

For the benefits to materialise, we assume that change management and interoperability are successfully implemented.

5.3.2.1 Strategic objectives of the government

We have identified the following strategic objectives of the government linked to eHealth:

- **Increase Quality of Care (QoC)**⁶⁸: Strong evidence from literature shows that healthcare ICT improves quality by increasing adherence to guidelines or protocol-based care, enhancing disease surveillance and decreasing medication errors;
- **Enhance care delivery efficiency**: Evidence from literature shows also that healthcare ICT improves efficiency by decreasing utilisation of care and potential GP⁶⁹ workload reduction. In the case studies presented in the previously cited OECD report, GPs reported improved access to patients' medical records, guidelines and medication lists, but generally felt ambivalent about the effects on workload as a result of using electronic medical records

⁶⁷ European Commission, DG INFSO & Media (2009): "The socio-economic impact of interoperable electronic health record (EHR) and ePrescribing systems in Europe and beyond, EHR Impact", October 2009, http://www.ehr-impact.eu/downloads/documents/EHRI_final_report_2009.pdf, accessed 24/07/2010

⁶⁸ "Soigner mieux en dépensant mieux" (Better care by better spending), <http://www.gouvernement.lu/gouvernement/programme-2009/programme-2009/programme-gouvernemental-2009.pdf>, p. 113, accessed 24/07/2010

⁶⁹ General Practitioner

(EMRs) or electronic health records (EHRs). Only Swedish physicians mentioned savings of approximately 30 minutes a day as a result of using e-prescription⁷⁰;

- **Improve patient safety:** Patients should be protected from medical malpractice, adverse drug events, and irradiation that may be due to lack of information either of the HC professional or the patients themselves;
- **Empower patients:** Empowered patients can openly discuss with their HC professional on their care, take informed decisions and thus actively contribute to reducing cost and maximise care efficiency;
- **Empower HC professionals:** Empowered HC professionals feel valued by the health system, and are hence more motivated to deliver excellence in care using ICT solutions that support their work on a daily basis. This should reduce the risk of medical malpractice, and augment quality.

5.3.2.2 Beneficiaries

The beneficiaries are the stakeholders who achieve a benefit from a specific benefit trigger (see below). We have identified the following beneficiaries⁷¹:

- **Patients:** They may benefit from better care access or being better informed;
- **Healthcare professionals (HCPs):** can benefit from more reliable information at the point of care, and of every benefits associated to a better shared information;
- **Care Delivery Organisations:** may rip both direct (more efficiency) and indirect benefits such as competitive advantages;
- **Public authorities:** Government and public payers should consider healthcare IT investment as an entire part of the overall healthcare strategy and define what indicators should be put in place to measure its overall performance;
- **ICT solution providers:** should provide fully interoperable solutions and Platform connectors;
- **Researchers:** in the context of epidemiology they could benefit from improved data quality and availability
- **All stakeholders:** all identified HC stakeholders in this study.

5.3.2.3 Benefits and their triggers

We define a benefit as a direct or indirect positive effect initiated by the adoption and the use of eHealth services by concerned users. In the context of our model, we classify benefits by global, general healthcare and specific healthcare benefits.

⁷⁰ OECD (2010): "Improving Health Sector Efficiency: The Role of Information and Communication Technologies", OECD Health Policy Studies, <http://www.oecd-ilibrary.org/content/book/9789264084612-en>, accessed 24/07/2010

⁷¹ Cf. also European Commission, DG INFSO & Media (2009), *ibidem*

Concerning **global** benefits, we expect the following to be achieved:

1. All forces of the HC sector combined;
2. Collaboration of all HC sector members;
3. Improved HC sector communication;
4. Benefits from synergy effects;
5. Reduced risk of redundant projects;
6. Improved decision-making processes;
7. Better control environments;
8. Organisational efficiency;
9. Cross-border interoperability;
10. Enhanced reputation of Luxembourg;
11. Financial incentives.

We have identified the following **healthcare general** benefits:

1. **Seamless sharing and exchange of medical information;**
2. **Informed patients:** Patients have direct access to data, information and knowledge about health issues and the impact of life styles and behaviour on health and wellness, prevention, their conditions and vital parameters, diagnoses, treatment options and healthcare facilities, to enable them to take effective decisions about their health and lifestyles;
3. **Enhanced accessibility:** healthcare services are available and accessible at the same standard to all those in need;
4. **Better patient health** through:
 - a. Reduced errors in diagnosis, medication, and treatment without medication;
 - b. Enhanced adherence to best practices by providers.
5. **Reduced cost;**
6. **Reduced redundancy;**
7. **Better HC infrastructure utilisation,** including reductions in the average stay length and wait times;
8. **Effectiveness:** Information enables healthcare to be developed, planned, scheduled and derived from evidence and provided consistently to patients who can, or may benefit, and not provided to those who cannot; and healthcare professionals are enabled to work effectively in multidisciplinary teams which share responsibility for the patient;
9. **Efficiency:** Information enables productivity to be improved due to greater efficiencies in obtaining patient information, record keeping, administration, waste to be avoided, resource utilisation optimised and costs contained to budgets;
10. **Holistic view on patient health:** centralise all medical information on the individual patients to deliver a holistic view on the patient's health;
11. **Less dependence of large-scale WAN⁷²:** reduce the dependence of a large-scale WAN infrastructure in the context of a general Platform roll-out;

⁷² Wide Area Network

12. **Offline systems supported:** As the major part of medical information is centralised on the Platform, local source systems need not be online 24/7.

The **healthcare specific** benefits that we have detected are:

1. Promote best practice⁷³;
2. Generic drugs delivery promotion;
3. Prescription errors reduction;
4. Adverse drug event prevention;
5. Medication errors reduction;
6. Direct access to imaging results for HC professionals;
7. Streamlined workflow for imaging prescriptions.

Benefit triggers are the sources generating the benefits. They can be linked to the eSanté programme, to the Agency workstreams, the Platform and its generic services, and to specific value-added services. They are illustrated in the tables below.

Table 14 shows the benefits related to the eSanté programme. The benefits are triggered by the actions outlined in the roadmap in section 5.2.1. Many programme-related benefits correspond to the global category (see above) as the establishment of the Agency, its governance and its organisational units and main processes trigger more sector-independent benefits. The beneficiaries of the programme-related benefits rank from clearly identified stakeholders to all stakeholders of the HC sector. Finally, the programme-related benefits contribute to most of the strategic objectives of the government.

Workstream-related benefits are illustrated in Table 15 and mainly belong to the global and healthcare general categories. The workstream-related benefits have clearly identified beneficiaries and show a high level of contribution to the government's strategic objectives.

Table 16 shows the benefits related to the Platform and its generic services. The benefit triggers mainly lead to healthcare general benefits except for the Centralised catalogues service. The latter provides also healthcare specific benefits (see above). Beneficiaries of the generic services-related benefits are Healthcare professionals, CDOs and patients. The benefits' contribution to the strategic objectives ranks from low to high.

In Table 17, the value-added services benefits are illustrated. The benefits related to the value-added services comprise global, healthcare general and healthcare specific benefits. The EHR and its sub-services in particular materialise many of the listed benefits above. The EHR contributes to all strategic objectives of the government and thus represents the centrepiece of the whole programme. The other value-added services trigger fewer benefits than the EHR but still cover all three benefits categories. Beneficiaries of the value-added services are patients, HC professionals and CDOs. The contribution to the strategic objectives is high for the basic decision support service and moderate for the remaining value-added services.

⁷³ By enhanced Platform adoption

Summing up, the programme, the Agency's workstreams, the Platform and its generic services and the value-added services provide many different benefits to the identified stakeholders. The most important ones are:

1. The establishment of an empowered agency provides benefits to all stakeholders as this combines the forces of the HC sector, reduces risks of redundancy and provides synergy effects;
2. Engaging with stakeholders is the foundation to make all HC sector members collaborate and go into one direction under the lead of the Ministry of Health and the Ministry of Social Security;
3. The centralised/decentralised hosting approach provides organisational efficiency and makes the Platform less dependent from large-scale WAN. A number of connected applications need not be online 24/7 as the data can be centralised on the Platform;
4. The right sourcing strategy allows the Agency to focus on its core business. Pure technical infrastructure can be outsourced;
5. A Continuous Improvement Process (CIP) unites all HC stakeholders and improves HC sector communication. As all improvements are centrally managed by the CIP Working group reporting to the Supervisory Board, the risk of redundant projects is reduced and Platform adoption should be enhanced;
6. The activities of the Convergence and Interoperability workstream provide the basis for seamless sharing and exchange of medical information. Financial incentives to HC professionals and ICT solution providers should motivate them to implement and use the Platform;
7. The Trusted Third Party (TTP) generic service leads to improved HC sector communication as it will be used by other stakeholders, too. It enables a better control environment, and provides the foundation to seamless sharing and exchange of medical information. TTP also provides efficiency, effectiveness and should thus enhance Platform adoption;
8. The EHR and its sub-services provide most of the benefits. It is the centrepiece of the Platform and the value-added services. Benefits range from improved HC sector communication, decision-making, efficiency, patient health as well as seamless sharing and exchange of medical information – just to name a few;
9. Integrating the other eHealth initiatives into the Platform also achieves many benefits. This task should materialise synergy effects, improve the decision-making process and lead to better control environments and organisational efficiency.

Table 14: Programme-related benefits by trigger

Trigger	Benefits	Beneficiaries	Strategic objectives				
			Increase QoC	Improve patient safety	Enhance care delivery efficiency	Empower patients	Empower HCPs
Create and establish an empowered Agency	all forces of the HC sector combined, improved HC sector communication, reduced risks of redundant projects, benefits from synergy effects,	All beneficiaries	X			X	X
Engage with stakeholders	collaboration of all HC sector members	All beneficiaries	X			X	X
Define, setup and stick to governance rules	improved decision-making processes, better control environments, organisational efficiency	All beneficiaries	X			X	X
Decide on architecture and sourcing	organisational efficiency, less dependence of large-scale WAN ⁷⁴ , offline systems supported	Public authorities, ICT solution providers	N/A				
The CISIS working group defines strategy and technical reference model for interoperability ⁷⁵	all forces of the HC sector combined, improved HC sector communication, reduced risks of redundant projects	HCPs, CDOs, Public authorities	X	X	X	X	X
Make the Platform a European showcase and consider mid-term interoperability with other countries (post 2015)	cross-border interoperability, enhanced reputation of Luxembourg, promote best practice	All beneficiaries	X	X	X	X	X
Ensure Information security	promote best practice	All beneficiaries			X		
Quick time to market	promote best practice	HC Professionals, patients, CDOs, Public authorities	X		X		

⁷⁴ Due to mixed centralised/decentralised hosting approach

⁷⁵ Interoperability Commission for Healthcare Information Systems (*Commission pour l'Interopérabilité des Systèmes d'Information de Santé*)

			Strategic objectives				
Trigger	Benefits	Beneficiaries	Increase QoC	Improve patient safety	Enhance care delivery efficiency	Empower patients	Empower HCPs
Ensure Usability/ICT solution ergonomics and stability	promote best practice	HC Professionals, patients, CDOs, Public authorities	X		X		
Setup and execute Continuous Improvement Process (CIP)	all forces of the HC sector combined, improved HC sector communication, reduced risks of redundant projects, promote best practice	HC Professionals, patients, CDOs, Public authorities	X		X		
Define measurement system and perform measures	Better patient health, reduced cost, reduced redundancy	HC Professionals, patients, CDOs, Public authorities	X		X		

Table 15: Workstream-related benefits by trigger

Trigger	Benefits	Beneficiaries	Strategic objectives				
			Increase QoC	Improve patient safety	Enhance care delivery efficiency	Empower patients	Empower HCPs
Convergence and Interoperability	seamless sharing and exchange of medical information, financial incentives, offline systems supported	Patients, HC professionals, CDOs, ICT solution providers	X	X	X	X	X
Technical platform and generic services setup	Enhanced accessibility, better utilisation of HC infrastructure, efficiency	Patients, HC professionals, CDOs	X		X	X	X
Upcoming projects: incentives and financial support measures for eHealth projects emerging from the user community	improved HC sector communication, financial incentives, promote best practice	HC professionals, CDOs, researchers	X		X	X	X

Table 16: Generic services-related benefits by trigger

Trigger	Benefits	Beneficiaries	Strategic objectives				
			Increase QoC	Improve patient safety	Enhance care delivery efficiency	Empower patients	Empower HCPs
HC professional register and identification management	organisational efficiency, enhanced accessibility, better HC infrastructure utilisation, effectiveness, efficiency, promote best practice	HC Professionals, CDOs	X	X	X		X
Access management	better control environments, promote best practice, improved HC sector communication	Patients, HC professionals, CDOs	X	X	X	X	X
Single sign-on (SSO)	promote best practice	Patients, HC professionals, CDOs			X		
Consent management	improved HC sector communication, better control environments, seamless sharing and exchanging of information, enhanced accessibility, better HC infrastructure utilisation, effectiveness, efficiency, promote best practice,	Patients, HC professionals, CDOs	X	X	X	X	
Trusted Third Party (TTP)	improved HC sector communication, better control environments, seamless sharing and exchanging of information, effectiveness, efficiency, promote best practice	Patients, HC professionals, CDOs, researchers		X	X		
Secure e-mail	improved HC sector communication, better control environments, promote best practice	Patients, HC professionals, CDOs			X		
Centralised catalogues	improved HC sector communication, benefits from synergy effects, improved decision-making processes, better control environments, organisational efficiency, enhanced accessibility, better patient health, reduced redundancy, effectiveness, efficiency, promote best practice, generic drugs delivery promotion, adverse drug event prevention, medication errors reduction	Patients, HC professionals, CDOs	X	X	X		

Table 17: Value-added services-related benefits by trigger

Trigger	Benefits	Beneficiaries	Strategic objectives				
			Increase QoC	Improve patient safety	Enhance care delivery efficiency	Empower patients	Empower HCPs
EHR and its sub-services	improved HC sector communication, benefits from synergy effects, improved decision-making processes, organisational efficiency, seamless sharing and exchange of medical information, informed patients, enhanced accessibility, better patient health, effectiveness, efficiency, reduce redundancy (in laboratory tests and medical imaging), direct access to imaging results for HC professionals, streamlined workflow for imaging prescriptions, holistic view on patient health	Patients, HC professionals, CDOs	X	X	X	X	X
ePrescription	organisational efficiency, effectiveness, efficiency, promote best practice, prescription errors prevention	Patients, HC professionals, CDOs	X	X	X		
Affiliation control	improved decision-making processes, organisational efficiency, efficiency, promote best practice	Patients, HC professionals, CDOs			X		X
Basic decision support	improved decision-making processes, organisational efficiency, reduced cost, efficiency, promote best practice, generic drugs delivery promotion, prescription errors reduction, adverse drug event prevention, medication errors reduction	Patients, HC professionals, CDOs	X	X	X	X	X
Other eHealth initiatives (integration into the ICT infrastructure of the Agency)	benefits from synergy effects, improved decision-making process, better control environments, organisational efficiency, informed patients, enhanced accessibility, better patient health, efficiency, promote best practice	Patients, HC professionals, CDOs	X	X	X		

6 Conclusion and recommendations

6.1 Findings of the study

In the context of this study, we have evaluated a number of European eHealth initiatives with regard to eHealth service priorities derived from:

- Analysing the eSanté-EFES study⁷⁶;
- A Strategy Workshop held with public health authority representatives⁷⁷.

Based on an initial long list of 20 initiatives, we have agreed with the Ministry of Health upon a short-list of 7 eHealth projects to be evaluated.

6.1.1 Lessons learned in other projects

We have learned from the evaluated eHealth projects that⁷⁸:

1. Governance definition should be one of the first steps when implementing eHealth services;
2. Continuous stakeholder involvement is a critical success factor, stakeholders need to be involved early on;
3. ICT solution providers, subcontractors and project managers should actively discuss stakeholder requirements with regard to eHealth services;
4. Key stakeholders should provide beta-testers for the ICT solutions enabling the eHealth services;
5. In order to facilitate user adoption:
 - a. ICT solutions should be easy to use;
 - b. Users need to be convinced that their data is protected at all times;
 - c. Patients need to be able to grant and revoke access on their data;
 - d. HC professionals require sophisticated ICT solutions to feel protected against medical errors related to e.g. adverse drug events that may be due to deliberate non-disclosure of crucial medical information by the patient.
6. Their scopes are limited to regional or national interoperability topics but that in the long term, pan-European interoperability solutions may come into focus.

⁷⁶ <http://www.santec.lu/project/esante/efes/start>, accessed 06/07/2010

⁷⁷ Cf. appendix 7.3

⁷⁸ Cf. section 3.2

In addition, the following issues to tackle may be⁷⁹:

- Complexity, e.g. managing dependencies between infrastructure, applications, information and integration;
- Governance, e.g. ensuring alignment between initiatives and overall organisational governance;
- Stakeholder engagement, e.g. ensuring involvement and acceptance from managers, clinicians and IT staff;
- Vendor engagement, e.g. ensuring contracts with clear responsibilities and liabilities;
- Adapting to change, e.g. successfully communicating changes, training staff and ensuring that projects do not become IT projects, but really clinician led projects aimed at improving ways of working;
- Measurement, e.g. establishing baseline measurements and agreed success metrics.

The eHealth IMPACT study also outlined conditions for succeeding eHealth programmes⁸⁰:

- Commitment and involvement of all stakeholders;
- Strong health policy and clinical leadership that guides a flexible and regularly reviewed eHealth strategy;
- Regular assessment of costs, incentives and benefits for all stakeholders;
- Organisational changes in clinical and working practices;
- Strong clinical leadership, good organisational change management, stable multi- disciplinary teams with a well-grounded experience in ICT and clear incentives;
- Long-term perspective, endurance and patience.

Goldzweig et al.⁸¹ recommend on the one hand that policymakers should expand existing programs to support the kind of public-private partnerships that will foster collaboration between hospitals and health plans seeking to implement commercial health ICT systems. On the other hand, academic experts in evaluation and the academic ICT-related research communities should be brought together in order to improve quality.

The programmes reviewed by Goldzweig et al.⁸² were all embedded in wider reform projects, and required the support of all stakeholders to achieve their goals. Simultaneous implementation of new service delivery models, organisational partnerships, changes in GP compensation and clear and dedicated leadership turned out to be key success factors for the adoption and the use of the programmes. Notable facilitators included dedicated managers and physician leaders who envisioned the required specific changes, and who were able to overcome organisational barriers

⁷⁹ Gartner (2009): "eHealth for a Healthier Europe", p. 11, www.se2009.eu/polopoly_fs/1.8227!menu/standard/file/eHealth%20for%20a%20Healthier%20Europe.pdf, accessed 20/07/2010

⁸⁰ European Commission, DG Information Society and Media (2009): "The socio-economic impact of interoperable electronic health record (EHR) and ePrescribing systems in Europe and beyond", final study report, www.ehr-impact.eu, accessed 22/07/2010

⁸¹ Goldzweig et al. (2009): "Costs and Benefits of Health Information Technology: New Trends from Literature", Health Affairs, Millwood, Vol. 2, 28, p. w282-w293

⁸² Goldzweig et al. (2009), ibidem

and unforeseen technical challenges at implementation. All initiatives had dedicated funding, including budgets for support and training of health professionals. This was widely recognised as a key factor in winning user acceptance.

Taking into account the lessons learned mentioned above and considering that national general ICT take-up⁸³ and eGovernment take-up are above average, eHealth services should be readily adopted by the target user groups.

6.1.2 Assumptions

To define, implement and operate eHealth services in Luxembourg, we have assumed in section 3.2 that:

1. A dedicated agency will be established that will have its own staff, dedicated roles, a streamlined organisation and a multi-year business plan;
2. The Agency will have to carry out certain workstreams and activities to become operational by July 1, 2011;
3. An interoperability platform will be the core for operating eHealth services in Luxembourg;
4. Based on the service priorities defined for Luxembourg, a specific roadmap will be defined;
5. The Agency:
 - a. Will become accountable for its own ICT infrastructure;
 - b. Will rightsource⁸⁴ the ICT infrastructure management activities;
 - c. Will operate a Service Desk function as a Single Point of Contact for platform users.

6.1.3 The Platform

The Platform consists of an interoperability platform as a secured infrastructure to facilitate the exchange and sharing of information between healthcare providers, patients and health administrations, by enclosing and providing a set of dedicated applications and functionalities (the “services”). The characteristics of the Platform are outlined in section 5.1.2.

There are two types of services: Generic services and value-added services. Generic services aim at providing a communication infrastructure allowing a secure exchange of medical information and a controlled access to the services. They enable value-added services, i.e. healthcare-specific services for sharing and exchanging medical information. Value-added services provide tangible added value from a stakeholder point of view.

⁸³ Cf. section 3.2.1

⁸⁴ finding the optimal balance between outsourcing and insourcing.

For the Platform, we have considered the following generic services⁸⁵:

- Access management;
- HC professional register and identification management;
- Single sign-on (SSO);
- Secure e-mail;
- Consent management;
- Master Patient Index (MPI) and Alias creation to be run by a Trusted Third Party (TTP);
- Centralised catalogues for prescribers.

The Platform will host the following value-added services⁸⁶:

- Electronic Health Record (EHR) consisting of:
 - eSanté-CARA;
 - eSanté-LABO;
 - A Personal Health Record (PHR);
 - Medication Dispense;
 - A Medical Summary sub-service;
 - Hospital discharge letters;
 - Cancer oriented medical record (COMR);
 - Results server for prescribers of exams providing access through a work list to ordered results;
 - Other important documentation yet to be identified and implemented after 2015.
- Affiliation Control;
- Electronic Prescription (ePrescription);
- Decision support service (DSS).

The assumptions have lead to a 5-phase service lifecycle model⁸⁷ in order to consistently define, implement and operate the value-added services as well as their continuous improvement. The lifecycle model contains the following phases:

1. HC needs identification/project initiation/change request (entry point);
2. Feasibility study (within one year after phase 1);
3. Service definition (within two years after phase 2);
4. Pilot phase (within one year after phase 3);
5. Deployment (within two years after phase 4).

The service lifecycle model encourages an active involvement of the HC sector stakeholders as they can initiate projects (phase 1), which is complementary to projects initiated by the Agency.

⁸⁵ Cf. section 5.1.3

⁸⁶ Cf. section 5.1.4

⁸⁷ Cf. section 4.4.2

The deployment phase (phase 5) of the service lifecycle model is crucial, too. Lessons learned from previous ICT projects in healthcare show that acceptance from users takes time and that ICT programme managers need to thoroughly prepare the deployment phase in order to accelerate overall acceptance. Therefore, it is important to define at an early stage, while involving all affected members of the HC sector, how coaching on deployment shall be carried out. This means, HC professional organisations, patient associations and ICT solution providers must be part of the collaborative process to assure the adoption of the ICT solutions.

6.1.4 Cost estimation

The service lifecycle model is needed to plan the roll-out of the value-added services, which is done in the workstream “data sharing and value-added services”⁸⁸. The roadmap⁸⁹ is a high-level plan for the activities within the Agency workstreams over the budget period (the years 2011 to 2015). As a number of uncertainties exist at this stage, we have derived two budget scenarios from the roadmap, a minimum and a maximum budget scenario. The budget scenarios differ in parameter values (such as annual ICT maintenance fee rate and salaries for Agency staff) but also in the implementation plan of some services⁹⁰ and in technical change management support. In the minimum budget scenario, a number of services have been deferred for one to two years (ePrescription, COMR, Affiliation control and basic DSS)⁹¹. Based on the scenarios, we have thus estimated 22,6 M€ (minimum budget) and 37,2 M€ (maximum budget) regarding funding requirements for the budget period. These amounts cover all activities of the workstreams, for which the Agency is accountable, for the budget period in the respective scenario.

6.1.5 Benefits

Measuring expected benefits of such complex, multidimensional, long-term projects is anything but straightforward. As a report from the Congress of the United States indicates, “no aspect of health IT entails as much uncertainty as the magnitude of its potential benefits”⁹². Even if a large number of publications intend to answer inherent questions linked to evaluation of eHealth and ICT in healthcare have already been published, building an accurate model to evaluate qualitative and quantitative benefits remains difficult to establish.

We have based our findings on an empirical approach transposing successful model, best practices and inherent results identified in other eHealth projects.

⁸⁸ Cf. section 5.2.5

⁸⁹ Cf. section 5.2.1

⁹⁰ For details, cf. section 5.2.1

⁹¹ For details, see Table 4, page 50

⁹² Congress of the United States (2008): “Evidence on the Costs and Benefits of Health Information Technology”, a CBO Paper, Congressional Budget Office, May 2008, <http://www.cbo.gov/ftpdocs/91xx/doc9168/05-20-HealthIT.pdf>, accessed 24/07/2010

In any case, the positive impact of information technologies on quality of care is obviously recognised and should be considered as one of the main objectives of every eHealth project. However, the EHR Impact study⁹³ has shown that the socio-economic gains to society eventually exceed the costs, albeit quite often only after a considerable length of time, hence justifying the investment. Substantial savings from EHR (and healthcare information exchange and interoperability) implementation are possible. Yet, it takes at least four, and more typically, up to nine years before initiatives produce their first positive annual socio-economic returns, and six to eleven years to achieve a cumulative net benefit.

To evaluate benefits, we have defined the following building blocks of the evaluation model:

- Strategic objectives of the government;
- Benefits, their contribution to the strategic objectives of the government and their triggers;
- Beneficiaries.

We define a benefit as a direct or indirect positive effect initiated by the adoption and the use of eHealth services by concerned users. In the context of our model, we classify benefits by global (sector-independent), healthcare general (for HC on a general level) and healthcare specific (on a service level) benefits.

The benefits related to the eSanté programme are triggered by the actions outlined in the roadmap in section 5.2.1. Many programme-related benefits are more on a global level, for example, establishing the Agency, its governance and its organisational units and main processes triggers more sector-independent benefits. The beneficiaries of the programme-related benefits rank from clearly identified stakeholders to all stakeholders of the HC sector. Finally, the programme-related benefits contribute to most of the strategic objectives of the government.

Workstream-related benefits mainly belong to the global and healthcare general categories. Those benefits have clearly identified beneficiaries and show a high level of contribution to the government's strategic objectives.

The benefits related to the Platform and its generic services are mainly healthcare general benefits except for the Centralised catalogues service. The latter provides also healthcare specific benefits. Beneficiaries of the generic services-related benefits are Healthcare professionals, CDOs and patients. The benefits' contribution to the strategic objectives ranks from low to high.

The value-added services benefits comprise global, healthcare general and healthcare specific benefits. The EHR and its sub-services in particular materialise many of the listed benefits above. The EHR contributes to all strategic objectives of the government and thus represents the centrepiece of the whole programme. The other value-added services trigger fewer benefits than the EHR but still cover all three benefits categories. Beneficiaries of the value-added services are

⁹³ European Commission, DG INFSO & Media (2009): "The socio-economic impact of interoperable electronic health record (EHR) and ePrescribing systems in Europe and beyond, EHR Impact", October 2009, http://www.ehr-impact.eu/downloads/documents/EHRI_final_report_2009.pdf, accessed 24/07/2010

patients, HC professionals and CDOs. The contribution to the strategic objectives is high for the basic decision support service and moderate for the remaining value-added services.

Summing up, the programme, the Agency's workstreams, the Platform and its generic services and the value-added services provide many different benefits to the identified stakeholders. The most important ones are:

1. The establishment of an empowered agency provides benefits to all stakeholders as this combines the forces of the HC sector, reduces risks of redundancy and provides synergy effects;
2. Engaging with stakeholders is the foundation to make all HC sector members collaborate and go into one direction under the lead of the Ministry of Health and the Ministry of Social Security;
3. The centralised/decentralised hosting approach provides organisational efficiency and makes the Platform less dependent from large-scale WAN. A number of connected applications need not be online 24/7 as most of the data is centralised on the Platform;
4. The right sourcing strategy allows the Agency to focus on its core business. Pure technical infrastructure can be outsourced;
5. A Continuous Improvement Process (CIP) unites all HC stakeholders and improves HC sector communication. As all improvements are centrally managed by the CIP Working group reporting to the Supervisory Board, the risk of redundant projects is reduced and Platform adoption should be enhanced;
6. The activities of the Convergence and Interoperability workstream provide the basis for seamless sharing and exchange of medical information. Financial incentives to HC professionals and ICT solution providers should motivate them to implement and use the Platform;
7. The Trusted Third Party (TTP) generic service leads to improved HC sector communication as it will be used by other stakeholders, too. It enables a better control environment, and provides the foundation to seamless sharing and exchange of medical information. TTP also provides efficiency, effectiveness and should thus enhance Platform adoption;
8. The EHR and its sub-services provide most of the benefits. It is the centrepiece of the Platform and the value-added services. Benefits range from improved HC sector communication, decision-making, efficiency, patient health as well as seamless sharing and exchange of medical information – just to name a few;
9. Integrating the other eHealth initiatives into the Platform also achieves many benefits. This task should materialise synergy effects, improve the decision-making process and lead to better control environments and organisational efficiency.

6.2 Recommendations

From our analysis, we have derived the following recommendations:

6.2.1 Create a dedicated empowered Agency

Although the current organisation of the eSanté programme (*Comité du Programme, Conseil National pour l'eSanté* and the eSanté team), has proven to be successful so far, this organisation form has reached its limits with regard to conducting the even more challenging projects of the future. In fact, the future projects (a fully operational interoperability platform with its services EHR, ePrescription, affiliation control) will require more resources and a dedicated organisation for steering these complex projects. As many ICT solution components constitute the architecture for the future Platform and in order to perform proactive coaching for their users, a strong and close dialogue is needed with the commercial partners in this field.

A dedicated agency should therefore run the eSanté programme and operate the eHealth Platform. To do so, the Agency would need a multi-year business plan, a dedicated budget and staff.

A precise definition of the Agency's organisation as well as its steering and operational committees should exist prior to the establishment of the Agency. In this context, it is crucial that all the members of the healthcare sector are appropriately represented within the Agency's organisation.

The Agency should not be limited to conceptualising, implementing, operating and maintaining the Platform and its services. At the same time, other objectives have to be foreseen, such as to:

- Develop a sustainable ICT strategy with regard to HCIMSs⁹⁴ and agree on it with all HC stakeholders;
- Articulate the HCIMS strategy with the national government programme to ensure that the HCIMS strategy fully supports the strategic healthcare objectives of the government while taking into account the needs of the HC stakeholders;
- Ensure the eSanté programme covers all measures to modernise the HCIMS in Luxembourg;
- Lead the national interoperability initiative with regard to HCIMSs;
- Establish a continuous improvement process covering changes and improvements over time.

Specifically, the Agency should fulfil the following tasks:

- Participate, coordinate and mutually collaborate an organised national strategy on HCIMSs;
- Conceptualise, implement, deploy the national Electronic Health Record (EHR) and other value-added services and provide these services to the users of health sector;
- Establish the development, implementation and continuous improvement of:

⁹⁴ Healthcare Information Management Systems

- Healthcare (HC) professional and patient identification;
 - Trusted services;
 - National registry of HC professionals and Care Delivery Organisations (CDOs).
- Conduct further eHealth and other projects, assigned by the Agency Supervisory Board;
- Integrate other national information system projects currently under responsibility of the Ministry of Health and other institutions, for example:
 - Activities of GIE HealthNet;
 - Day-to-day management of the eHealth Portal (Portail Santé);
 - Mammography Programme systems.
- Define, promote and approve the reference models which contribute to interoperability, security and use of HCIMSs in Luxembourg;
- Coaching and assistance for the implementation of any project promoting eHealth in Luxembourg, including change management;
- In the context of European eHealth projects:
 - Support cross-border interoperability and participate and follow-up on such projects;
 - Establish a technology and methodology watch.

For the eSanté programme and in particular the Platform to be a successful endeavour, the Agency must be sufficiently empowered with full funding and political support by the supervising ministries of Health and of Social Security.

Table 18: Recommendations regarding a dedicated agency

No.	Topic	What	How?
1.1	Institution	Establish a dedicated legal entity	Create a <i>GIE eSanté</i> (<i>Groupement d'Intérêt Economique</i> , Economic Interest Group)
1.2	Communication	The Ministries of Health and of Social Security should clearly state from the beginning that the Agency has been charged to promote eHealth in Luxembourg and communicate on the Agency's authority and scope	Develop communication plan, appropriate communication instruments and stick to it
1.3	Business plan	Define a multi-year business plan	Decide on cost scenario alternatives, perform supplementary research and develop business plan

6.2.2 Engage with stakeholders

The Strategy Workshop and preliminary eSanté programme experiences have shown that stakeholder engagement is crucial to make the Platform a successful endeavour. It is therefore necessary to take into account stakeholder needs and benefits at an early stage. This can be achieved by encouraging stakeholders to submit projects in the context of the “Upcoming projects” workstream⁹⁵, and to involve them in the Platform definition and in the deployment phase. It is also important to coach users in the change management process from a technical and usage point of view. If the stakeholders' needs will be satisfied, a broad consensus in going forward with the national eHealth programme can be expected. This includes the users' willingness to share and exchange medical information using the Platform.

We therefore recommend that the following groups are involved at an early stage:

- Ministry of Health and Ministry of Social Security: major sponsors of the project;
- The national health insurance (CNS, *Caisse Nationale de Santé*) should be another main sponsor of the project. The CNS should co-finance and conceptualise an incentive system for

⁹⁵ Cf. section 5.2.8

the implementation and for the Platform use (linked with billing and reimbursement). If applicable, such an incentive system should be aligned to a "Meaningful Use"-type⁹⁶ of regulation, which the Ministry of Health will have to define;

- The national data protection commission (CNPD, *Commission Nationale pour la Protection des Données*) must also be part of every discussion dealing with patient privacy and data protection;
- HC professionals and CDOs should be involved. They should be accountable for the content of the EHR, terminology/taxonomy, for the decision support service, and, at a later stage for the alert and notifications system from a medical point of view;
- Patient representatives should be involved as patients need assurance that their data is secure and that it is useful for them to use the Platform and its services. They should also learn that the information they provide has to be accurate and complete to avoid wrongful clinical decisions. A significant amount has therefore been integrated into the Platform budget for communication and change management. To this end, patient representatives should be part of dedicated workgroups;
- On a strategic and technical level, a partnership should be established with the CCSS⁹⁷ and the CTIE⁹⁸ as Platform services should be complementary to CCSS and CTIE services. A strategic agreement should also be established with the EHL regarding CIS involvement;
- Representatives of ancillary service providers (laboratory, imaging, etc) should be involved to achieve a consensus on content, terminology, and format for the end user with regard to the value-added services by whom they are affected;
- Representatives of pharmacists and other HC professionals should actively participate in setting up a national catalogue of prescribable drugs and other medical services or products, its implementation and its related update process.

Table 19: Stakeholder engagement recommendations

No.	Topic	What	How?
2.1	Who	Know your stakeholders	Use spreadsheets and a stakeholder matrix, update it monthly
2.2	When to start	Involve all stakeholders from the beginning of the project	Develop communication plan and stick to it

⁹⁶ See for example <http://healthit.hhs.gov/portal/server.pt?open=512&objID=1325&mode=2>, accessed 13/07/2010

⁹⁷ *Centre Commun de la Sécurité Sociale*, the social security service centre. The CCSS operates IT systems of the CNS and related databases, e.g. affiliation, reimbursement, drug database.

⁹⁸ *Centre des technologies de l'information de l'Etat*, the national information technology centre. The CTIE is an IT service provider for all state institutions and is in charge of eGovernance definition and implementation.

No.	Topic	What	How?
2.3	Accountability		Agree with all stakeholders on a roadmap and an implementation strategy
2.3	Accountability	Assign project owner role to HC stakeholders most affected by a specific service	Use sponsoring within the “Upcoming projects” workstream to support new initiatives compliant with the Platform and the <i>eSanté programme</i>
2.4	Organisation	Assure stakeholders’ requirements and expectations regarding the Platform, the generic and the value-added services will be taken into account	Organise collaborative working groups with the stakeholders
2.5	Organisation	Make key stakeholders for specific services beta-testers	Agree upon a list of users who are supposed to utilise the respective service in the future, provide them with test support, have them test the ICT solution, timely collect feedback, keep close contact
2.6	Legal	Remove legal concerns at an early stage	Involve the CNPD at an early stage, the Agency Director should become the Single Point of Contact (SPOC) for the CNPD
2.7	Legal	Become agile regarding regulatory road blocks	Build a network of specialised external lawyers assisting the Agency to find the optimal way regarding data protection concerns
2.8	Communication	Avoid redundancies in national projects and benefit from synergy effects	Define SPOC for other HC sector members not yet implied in the eSanté programme such as EHL with its CIS and IBBL

No.	Topic	What	How?
2.9			Discuss with them the scope of the Platform and its services, the expectations regarding this and define interfaces
2.10			Define common projects with them.

6.2.3 Define, setup and stick to governance rules

Clear governance is important to create a sustainable and efficient organisation and to leverage the empowerment assigned by the government.

To successfully implement the eSanté programme, strong strategic and operational governance must support it.

Table 20: Governance recommendations

No.	Topic	What	How?
3.1	Governance	Define governance rules and an organisation that support definition, implementation and maintenance of an interoperability platform	Define roles and responsibilities
3.2			Develop and establish organisational units (Supervisory Board, working groups, etc.)
3.3			Produce organisational charts
3.4			Define reporting lines (from whom, to whom, what, when)
3.5			Define further governance rules ⁹⁹
3.6	HR	Recruiting	Define job profiles

⁹⁹ Cf. section 4.1.3

No.	Topic	What	How?
3.7			Recruit staff

6.2.4 Decide on Platform architecture and sourcing

We recommend a mixed approach mainly using a centralised data repository and allowing the use of decentralised data repositories for special types of data such as medical images. We thus assume that medical imaging native data (DICOM images) will be stored at the location where the images have been produced, but there will be a link repository pointing to those locations. Other data will be stored centrally in the ICT infrastructure of the Agency.

In order to optimise budget use, a sourcing strategy should be defined with regard to Platform management. For the purpose of this study, we have assumed a Managed Services approach that outsources basic technical infrastructure management to a service provider. Only healthcare-specific ICT infrastructure components management remains in-house.

Table 21: Architecture and sourcing recommendations

No.	Topic	What	How?
4.1	Architecture	Decide on architecture	Analyse the different architecture options in more detail and communicate with industrial partners to clearly define Platform architecture
4.2	Sourcing	Delegate non-core ICT infrastructure management activities to an external service provider	Setup Supplier Management and Service Level Management processes
4.3			Clearly define scope of outsourcing
4.4			Select suppliers and negotiate outsourcing/Managed Services contract

6.2.5 Setup workstreams

As outlined in section 5.2, we recommend a number of workstreams for the Agency that shall support the strategic objectives of the government and the stakeholders of the health sector:

- National HCIMS strategy;
- Convergence and Interoperability;
- Technical platform and generic services setup;
- Data sharing and value-added services;
- Scope definition and solution outline¹⁰⁰;
- Other eHealth initiatives;
- Upcoming projects.

Table 22: Workstream recommendations

No.	Topic	What	How?
5.1	National HCIMS strategy	Define a nationally coordinated HCIMS strategy and establish the Agency	Define the strategy and the roadmap, define the Agency's objectives and governance and establish the Agency
5.2	Convergence and Interoperability	Enable sharing and exchange of medical information between HC professionals	Define and implement standards and reference models for interoperability, provide coaching to users and vendors to promote ICT solution interoperability
5.3	Technical platform and generic services setup	Setup the basic ICT infrastructure to operate the platform	Build and operate the Platform and the generic services
5.4	Data sharing and value-added services	Implement and operate value-added services	Define, prepare implementation, deploy and maintain the value-added services

¹⁰⁰ of priority projects, for which technically mature solutions are yet not available

No.	Topic	What	How?
5.5	Scope definition and solution outline of priority projects, for which technically mature solutions are yet not available	Elaborate a strategy and define the services	Perform feasibility study on certain services and define them (see in section 6.2.6 on a services level)
5.6	Other eHealth initiatives	Identify and integrate existing eHealth solutions, currently managed by other organisations	Involve affected organisations at an early stage and elaborate a close collaboration, determine together with them how to best integrate the other eHealth solutions into the ICT infrastructure of the Agency
5.7	Upcoming projects	Support new initiatives and changes emerging from the Platform user community	Define incentives and financial support measures for eHealth projects enhancing the Platform and supporting the overall health policy of the government

6.2.6 Define services

With regard to the indicative roadmap, a number of services (generic and value-added services) are to be implemented on the Platform.

Table 23: Recommendations with regard to services

No.	Topic	What	How?
6.1	Generic services	Setup Platform and generic services	Build and operate the services
6.2	EHR service	Define and implement the EHR (including eSanté-CARA, eSanté-LABO and other sub-services)	Define the service, elaborate POC and calls for tender, setup the pilot, deploy and maintain the service
6.3	ePrescription	Define the ePrescription service	Elaborate a feasibility study and define the service
6.4	Affiliation Control Service	Implement and operate the Affiliation Control Service	Define the service and setup the pilot and the POC
6.5	Basic Decision Support Service	Implement and operate the Decision Support Service	Elaborate a feasibility study and define the service
6.6	Health Portal (<i>Portail Santé</i>)	Integrate the Health Portal within the Agency	Prepare and migrate the system into the ICT infrastructure of the Agency
6.7	HealthNet	Integrate HealthNet within the Agency	Prepare and migrate the system into the ICT infrastructure of the Agency
6.8	Mammography Programme	Integrate Mammography Programme ICT solution within the Agency	Prepare and migrate the system into the ICT infrastructure of the Agency

6.2.7 Promote interoperability

To promote national interoperability, a dedicated working group as part of the Agency should be established. This group should elaborate the strategy and the reference models with regard to interoperability.

With regard to international interoperability, the specific situation of Luxembourg within the Greater Region, e.g. high proportion of cross-border commuters in the workforce, tourists, and a high patient affinity to cross-border healthcare services, should not be left out: For the period after 2015, international interoperability should become therefore more and more important. Architectural platform design thus has to take this into account already now.

Table 24: Interoperability recommendations

No.	Topic	What	How?
7.1	National Interoperability	Setup the CISIS working group (Interoperability Commission for Healthcare Information Systems (<i>Commission pour l'Interopérabilité des Systèmes d'Information de Santé</i> ¹⁰¹))	The CISIS should elaborate further the priorities and a detailed roadmap to implement the different services.
7.2		Develop strategy for interoperability for HC information systems	A clear strategy is needed. Define the contents to share and exchange, and carefully choose standards, reference models, norms, technology. Agree with ICT solution providers and HC stakeholders. Establish technology watch with regard to the standards and IHE profiles.

¹⁰¹ Cf. section 4.1.3

No.	Topic	What	How?
7.3		Develop a technical reference model	Document HC sector requirements, improvements, national and international recommendations. Have it validated by the CISIS. Must become part of the functional requirements documents for future ICT solutions of the Platform
7.4		Document interoperability in a whitebook	Publish a whitebook on interoperability in the HC sector in Luxembourg.
7.5	International interoperability	Make the Platform a European showcase and consider mid-term interoperability with other countries (post 2015)	Select and implement internationally renowned standards, norms and reference models and match with European trends in this area.
7.6			Participate in international working groups defining, developing and improving the standards.
7.7			Participate in international HC exhibitions and promote the Platform

6.2.8 Ensure flawless Platform reputation

If the users shall adopt the Platform and the services hosted thereon, it is essential that the Platform should strive to become a role model with regard to:

- Information security;
- Time to market;
- Usability/ICT solution ergonomics;
- Technical stability;
- Continuous improvement.

To achieve this, the Platform, the generic and the value-added services have to be thoroughly tested before go-live.

Table 25: Recommendations regarding flawless Platform reputation

No.	Topic	What	How?
8.1	Information security	Make sure Confidentiality, Availability, Integrity and Non-Repudiation is fulfilled at all times	Define and implement flawless information security process
8.2			Purchase state-of-the art information security solutions (ICT infrastructure, strong encryption, user authentication)
8.3			Utilize state-of-the art security technology and processes (security certificates, complex user name-password combinations, electronic signatures)
8.4	Time to market	Assure quick time to market	Keep functionalities of ICT solutions simple and limited in the beginning
8.5			Restrict scope to have a basic version 1.0 that is usable and that provides initial added value to the users
8.6		Assure short project durations	Negotiate tough timelines with ICT solution providers
8.7			Analyse the usage of agile project management and software engineering methods
8.8	Usability/ICT solution ergonomics	Make sure the ICT solutions are easy to use	Have beta-testers from the HC sector test the solution before go-live
8.9	Stability	Ensure technical stability and maturity	Setup professional test management: test strategy, test plan, test data sets, dedicated test teams

No.	Topic	What	How?
8.10			Keep close contact with the vendor and assure short maintenance and patch cycles
8.11	Continuous Improvement Process (CIP)	Setup and execute an efficient CIP	Define the governance for and establish the Continuous Improvement Workgroup (cf. section 4.1.3)
8.12			Setup and efficiently manage a requirements backlog
8.13			Develop global release and deployment plans
8.14			Interact with the stakeholders regarding all main deliverables

6.2.9 Measure progress

In order to support the Continuous Improvement Process, measurement systems should be defined and implemented. In this context, it is important to:

- Establish baseline measurements;
- Regularly follow-up on important metrics such as costs, benefits, and on other agreed success metrics.

Table 26: Measurement recommendations

No.	Topic	What	How?
9.1	Measure success	Measurement system	Define metrics and agree with all HC stakeholders (costs, benefits, project progress metrics, etc.)
9.2			Implement measurement system and establish baseline
9.3			Follow-up on metrics in Supervisory Board, working group and project meetings, respectively.

7 Appendix

7.1 Approach and methodology

PwC global network and PwC Luxembourg Project Team expertise (PwC Health Research Institute, PwC Health IT Practice, PwC Knowledge & Research Centres and contacts in the healthcare and IT sectors) helped us on this study.

This study was assessed following 3 phases:

- Strategy Workshop;
- Comparative analysis;
- Cost and benefits analysis.

7.1.1 Strategy workshop

Prior to the Strategic workshop, a preparation meeting was held with the Ministry of Health to discuss the organisation of the project. It was agreed to conduct a survey related to the future eHealth Service Platform before the Strategy Workshop. Participants to the Strategy Workshop were requested to answer a designed questionnaire before the meeting. The survey aimed at gathering healthcare stakeholders' expectations and opinions about:

- The objectives of the Platform and the services hosted thereon;
- The way to develop a roadmap for Platform and services setup;
- The investment and operational budget needed for the Platform.

The overall objective of the Strategy Workshop was to define a patient-centric vision of the future Luxembourg eHealth service platform and to share a common understanding on the expectations regarding the platform. This was divided into two sub-objectives:

1. Discuss the answers of the questionnaire previously sent and
2. Rank the value-added services of the eSanté-EFES study according to their importance based on needs perceived by the participants.

The following table presents the ranking of the needs provided by the eSanté-EFES study.

Table 27: Service needs identified in the eSanté-EFES study

Ranking	Need
1	Share a national medical summary of the patient
2	Verify online the patient's affiliation
2	Share information in a common medical record for multidisciplinary care with other HC professionals
4	Have access to CNS online forms
4	Securely send or receive electronic mail
4	Transfer sample analysis results electronically
7	View all medical analysis results stored on a central server
7	Receive medical images and their related reports electronically
7	Receive hospital discharge letters electronically
7	Save a copy of patient records on a central server
11	Share the medication history of the patient
11	Transfer hospital transfer letters electronically
13	Invoice medical treatments for a third-party payer electronically
14	Send prescriptions for medical imaging electronically
14	Send end of treatment reports to the doctors electronically
14	Receive notifications when the patient is hospitalised
14	Receive anatomical pathology reports electronically
14	Receive surgical reports electronically
14	Transfer clinical biology prescriptions electronically

Results from the questionnaire confirmed this ranking, and provided more information about the participants' vision of the Platform, the categorisation and the importance of the services to be supported by the Platform. This led to a defining a high-level organisation, a positioning of the Platform and to developing basic governance principles.

The results of the strategy workshop are described in appendix 7.3.

7.1.2 Comparative analysis

To determine European good practice, we adopted a two-step approach. We developed a long list that was validated by the Ministry of Health. Based on the long list, we derived a short-list of projects for more detailed analyses.

Step 1: the long list

Based on the knowledge of our experts and on literature related to eHealth, a first list of 45 projects was drafted. With the results of the Strategy Workshop, PwC expert opinions and the availability of reliable and available information, we reduced this list to 20 projects. Particular attention was given to the following points:

- Different countries and regions should be represented, especially countries and regions whose healthcare context is comparable to Luxembourg;
- Projects that are similar to those expected for the Platform such as electronic prescription, decision support, statistics, affiliation control services, as well as services provided by a report and result server.

Long listed projects are in the table below. For more detailed information on the long listed project, cf. appendix 7.4.

Table 28: Long list of eHealth projects

Project number	Project Name	Provider	Location
1	Filmless	Groupeement de Coopération Sanitaire (GCS D SISIF)	Ile de France (France)
2	Dossier Médical Personnel (DMP)	ASIP Santé	France
3	Diraya	Andalusian Health Service	Andalusia (Spain)
4	Franche-Comté regional eHealth platform	Groupeement de Coopération Sanitaire EMOSIST	Franche-Comté (France)
5	SIS-RA platform and its services	GCS and SIS-RA	Rhône-Alpes (France)
6	US National Health IT Initiative and Meaningful Use programme		USA

Project number	Project Name	Provider	Location
7	Sjunet - Sweden national healthcare broadband network	Ministry of Health and Social Affairs	Sweden
8	Quebec Electronic Health Record	Quebec Health and Social Affairs	Quebec (Canada)
9	ELGA (Electronic Health Record Initiative)	ELGA GmbH	Austria
10	EPA 2015 - Elektronische Patientenakten	German Ministry of Work, Health and Social Affairs	North Rhine-Westphalia State, Germany
11	KP Health Connect	Kaiser Permanente	Colorado (USA)
12	Pharmaceutical Record	Conseil National de l'ordre des pharmaciens	France
13	Health and Social Care Information System (CRS-SISS)	Direzione Generale Sanita Lombardia	Lombardia (Italy)
14	NHS "Connecting for Health"	Department of Health Task Force	UK
15	Be-Health - eHealth platform in Belgium	Ministry of Health and the Secretariat of State for Informatics	Belgium
16	Digital Health Record in Estonia	Ministry of Social Affairs	Estonia
17	National Electronic Health Record	NICTIZ National Institute for Healthcare	The Netherlands
18	Strategic eHealth projects in Catalonia	TIC Salut Foundation	Catalonia (Spain)
19	Picardie eHealth Platform	GCS eSanté	Picardie (France)
20	Slovenian eHealth experience	Slovenian Ministry of Health and the Institute of Public Health of the Republic of Slovenia	Slovenia

Step 2: the short list

For each long listed project, opportunities for further analysis, limitations and overall evaluation conclusions were provided by the project team members depending on the project information collected. Based on these conclusions, the project team suggested a short list of seven projects together with three further projects selected for contingency. The contingency list identified supplementary projects for the study if more detailed information on the short-listed projects could not be obtained.

Following these discussions, we agreed on the following shortlist:

- Project 2: *Dossier Médical Personnel* (DMP), ASIP Santé, France;
- Project 4: *Franche-Comté regional eHealth platform, Groupement de Coopération Sanitaire EMOSIST*, Franche-Comté (France);
- Project 5: SIS-RA platform and its services, GCS and SIS-RA, Rhône-Alpes (France): Rhône-Alpes;
- Project 9: ELGA (Electronic Health Record Initiative), ELGA GmbH, Austria;
- Project 10: EPA 2015 - *Elektronische Patientenakten*, German Ministry of Work, Health and Social Affairs, North Rhine-Westphalia State, Germany;
- Project 16: Digital Health Record in Estonia, Ministry of Social Affairs, Estonia;
- Project 18: Strategic eHealth projects in Catalonia, TIC Salut Foundation, Catalonia (Spain).

The details of short-listed projects are presented in appendix 7.5.

7.1.3 Cost and benefit estimations

To assess cost and benefit estimations, we collected financial information from long-listed and short-listed projects. Based on this information, we setup our own cost model by making assumptions on functional, organisational and technical requirements to operate the Platform. This led to an implementation roadmap and options. The options helped us define a minimum and a maximum budget scenario for the targeted budget period 2011 to 2015. Finally, we defined items with their related costs.

7.2 Meetings

The following external meetings were held within the context of this project:

No.	Date	Subject	Participants (and initials)
1	May 6, 2010	Project preparation meeting	Mike Schwebag, Ministère de la Santé (MS) René Krippes, Ministère de la Santé (RK) Christine von Reichenbach, PwC (CVR) Jean-Charles Dron, HMS via PwC (JCD) Christophe Gence, PwC (CG)
2	Held in two sessions on May 20 and May 25, 2010	Strategy Workshop	Roger Consbruck, Ministère de la Santé (RC) René Krippes, Ministère de la Santé (RK) Mike Schwebag, Ministère de la Santé (MS) Carlo Back, Ministère de la Santé (CB) Françoise Berthet, Ministère de la Santé (FB) Carole Theisen, Ministère de la Santé (CT) Marc Mertens, Inspection Générale de la Sécurité Sociale (MM) Raymond Wagener, Inspection Générale de la Sécurité Sociale (RW) Jean-François Baijot, Caisse Nationale de Santé (JFB) Christine von Reichenbach, PwC (CVR) Christophe Gence, PwC (CG) Jean-Charles Dron, HMS via PwC (JCD)
3	June 22, 2010	Project coordination meeting	René Krippes, Ministère de la Santé (RK) Christine von Reichenbach, PwC (CVR) Christophe Gence, PwC (CG) Jean-Charles Dron, HMS via PwC (JCD)
4	July 5, 2010	Project coordination meeting	René Krippes, Ministère de la Santé (RK) Mike Schwebag, Ministère de la Santé (MS) Christine von Reichenbach, PwC (CVR) Christophe Gence, PwC (CG) Jean-Charles Dron, HMS via PwC (JCD)

Further project meetings within the study team are not included.

7.3 Strategy workshop results

This section describes the outputs of the Strategy Workshop (vision) and introduces the list of services the Platform should support.

7.3.1 Presentation of the project objectives

- Provide an overview of good practice in terms of eHealth services implementation; management, costs and financing of already existing eHealth service platforms;
- Analyse good practice with regard to the specific context in Luxembourg;
- Perform a financial cost and benefit overview related to the implementation (initial investment) and operations (recurrent cost) of the Platform in order to estimate the cost and benefits of implementing such a platform in Luxembourg.

7.3.2 Presentation of the workshop objectives

- Provide an overview on the project objectives, phases, schedule and organisation;
- Share opinions and main priorities regarding the implementation of the future eHealth Service Platform (hereafter, the Platform);
- Synchronise expectations of the main stakeholders;
- Validate the vision of the Platform: agree on a definition of the objectives of the Platform and the services running thereon.

7.3.3 Overview on the project organisation

The project comprises three phases:

- Phase 1- Strategy Workshop;
- Phase 2- Comparative Analysis;
- Phase 3- Cost and Benefits analysis.

The project is composed of:

- Steering Committee;



- Project Team;
- A pool of experts.



7.3.4 Q&A session on the future Service Platform

Question 1: What is your general vision of the future platform?

The future platform should:

- Trigger the exchange and sharing of information by actors in the healthcare sector, either by directly retrieving the information on it or by providing the contact data of the related information owner;
- Support better quality of care by:
 - Making understandable and appropriate information available to patients, providers involved in their care, and the public health authority;
 - Exchanging seamlessly such information, thereby improve patient's health literacy;
 - Producing feedback to providers and patients (alerts and notifications);
 - Aggregating depersonalized information for public health purposes;
 - Supporting clinical decision making applications for healthcare providers;
 - Supporting a national Critical Incident Reporting (and Learning) System to help identify system failures.
- Be an enabling technology;
- Focus on health-related information as scope;
- Be connected to the eSanté portal;
- Facilitate health data exchange between the different users (e.g. between the patient and its practitioner, between the practitioner and health authorities...) through appropriate tools;
- Contain a repository;
- Contain the Electronic Health Record (EHR) as a central element;
- Give comprehensive information at the right time to the right user (e.g. health data easily understandable by the patient);
- Give the right access to the right person: access authorisation for each group of users should therefore be defined;
- Contain services and applications that are easy to use;
- Be a source for aggregating depersonalised information for public health and statistical

purposes;

- Support the quality assurance initiative.

The attendees agreed that collaboration and communication were also two major enablers to facilitate user acceptance. The attendance mentioned that:

- Change management will be important as from project start; healthcare professionals should therefore be contacted at the very beginning of the project and have the possibility to give their opinion on the Platform during Workshops;
- Collaboration between the affected healthcare professionals is more important than mere communication;
- Benefits of the Platform should be presented during these Workshops;
- Healthcare professionals should be trained regarding the Platform to develop awareness and technical usage skills;
- Healthcare professionals should be encouraged through incentives to use the Platform and share their information.

Question 2.1: Which added-value services should be supported by the future platform? Which features should each service contain?

The following list (based on information provided by respondents) has been discussed. Participants agreed with most of the services and pointed out that this list is a good starting point (even if it is non-exhaustive):

- Hosting a patient-centred, longitudinal Electronic Health Record (EHR), including: Electronic medical record (EMR), health information and data (from clinicians, health professionals and patients), results (for lab tests, imaging, other diagnostic tools), order entry (computerised provider order entry, CPOE) and a decision making support application (clinical and prescribing support);
- Electronic communication and connectivity with patients, providers, health insurance, and public health authority;
- Patient support (access to case management, education, ...);
- Administrative processes (e.g. eligibility for procedures, case management, ...);
- Reporting system/population health management;
- Electronic prescription (as a pilot with voluntary candidates);
- Sharing clinical information about cancer patients by the numerous professionals (oncologists, radiotherapists, nurses, psychologists, radiologists...).

It has been agreed to create a glossary in order to clearly define eHealth terms for the eSanté programme.

Participants were then asked to rank by order of priority another list of services (see Appendix). According to them, the top 6 services of this list (in French as proposed in the survey) are:

- 1) *Echange du compte-rendu et des résultats entre plateau technique et prescripteur (imagerie, biologie, anatomopathologie);*
- 2) *Aide à la décision pour la prescription des actes de biologie;*
- 3) *Echange de la prescription médicamenteuse au travers d'un serveur de prescription;*
- 4) *Requêtes de santé publique et recherche/Datawarehousing;*
- 5) *Echange de la prescription d'examens avec un plateau technique (imagerie, biologie, ...) au travers d'un serveur de prescription;*
- 6) *Contrôle de l'affiliation du patient (AM, AD, AA).*

The top 6 concerns different types of service: electronic prescription (services #3 and 5), decision support (#2), statistics (#4), affiliation control services (#6), as well as services provided by a report and result server (#1).

Note: This ranking is debatable as a set of comprehensive definitions and a common understanding of the services among the participants has not been achieved yet (this is a work in progress in the eSanté programme).

Question 2.2: What are the benefits expected from each service identified in 2.1?

The workshop participants have submitted the following information:

- EMR with clinical decision support capabilities enhances quality of care and reduces cost of care by improving effectiveness, reducing waste and overuse (improving efficiency) and improving patient safety;
- Communication and connectivity enhances quality of care by improving timeliness, access and availability of health care, thereby improving health outcomes;
- Patient support improves quality of care by delivering patient-centred (understandable and acceptable) information and by enhancing patients participation/adherence to their health-related interventions;
- Reporting helps providers to learn about themselves (benchmarking) and reporting associated with population health management provide the system with insight about to-be covered public health needs and system failures;
- Sharing information among professionals, with the agreement of the patient, in a highly efficient and secure way to the benefit of the patient;

- The professionals are convinced that the platform is an added value to their work.

Question 2.3: For each service and according to your knowledge, what are preliminary organisational and technical conditions to be met before the service can be operational?

The following information have been provided by the respondents to the questionnaire and by the participants of the Strategy Workshop:

- EMR: Commitment from the providers community (at least leaders/champions) on the development of EHR;
- Development of, or agreement on existing, common terminology and taxonomy;
- Development of a canvas for the “meaningful use” of health IT for Luxembourg;
- Agreement on the health information (content, format, granularity) to be shared/exchanged/reported;
- Ownership by HC professionals. It is a project of HC professionals, not an IT project;
- A clear political commitment and support of the initiative;
- A fine-tuned approach taking into account the complexity of building/running such a project including:
 - Governance;
 - Organisational issues;
 - Technical and interoperability challenges;
 - Financial aspects and;
 - Patient rights/data protection management.

Question 2.4: What should be considered to facilitate the adoption of these services by end users from a technical and organisational point of view?

To facilitate the adoption of the services by end users has been described as extremely important by the group. This shall be assured by:

- Usability of the system;
- Added value for each category of users that will access the services;
- Transparency about the primary/secondary objectives of the services and expected impacts on direct and indirect users;
- An adapted access for each category of users: unique portal for patient to access both medical/administrative services (eForms, patients’ rights checking, ...).
- A secure and trusted system;
- Single sign-on for all applications, ease of use (user-friendly system);
- Technical support during the implementation phase, and thereafter;
- Built-in feedback loops on utilisation (provider’s self-profiling);
- Link with billing/reimbursement application, link with administrative forms (certificates, ...);

- Link with national formulary for Computerised Provider Order Entry (CPOE);
- Clinical decision making support application.

Question 2.5: For each service, which actors are affected? Which roles and responsibilities would you assign to each actor?

The following information has been provided by the respondents to the questionnaire:

- Patients should support the initiative by helping solving confidentiality and access issues, accountable for the accuracy of the information they provide, and for updating it;
- Clinicians and health care organisations: main sponsor of the platform; accountable for the content of the EHR, on terminology/taxonomy, on clinical decision support application, and on alert/notifications systems;
- Ancillary service providers (laboratory, imaging, ...): sponsors of the project; accountable for agreeing on the content, the terminology, the format for the end-user;
- Pharmacists and other professionals: sponsors of the project; should agree on a national formulary/list of services, and on the modalities of its distribution and its notification updates;
- Health Insurance (CNS): main sponsor of the project, accountable for financing and building incentives for the implementation and utilisation of the platform (link with billing/reimbursement);
- Public health authority: major sponsor of the project, accountable for the definition of the “meaningful use” of health IT.

And discussed during the Steering Committee meeting:

- CNS cannot be the sole financial sponsor of this project;
- For already identified projects, such as eSanté-CARA and eSanté-LABO, potential affected users have already been identified and implied in dedicated workgroups in order to define the way projects should be tailored to their specific needs;
- This approach should be extended to every project that will be defined in the framework of the eSanté programme. It is expected that this approach will also contribute to the overall acceptance of the services;
- RC mentioned that it is important to imply all the affected actors at the beginning of the projects. If not, it may be difficult to integrate newcomers in the projects.

Question 3.1: Which organisation should be in charge or put in place to govern the future platform? What should be its legal framework?

The following information have been provided by the respondents to the questionnaire and the participants of the Steering Committee:

- The Platform should be under the authority of the Ministry of Health. It should operate on a

- contractual basis. A public/private partnership can be a way to go;
- Organisation that comprises all professionals who have access to the data, including the patient;
- Setup dedicated government agencies - the following three organisms where proposed:
 - The supervisory board;
 - The continual improvement group, a working group defining the continual improvement process and suggesting reference models and standards to be used by the Platform;
 - An organism responsible for technical operations (maybe outsourced to an external third party).
- The governance body should include every authority representing the healthcare actors in Luxembourg (Ministry of Health, Ministry of Social Security, long term care, CNS, EHL, AMMD¹⁰², COPAS¹⁰³, healthcare professionals, patient associations, ...);
- The project should be led under the authority of the Ministry of Health and the CNS;
- Functions of the governing body should include policy implementation and a close follow-up of the activities of the Platform by assuring a structured and periodic reporting to the supervisory board.

Question 3.2: What should be the governance principles for the new platform?

Participants to the Workshop proposed to:

- Imply every healthcare actor from the very beginning of the project;
- Imply patients' representatives in the governance to assure their support of the Platform;
- Define roles and responsibilities to ensure accountability;
- Be transparent on the project progress;
- Reach consensus on main decisions to ensure the sustainability of the Platform;
- Ethics in healthcare should be applied at all times;
- Focus on the interests of the patient from the very beginning in order to build trust among patients and professionals of the healthcare sector;
- Implement cost sensitivity by revealing costs for specific services to patients. It was pointed out that this should not make the patients feel guilty. It could therefore be an option to display costs related to the patient's behaviour.

¹⁰² Association des Médecins et Médecins-Dentistes, the association of physicians and dentists in Luxembourg

¹⁰³ Confédération des organismes prestataires d'aides et de soins, a federation of service providers in assistance and care

Question 3.3: What is the expected positioning compared with actors of the healthcare sector in Luxembourg?

Attendees agreed on the following:

- The principle of subsidiarity is crucial to answer this question: the governance body should manage topics of national importance, whereas each actor of the project will manage their own concerns;
- A Service Owner should be appointed for each service;
- Luxembourg is too small to manage more than one eHealth initiative. Consequently, we need to unite all healthcare actors to avoid redundant projects;
- It has to be defined if strategic decisions, and other national driven projects, should be managed by the same management board.

Question 3.4: Who should be charged of technically operating the future platform? Should it be outsourced to an external IT provider or should it be operated internally by the body in charge of governance? Do you see other options?

The attendees mentioned that:

- The governing body should be in charge of technically operating the future platform;
- The contracting owner chosen to operate the future platform should be represented in the governing body;
- Some of the technical tasks could be outsourced (e.g. hosting, helpdesk, technical maintenance...);
- The project owner (“*Maîtrise d’ouvrage*”) should be the governing body at all times.

Participants agreed that any decision related to these topics should be taken by the governing body.

Question 3.5: What is the expected positioning compared to potential European partners? (e.g. cross-border cooperation, interfaces with existing eHealth services or platforms developed abroad)

Participants to the Workshop:

- Mentioned that collaboration with neighbourhood countries that develop eHealth initiatives is necessary in order to create interfaces between platforms;
- Outlined that representatives of the project team should participate in the coming discussions related to the evolution of IT standards in the Health sector;
- Agreed that developing a common Platform with a foreign agency will be too complex;
- Indicated that Platform services should first fit the need of Luxembourg stakeholders. Although connections with other countries are necessary, at first an accepted and running set of services in Luxembourg, tailored for the country, is the main priority;
- Added that looking at other countries remains important to stay informed about best practice, and also to taking advantage of already well-defined projects and latest technological trends;
- Suggested that patients should be able to grant an access to their data to medical practitioners abroad using the Platform.

Question 4.1: What is your vision of the roadmap for the Platform (first three years)?

- ☐ **From an organisational point of view?**
- ☐ **From a service point of view?**

Respondents to the questionnaire have provided us with the following information:

- Service point of view: Quick wins - results of a clinical biology or radiology images, starting with a service where the users exchanging information have a positive approach and have some prior experience of exchanging relevant clinical information among themselves;
- Experience shows that the adoption of changes (and IT) is best achieved by: 1. Conceptual phase - building agreements with main stakeholders, 2. Pilot phase – small scale, with motivated leaders/champions, 3. expansion phase, 4. Generalisation of the program;
- The Platform specifications should follow soon, taking all requirements of the various stakeholders into account. Establish a set of minimal requirements and a set of “ideal” requirements to be submitted to potential vendors/external contractors;
- The implementation could be phased into: 1. laboratory and imaging data with data accessible for the providers and users who are willing to sign in (first adopters), 2 with the experience in managing the Platform and data exchange, extension to other components of the EHR, 3. Expansion in 3 ways: completeness/depth of the information, number of applications, and number of end-users, 4. Generalisation with dis-incentives for the non-adopters (e.g. reduced reimbursement policy).

Participants discussed during the Strategy Workshop as follows:

- Service point of view: during the first three years, the Platform and its hosted services should be fed with relevant health information. A big amount of data is currently paper-based. Making this information available and organise it in an efficient way should therefore be amongst the top priorities;
- The Platform should be fed with information provided by the CARA and LABO projects;
- Organisational point of view: the governing body should be established at the early stage of the project.

Question 4.2: According to you, what are the most relevant regional or national eHealth projects you expect to be examined in detail? Why?

The following projects have been mentioned by the attendees:



- ELGA (Austria) especially its first phase;
- DMP (France);
- *Elektronische Patientenakten* - EPA 2015 (NRW).

Moreover, attendees advised the project team to have a look at initiatives led by the following region/country:

- Andalusia (Spain);
- Catalonia (Spain);
- Franche-Comté (France);
- Rhône-Alpes (France);
- Sweden;
- Denmark;
- Czech Republic;
- Ontario (Canada);
- Quebec (Canada);
- Austria;
- Belgium;
- Kaiser Permanente (Colorado).

Participants were asked to rank by order of priority the following list of services. Points are allocated as follows: 1st position: 1 point, 2nd position: 2 points, 3rd position: 3 points, from 4th to 10th position: 4 points. Services unranked by the respondents get 5 points. Consequently, services with smaller score are of utmost importance.

Type de service	Service proposé	P1	P2	P3	P4	P5	P6	P7	P8	TOTAL
Serveur de résultats	Echange du compte-rendu et des résultats entre plateau technique et prescripteur (imagerie, biologie, anatomopathologie)	5	5	3	1	1	1	1	1	18
Aide à la décision	Aide à la décision pour la prescription des actes de biologie	3	1	4	3	2	2	3	1	19
Prescription électronique	Echange de la prescription médicamenteuse au travers d'un serveur de prescription	5	1	2	3	5	1	1	1	19
Statistiques	Requêtes de santé publique et recherche / Datawarehousing	5	5	5	1	1	1	1	1	20
Prescription électronique	Echange de la prescription d'examens avec un plateau technique (imagerie, biologie, ...)	5	2	2	3	2	2	2	2	20
Services administratifs	Contrôle de l'affiliation du patient (AM, AD, AA)	4	1	5	1	2	5	1	1	20
Aide à la décision	Aide à la décision pour la prescription médicamenteuse	5	3	4	1	1	5	1	1	21
Service Catalogue	Gestion des catalogues des actes médicaux ou autres	4	5	4	1	2	1	1	3	21
Messagerie électronique professionnelle sécurisée	Messagerie électronique professionnelle sécurisée	5	5	5	2	1	1	1	2	22
Dossier Patient Partagé	Partage des informations de dispensation médicamenteuse dans un dossier patient partagé	5	1	5	2	2	5	2	1	23
Dossier Patient Partagé	Partage du compte rendu d'imagerie médicale / images illustratives dans un dossier patient partagé	5	3	3	3	2	3	3	1	23
Dossier Patient Partagé	Partage de la documentation des filières des soins dans un dossier patient partagé	5	3	1	1	5	5	1	2	23
Formation professionnelle en ligne / eLearning	Formation professionnelle en ligne / eLearning	5	5	5	3	1	1	1	3	24
Dossier Patient Partagé	Partage du compte rendu de biologie dans un dossier patient partagé	5	3	3	3	2	2	5	1	24
Aide à la décision	Aide à la décision pour la prise en charge médicale et soignante (accès aux guidelines)	5	5	4	2	3	1	2	3	25
Prescription électronique	Echange de la prescription (autres: actes thérapeutiques, aides technique, médico-dentaire) au travers d'un serveur de prescription	1	3	5	5	3	3	3	2	25
Services administratifs	Demandes de prises en charge (AM, AD, AA)	5	1	5	3	2	5	2	2	25
Dossier Patient Partagé	Partage des données administratives du patient	1	3	5	5	5	1	5	1	26
Services administratifs	Transfert et validation des données de facturation (AM,AD, AA ?)	5	2	5	2	2	5	3	2	26
Dossier Patient Partagé	Partage des informations relatives aux allergies et incompatibilités	1	4	1	5	5	5	5	1	27
Aide à la décision	Aide à la décision pour la prescription des actes d'imagerie médicale	5	2	4	3	5	3	5	1	28
Téléservice	Télémonitoring	5	5	5	5	1	2	1	5	29
Téléservice	Notification push & alertes (patients et PS)	5	5	5	2	3	1	5	3	29
Dossier Patient Partagé	Partage des images significatives dans un dossier patient partagé	5	1	3	5	5	5	5	1	30
Dossier Patient Partagé	Partage des informations relatives aux maladies chroniques (et disease management)	5	4	1	5	5	5	3	2	30
Services génériques de la plateforme	Archivage centralisé	5	5	5	5	1	5	5	1	32
Services génériques de la plateforme	Gestion des habilitations	5	5	5	5	1	5	5	1	32
Services génériques de la plateforme	Gestion des traces d'accès	5	5	5	5	1	5	5	1	32
Services génériques de la plateforme	Gestion du consentement	5	5	5	5	1	5	5	1	32
Services génériques de la plateforme	Single Sign On	5	5	5	5	1	5	5	1	32
Téléservice	Réunion de concertation pluridisciplinaire	5	5	5	1	5	5	5	1	32
Dossier Patient Partagé	Partage des informations relatives aux épisodes de soins	5	4	1	5	5	5	5	2	32
Téléservice	Téléconsultation patient / professionnel	5	5	5	5	2	3	5	3	33
Services administratifs	Transfert des données de déclaration d'incapacité de travail	5	3	5	5	2	5	5	3	33
Dossier Patient Partagé	Partage des informations d'expression personnelle du patient dans un dossier patient partagé	5	4	5	5	5	5	5	1	35
Dossier Patient Partagé	Partage des informations relatives aux vaccinations	5	4	5	5	5	5	5	1	35
Services génériques de la plateforme	Gestion des annuaires / ID Management (ressources professionnelles)	5	5	5	5	1	5	5	5	36
Services génériques de la plateforme	Master Patient Index / Désidentification (Trusted Third Party)	5	5	5	5	1	5	5	5	36

7.4 Details of long listed projects

Below are listed the 20 fact sheets of the long listed projects:

Factsheet no.	1
Project	Région sans film Ile de France/Filmless Ile de France region
Project Owner	Groupement de Coopération Sanitaire (GCS) pour le développement des systèmes d'information de santé partagés en Ile-de-France (GCS D SISIF)
Country/Region	Ile de France (France)
Current Status	Implementation

Main objectives

Deploying a shared platform for hosting medical imaging (PACS) and radiology information management systems (SIR), available to all mid-size healthcare organisation of the region Ile de France.

Expected results

Generalisation of PACS in healthcare institutions of the region Ile de France. This project is also a first experimentation for the deployment of a similar approach for the whole French territory.

Implemented services overview

This service is tailored to fit the need of mid-sized hospitals that do not have the capacity or the critical size to operate an integrated PACS/RIS system on their own. Service is delivered on SAAS (Software as a Service) base.

A consortium consisting of Orange HealthCare, General Electric and EDL has been chosen to operate the service.

Budget overview

Total budget of the operation is estimated at 29,1 million EUR for a period of five years.

Project financing

GCS D-CISIF, the owner of this project benefits from national fundings (plan Hôpital 2012), for an amount of 6 million EUR. A similar subsidy will be requested as part of the second Hôpital 2012 funding plan.

Planning

Start Date	Targeted end date
2008	2013 (An agreement of 5 years between the project owner and the consortium that will deliver the service, has been signed)

Further analysis

Options for further analysis	Limitation of further analysis
1. Group buying approach 2. SAAS delivery approach 3. Call to the market based on a competitive bid approach	1. Context of implementation different from Luxembourg 2. Project scope limited to medical imaging

Conclusions & Recommendations

Remarkable initiative in the framework of a group buying project. Could also be interesting in the context of the national archive suggested and supported by EHL.

Other

Information sources	Main contacts
1. Le projet "région Sans film" attribué à Orange, TIC Santé , PARIS, 14 mai 2010 2. Le livre blanc des PACS: Pour un plan public de généralisation des systèmes d'information de radiologie en France métropolitaine, à paraître	Hervé Barge, Policy Officer Telemedicine, ARS Franche Comté Bruno Grossin, CEO, GCS Emosist

Factsheet no.	2
Project	Dossier Médical Personnel
Project Owner	ASIP Santé
Country/Region	France
Current Status	Implementation

Main objectives

Created by the Law of August 13, 2004, the Personal Medical Record (DMP) is a service designed to help improve coordination, continuity and contribute to the quality of care. In April 2005, the GIP DMP was set up to begin implementing DMPs and to drive a first experimentation. Because of several difficulties, and also the fact that no single body had overall responsibility for the project, the experimentation was stopped and led to several evaluation reports that enabled a relaunch of the project in April 2009, with a dedicated agency, ASIP Santé, created to be in charge of its management. Although the major focus of ASIP Santé is to develop the first version of the electronic patient record (DMP), the agency is also engaged in different projects (standardisation work, new regulations), in order to structure the French health IT landscape and establish an industrial framework for e-health.

Expected results

First Results:

A first version of the electronic patient record (DMP), should be operational by the end of 2010. To achieve this result, a hosting capacity of a minimum of 5 million DMPs is to be made available. Other results considered as prerequisites for the deployment of the DMP have been provided by ASIP Santé (most of them are still work in progress):

- INS: A National Health Identifier based on the patient card identifier (Sesam Vitale Card);
- CIS IS: Interoperability Framework used to connect with the DMP, but will also be mandatory for IT systems providers;
- Repository authentication PS: First step of the To-Be security strategy, consisting of an overall strategy for identification and authentication of healthcare providers;
- Repository accountability: Designed to manage access and exchange of data with the DMP, including electronic signature.

Future work planned for 2011 includes:

- Standards National Repository: To provide a set of web-based forms to allow exchange of information with the DMP and also a multi-terminology server;
- Secure Messaging;
- Network Directory: To provide a consistent repository of healthcare providers and patients;
- PGSSI (Politique Générale de Sécurité des Systèmes d'Information): To provide guidelines and clear objectives concerning security issues in health IT.



Implemented services overview

First version of the DMP will be deployed progressively with a range of value-added services, such as the children's DMP, the shared oncology record (DCC), the diabetes record, and e-prescriptions.

The consortium that will build the DMP, led by SANTEOS SA / ATOS Worldline SAS / SAS Extelia, will also contribute to finalising the detailed specifications that shall enable publishers to integrate DMP functions into their solutions during the year 2010.

Budget overview

Concerning the specific DMP project, the economic objective of an operating cost below 1 EUR per year and per patient has been reached. A total budget of 60 million EUR/year for the first 4 years is defined (this cost does not represent all of the direct and indirect costs inherent in the creation of the DMP, but the contract with the consortium only). To achieve all of its missions, the ASIP Santé total budget is 130 million EUR (2010).

Project financing

The project is fully publicly funded (Assurance Maladie).

Planning

Start Date	Targeted end date
2006 (initial start)	No targeted end date, the project is still running
2009 (project relaunch)	

Further analysis

Options for further analysis	Limitation of further analysis
1. Relaunch approach, considering DMP as a driver to structure French healthcare IT landscape	1. Project sized for a population of 60 million citizens
2. ASIP Santé Agency governance and missions portfolio	2. Relaunching plan has started in 2009, too early to have a clear evaluation about results
3. Potential synergies with Luxembourg as a neighbouring country	

Conclusions & Recommendations

The French project has new interesting dynamics and most of the recent work could be reused in Luxembourg. French projects, their organisation, and their management may therefore be important candidates for further analysis.

Other

Information sources	Main contacts
1. Rapport d'activité 2009 de l'ASIP Santé 2. Site internet de l'ASIP Santé (http://www.asipsante.fr)	Jean-Yves Robin, CEO, GIP Asip Santé Vladimir Vilter, Policy Officer, Section Territory, ASIP santé Pascal Poitevin, International relationships Manager, ASIP Santé

Factsheet no.	3
Project	Diraya - The electronic health record system of Andalusia
Project Owner	Andalusian Health Service
Country/Region	Andalucia - Spain
Current Status	In Production

Main objectives

Diraya is the electronic health information system in the Andalusian region of Spain. It currently covers primary care, outpatient specialised care and emergency care services. Diraya integrates the health records of 8 million citizens. It supports the continuity and coordination of care and the analysis of clinical and managerial data and thus contributes significantly to the provision of citizen-centred care. Diraya tackles the need to host the clinical data of the citizens in a structured manner, allowing primary and secondary care clinicians to share it in a seamless way, and to increase accessibility to the services provided by the health system itself. It has been developed with the aim to support the continuity and coordination of care between the different healthcare professionals, and to provide a longitudinal health record for every patient. It is supposed to facilitate the analysis of the clinical and healthcare activity data for medical research and management planning and consequently reduce medical errors and the administrative workload of clinicians.

Expected results

Diraya integrates all information of each patient into a Single Health Record. It is available where and when it is needed for his/her care. It also facilitates access to all the services and provisions of the health system, and ensures that the relevant information is structured. Since its rollout in 2003, different modules have been gradually integrated into the system, such as for appointments and electronic health records. Patients are registered with Diraya with a unique identification number. The system allows the patients' data to be synthesised and viewed as a Single Electronic Health record. Diraya has not reached the expected results yet. The project has been criticised by the medical community and has encountered many delays. Further issues have arisen, such as application instability, unacceptable system response times, data loss as well as confidentiality and data privacy issues.

Implemented services overview

Diraya is based on a set of related modules that share information:

Basic components:

- User Data Base (UDB) supplies every citizen with a Single Andalusian Health Record Number (NUHSA) to which all his/her information is linked. There are 8 million registered users (98,8 % of the population);
- Centralised Operator Access Module (COAM);
- Structure Module (departments and functional units as well as physical locations);
- Single Health Record in 684 primary healthcare centres and in all hospitals (emergency departments and outpatient clinics), with over 10 000 working stations (93,76 % of the population with clinical data);

- Prescriptions (Receta XXI): electronic prescription in 680 primary healthcare centres, covering 93,56 % of the population and 3 500 pharmacies (97,8 %). More than 100 million prescriptions have been issued since 2003;
- Central appointment service: manages primary care, outpatient specialised consultations and diagnostic procedures agendas. More than 150 million appointments since it started;
- Datawarehouse and information system on health activity and performance;
- InterS@S: The Public Health System Virtual Office allows users to change doctors, to see and update their personal data, or to request a second medical opinion.

Indra and Fujitsu have developed and implemented the different systems.

Budget overview

The project has received funding from:

- ERDF: 3 647 000 EUR between 2005 and 2008;
- Red.es: 10 541 000 EUR between 2007 and 2009.

Project financing

The project has received funding mainly from two sources:

- ERDF (European Regional Development Fund);
- Red.es (Spanish federal body for the promotion of the information society).

Planning

Start Date	Targeted end date
2005	Ongoing

Further analysis

Options for further analysis	Limitation of further analysis
1. A unique User Data Base supplying every citizen with a unique Health Record Number (NUHSA) to which all his/her information is linked 2. Electronic prescription	1. Healthcare context is different in Luxembourg 2. The different systems created do not meet the expectations

Conclusions & Recommendations

Interesting initiative, especially the electronic prescription module (Receta XXI). However, the applications implemented do not meet the expectations. Diraya could though be an interesting case to analyse failure reasons.

Other

Information sources	Main contacts
<p>1. Moving toward a Single Comprehensive Electronic Health Record for Every citizen in Andalucía, Spain. Healthcare Quarterly Vol 10. No 4 2007 by Professor Denis Protti.</p> <p>2. Initiatives. La lettre des porteurs des projets du DMP, March 2008, N° 3: 92 % des Andalous sous Diraya.</p> <p>3. The European Files: eHealth in Europe (May - June 2009, Nr 17)</p> <p>4. http://www.juntadeandalucia.es/servicioandaluzdesalud/library/plantillas/externa.asp?pag=/servicioandaluzdesalud/contenidos/gestioncalidad/diraya/DossierDiraya2010_En.pdf</p> <p>5. http://www.20minutos.es/noticia/446764/0/salud/cambia/diraya/</p> <p>6. http://www.synaptica.es/noticia/el-sas-expone-su-estrategia-ante-la-crisis-de-diraya</p>	<p>José Antonio Cobena, Consejería de Salud, Junta de Andalucía</p>



Factsheet no.	4
Project	Plate-forme régionale Franc-Comtoise/Franche Comté regional eHealth platform
Project Owner	Groupement de Coopération Sanitaire EMOSIST (Ensemble pour la Modernisation des Systèmes d'Information de Santé et de Télémédecine)
Country/Region	Franche Comté (France)
Current Status	In Production

Main objectives

Starting in 2000, Franche Comté is, with the Rhône Alpes Region one of the two French pioneers in the development of regional platforms. By the initiative of the Regional Hospital Agency (ARH), a draft platform has been established since 2002. A first version of the platform was designed to collect data from various health networks (Alzheimer, gerontology, diabetes, perinatal palliative care, ...), while offering access to the general public. In its second version, the platform integrates also healthcare information from hospitals and doctors.

Expected results

The main objective is to develop a solution with the capacity of:

- Offering a regional based EHR for Franche Comté citizens: DMP-FC is the only shared regional EHR in France to propose a regional patient access (French Patient Data Protection Agency, CNIL, allowed the deployment of the DMP-FC project in the region in 2008.);
- Managing the connection to the platform of 1965 health professionals and 19 healthcare facilities;
- The deployment of the national DMP will imply the definition of connections between the 2 EHRs.

Implemented services overview

DMP-FC, the regional EHR, is one of the services proposed by the platform. A wide range of applications, dedicated to hospitals, ambulatory practices, and disease management networks are also provided. Generic services of the platform include amongst others a regional directory to manage access rights of healthcare professionals, and a "Rapprochement des Identités" approach for identifying patients. To support this, an "identito vigilance" organisation has also been established that is to provide hospitals with an audit of their organisation and provide guidance in the implementation of organisational measures aimed at eliminating duplicate records and unexpected collisions.

SQLI is the main industrial partner involved in the project for the design and development of DMP-FC since 2002, based on an IHE XDS-compliant architecture. Since 2007, dbMotion is in charge of the implementation of an index-based solution that uses different sources of medical information about the same patient (a solution developed in Israel). IBM has been chosen to provide connectivity with clinical systems using WebSphere ESB (Enterprise Service Bus)

Other providers include:

- Axilog, Hellodoc et Prokov (Primary care management systems);
- CDP Dossier Patient (C-Page), DXCARE (Medasys), CROSSWAY-HOPITAL, (Mc Kesson), Millenium (Cerner), PSI (ASC2I) et HYPERMED (Hospital Information Systems);
- Improve and Polymedis (Emergency EHR).

Budget overview

No reliable information on the budget of the Franche Comté eHealth platform has been found until now.

However, an evaluation report conducted by ASIP Santé on French regional platforms indicated that investment cost for building such a platform are between 1,5 to 6 million EUR, depending on different factors (proposed services, region size, ...).

Project financing

No reliable information on the financing of the Franche Comté eHealth platform has been found until now.

The evaluation report conducted by ASIP Santé on French regional platforms indicated that regional platforms are fully publicly funded, including financing by Assurance Maladie (FAQSV then FIQCS), the Ministry of Health plans (Hôpital 2007, Hôpital 2012), FEDER funds, and other minor regional funds.

Planning

Start Date	Targeted end date
2000	No targeted end date, the project is still in production

Further analysis

Options for further analysis	Limitation of further analysis
<ol style="list-style-type: none"> 1. Comparable size with Luxembourg (Franche-Comté has had 1 195 244 inhabitants in 2007) 2. One of the most successful regional eHealth platforms in France 3. Research center approach: Institut International des Systèmes de Santé et de Télémédecine (IISIST-Edouard Belin) was created in 2008 to develop a specific technical environment to promote Health IT and interoperability 4. One project only to provide an access to the EHR for the patient 5. The exchange of information based on a shared virtual temporary repository (provided by DBmotion and deployed nationally in Israel) 	<ol style="list-style-type: none"> 1. Every regional platform in France can rely on national basic components such as health professional identifier cards and patient identifier cards

Conclusions & Recommendations

The Franche Comté is approach is rather unique in France. The regional expertise and the specific choices led to the development of specific solutions as well as building skills. Even if until now, there is no clear view of the costs of building and running such a platform, Franche Comté model should be considered for a further analysis.

Other

Information sources	Main contacts
<ol style="list-style-type: none"> 1. Expérience Plate-forme régionale Franc-Comtoise: Management et structure régionale de coopération, Journée de la sécurité, Rennes, 3 juin 2009 2. Présentation du projet régional Franche Comté sur le site de l'ASIP Santé, www.asipSante.fr/index.php?option=com_content&task=view&id=278&Itemid=232 (26/05/2010) 3. Etat des lieux et perspectives des Plate-formes régionales de services, ASIP Santé, 2009 	<p>Bruno GROSSIN, CEO, Emosist Patrice BLEMONT, CEO, ARS – Agence Régionale de Santé Franche Comté Hervé BARGE, Telemedicine Policy officer, ARS – Agence Régionale de Santé Franche Comté</p>



Factsheet no.	5
Project	Plate-forme régionale Rhône Alpes/SIS-RA platform and its services (DPPR, PEPS, Trajectoire, ...)
Project Owner	GCS (groupement de coopération sanitaire) de la plateforme régionale de télésanté SIS-RA (Système d'information de santé de la région Rhône-Alpes)
Country/Region	Rhône-Alpes (France)
Current Status	In Production

Main objectives

Starting in 2000, Rhône-Alpes is, with the Franche Comté Region, one of the 2 French pioneers in the development of regional platforms. The GCS SIS-RA, was founded in 2006, to take over the operational project strategy including the implementation of tools and the connection of regional health structures, networks and physicians. In this context, the DPPR (Dossier Patient Partagé et Réparti/Shared and Distributed Patient Record) results from a regional initiative in Rhône-Alpes to create a region-wide federated patient health record using existing EHR systems or other personal health data sources. It is made accessible to affected patients and to authorised hospital-based or privately practising health professionals.

Expected results

The DPPR tool was specifically designed as a response to share clinical information about multiple conditions between health professionals who concur to deliver healthcare to a patient. Health professionals who concur to deliver healthcare to a patient can now identify, view and download clinical information about a patient that is originated in a variety of remote distributed sources (hospitals, integrated networks, private surgeries, etc). Patients also have a permanent access to this data. DPPR permits real time access to patient data remotely stored in multiple sources (e.g. hospitals, integrated networks, private surgeries, etc). More than 450 000 records were managed by SIS-RA at the end of 2009. The objectives for the end of the year 2010 are to include 1 050 GPs (810 at the end of 2009) and 85 sources of information/healthcare organisations (74 at the end of 2009).

Implemented services overview

DPPR calls for the use of two other tools also supported by SIS-RA:

STIC (Serveur télématique d'identification communautaire): STIC is a persistent regional patient ID server designed to help match the different identifiers used for a given patient in different settings. Its operations began in April 2004. Broadly speaking, it is based on the comparison (by scoring and search for potential errors, such as character inversion) of five traits, namely, name, first name, gender, date of birth and post code of place of birth. Following a set of specifications for patient identification adopted at the regional level (Charte régionale d'identification), 2 000 000 patients were identified in the STIC by Summer 2009.

PEPS (Plateforme d'échanges entre les professionnels de santé): PEPS is a system designed for secured data communication and sharing between healthcare professionals in clinical networks.

Another important service of the platform is "Trajectoire". Trajectoire allows:

- To understand quickly, for each patient, which healthcare facilities are able to take over its rehabilitation and the rehabilitation project required;
- To take into account specificities that may change the type of care;
- To be assured that the identified structures possess any soft and technical skills required;
- To identify facilities close to his home or that of his family.

DPPR developments are made under open source agreements, using around 1 000 person-days. Once developed, these solutions remain in SIS-RA's ownership and are distributed according to an open source license.

Budget overview

No reliable information on the budget of the SIS-RA eHealth platform has been found until now. However, an evaluation report conducted by ASIP Santé on French regional platforms indicated that investment cost for building such platforms are between 1,5 to 6 million EUR, depending on different factors (proposed services, region size, ...). SIS-RA promoters also declared in a presentation that 2,85 million EUR have been provided in 2005 for the development of the DPPR.

Project financing

Project financing in 2005 for the development of the DPPR includes grants from:

- The Regional Council (2,30 million EUR);
- The Regional Union of Privately Practicing Physicians (0,05 million EUR);
- The Regional Fund for the Development of Clinical Integrated Networks run by ARH and URCAM (0,5 million EUR).

Planning

Start Date	Targeted end date
2000	No targeted end date, the project is still in production

Further analysis

Options for further analysis	Limitation of further analysis
<ol style="list-style-type: none"> 1. One of the leading regional eHealth platforms in France 2. Decentralised EHR management approach 3. "Trajectoire" tool used for patient orientation 4. Part of a European project, including eight partners, to develop synergies (to be confirmed) 	<ol style="list-style-type: none"> 1. The Rhône-Alpes region is far bigger than Luxembourg (6 065 959 inhabitants in 2007) 2. Effective DPPR usage/adherence by general practitioners is not as big as expected

Conclusions & Recommendations

SIS-RA is a leading eHealth regional French project, with an advanced technical maturity. As other French projects, the issues of deployment and usage development are main issues of the platform. SIS-RA may be considered for further analysis.

Other

Information sources	Main contacts
<ol style="list-style-type: none"> 1. Plateforme SIS-RA - Guide pour les établissements de Santé 2. Plateforme de téléSanté SIS-RA: fréquentation en hausse, site TICSanté, www.ticSante.com/show.php?page=story&id=444 (26/05/2010) 3. Etat des lieux et perspectives des Plate-formes régionales de services, ASIP Santé, 2009 3. Présentation du projet régional Rhône Alpes sur le site de l'ASIP Santé, www.asipSante.fr/index.php?option=com_content&task=view&id=278&Itemid=232 (consulté le 26/05/2010) 4. Site web de l'Institut International Recherche Systèmes d'information Santé et télémédecine, www.iisist.org (01/06/2010) 	Thierry DURAND, Administrator, GCS – Groupement de Coopération Sanitaire

Factsheet no.	6
Project	US National Health IT Initiative and Meaningful Use programme
Project Owner	Office of the National Coordinator: David Blumenthal
Country/Region	USA
Current Status	Implementation

Main objectives

Effective since February 19, 2009, the “HITECH” section of the American Recovery and Reinvestment Act (ARRA)/Stimulus Bill dealing with health IT, outlines an incentive plan, managed by the Office of the National Coordinator (ONC), comprised of two programmes:

2 billion USD for programmes administered by ONC, to address HIT Regional Extension Centers, State Health Information Exchange, Beacon Communities, Community College education, Strategic Health IT Advanced Research Projects (SHARP), ...

2 billion USD in incentive payments (and penalties for noncompliance) for Eligible Providers and Hospitals under Medicare and Medicaid for “adoption and meaningful use of certified EHR technology”

Expected results

The objective of the Meaningful Use programme is to accelerate the adoption of robust, interoperable health IT by hospitals and other health providers. Another objective is the provision of incentives for Eligible Providers. These providers can earn Medicare or Medicaid incentive payments by demonstrating meaningful use of a certified EHR technology. Examples:

- An Eligible Provider with more than 24 000 USD in allowed Medicare charges p.a. will perceive 44 000 USD if it reaches certification Stage 3 in 2015;
- A hospital with 500 beds, 30 000 discharges p.a. and 32 % Medicare mix will perceive 5 million USD if it reaches certification Stage 3 in 2015. If the organisation has not reached Stage 3 in 2015, penalties will apply.

Implemented services overview

N/A

Budget overview

20 billion USD for the overall incentive programme.

Project financing

American Recovery and Reinvestment Act (ARRA)/Stimulus Bill.

Planning

Start Date	Targeted end date
2004: Executive Order (creation of a National Coordinator function)	2015

Further analysis

Options for further analysis	Limitation of further analysis
1. The Incentive approach: - Adopt certified EHR Technology, achieve Meaningful Use objectives, apply for incentive payments - Incentive/penalties approach	1. Health IT deployment in USA is low and not comparable with the Luxembourg situation

Conclusions & Recommendations

Even if the model cannot be duplicated in Luxembourg, the 3-step incentive approach can be considered as part of an overall incentive approach.

Other

Information sources	Main contacts
1. EHR Certification Town Hall, Mark Leavitt, MD, PhD, Aliza Ray – Executive Director, CCHIT – Chair, CCHIT, HIMSS10 Conference; Atlanta, GA 2. Meaningful Use, Certification Criteria and Standards, and HHS Certification Process, www.himss.org/economicstimulus (01/06/2010)	David Blumenthal, National Coordinator for Health Information Technology

Factsheet no.	7
Project	Sjunet - Sweden national healthcare broadband network
Project Owner	Swedish Ministry of Health and Social Affairs
Country/Region	Sweden
Current Status	In Production

Main objectives

Sjunet is the Swedish healthcare Network comprising an infrastructure for communication between hospitals, primary care centres and home care. It also hosts a wide range of services from national authorities and healthcare service providers and vendors of healthcare systems. Sjunet allows secure transmission of healthcare data and applications on an IP-network separate from the Internet. The network is used for telemedical videoconferences, teleradiology, remote access to applications, database access, secure e-mail, EDI-messages and IP telephony. It can also be used for e-learning in medical education and further training for health personnel. Carelink is responsible for Sjunet in close co-operation with the county councils and other actors within Sjunet. Hence, Sjunet is as much a co-operative network as it is a technical communication platform for Swedish healthcare.

Expected results

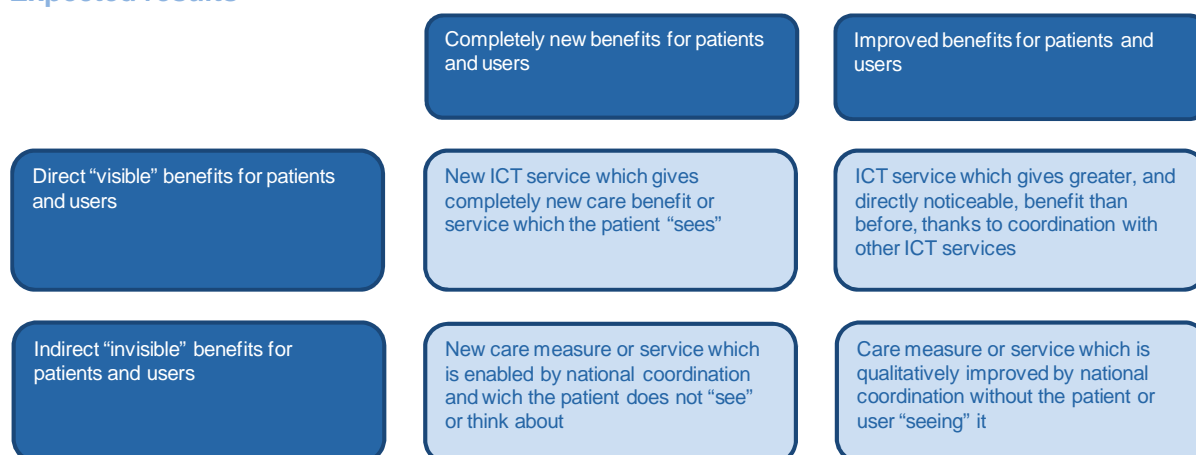


Figure 7: Benefits of the Swedish Strategy for eHealth for patients and users

Implemented services overview

Sjunet comprises:

- A secure and reliable exchange of confidential data, including images;
- Video conferencing;
- Order entry;
- A national phone directory;
- A knowledge database;
- Clinical care planning;
- Remote diagnostic services.

Sjunet supports different modules:

ePrescription: Implementation of a new software module to permit sending an eRecept (electronic prescription) from the doctor to the pharmacy using the electronic Sjunet network. eRecepts are transmitted electronically from a GP surgery or hospital ICT system to the pharmacies through the Extranet provided by Sjunet. The mailbox allows all pharmacies in Sweden to pick up an eRecept so that patients do not have to specify the pharmacist they use for their medicine. The mailbox was introduced in June 2004 and has been a success with all the users, especially with patients, who enjoy greater flexibility and a wider range of services, such as a 24-hour call centre offering advice and home delivery.

National patient summary (NPÖ) is intended to make real-time patient information available to healthcare providers anywhere in the country.

The platform is delivered by Telia - the Swedish telecom company.

Infrastructure services provided by the platform are procured by Carelink from the vendor Steria.

Budget overview

The initial investment was 1,4 million EUR for the infrastructure and basic services development. 200 000 EUR to 500 000 EUR is required p.a. for further development and maintenance within Carelink. Each county council pays 12 000 EUR connection fees p.a.

Project financing

The Ministry of Health and Social Affairs, the Swedish Association of Local Authorities and Regions together with the National Board of Health and Welfare.

Planning

Start Date	Targeted end date
2000	Ongoing

Further analysis

Options for further analysis	Limitation of further analysis
1. Electronic prescription 2. National patient summary	1. Healthcare context is different in Luxembourg

Conclusions & Recommendations

Sweden is well advanced in its eHealth initiative. Two modules (electronic prescription and national patient summary) seem interesting for further analysis. Extensive documentation including costs is available on the Internet. The healthcare context however is different compared to Luxembourg.

Other

Information sources	Main contacts
<ol style="list-style-type: none"> 1. Swedish Strategy for eHealth - 2008 Status Report 2. Networking in Health Care: An Issue of Connection or Co-operation? - The Evolution of Sjunet, the Swedish Health Care Network 3. www.carelink.se 4. www.eHealth-era.org/database/documents/factsheets/Sweden.pdf 	<p>Gustav Malmqvist, Director of ICT, Dept of IT & Development County Council of Västernorrland</p>



Factsheet no.	8
Project	Dossier de Santé du Québec (DSQ)/Quebec Electronic Health Record (EHR)
Project Owner	Santé et services sociaux du Québec
Country/Region	Quebec (Canada)
Current Status	Experimentation

Main objectives

The "Plan d'informatisation du secteur de la santé et des services sociaux" has been launched by the Quebec government on April 25, 2006 in order to improve quality and accessibility of healthcare offered to the population of Quebec. As part of this plan, the Quebec government develops and deploys a solution for a regional interoperable electronic health record called "Quebec Health Record". It includes information on drugs and the results of examinations and laboratory tests as well as results of medical imaging exams. This is primarily to promote the organisation and the integrated delivery of health services as well as to improve the quality of care and health services.

Expected results

The experimentation initially proposed for 12 months was extended for one year and is entering now a second phase of experimentation before generalisation (involving the city and the Montreal metropolitan region, regions of Lanaudière and Saguenay-Lac-Saint-Jean). By mid-March 2010, 681 431 citizens, 99,5 % of the population of the Quebec capital had a Health Record. By 2011, unless further delay, once completed its generalisation, the Quebec Health Record will cover 7,5 million citizens.

Implemented services overview

Quebec EHR comprises:

- A standards-based repository storing clinical data;
- A clinical web portal allowing clinicians to search and view information and order tests electronically;
- An electronic display showing up-to-date patient health information;
- Such solution is currently being deployed in the Quebec City Region and will be rolled-out to the other administrative regions.

Budget overview

The initial budget was 563 million CAD (or 410 million EUR).

Project financing

Partially funded by the "Inforoute de santé" programme and the state of Quebec.

Planning

Start Date	Targeted end date
2006	Ongoing

Further analysis

Options for further analysis	Limitation of further analysis
1. Like in Luxembourg, "medical imaging" and the "Laboratory" domain are established as the first priorities. Medication will follow. 2. Master Patient Index approach for the management of patient identification	1. The Quebec Health Record can not be used for research or epidemiological studies. 2. Patient consent management is based on "implied" consent, as in other eHealth projects in Canada. 3. A number of management issues within the Quebec initiative

Conclusions & Recommendations

Considering the experimentation results in Canada, and the implication with the "Inforoute de Santé" programme could be interesting. Moreover, with a special focus on biology and imaging as priority projects, Quebec is in line with Luxembourg Strategy. However, it may be difficult to obtain detailed information.

Other

Information sources	Main contacts
1. Vigie relative au projet Dossier de santé du Québec, Rapport du Vérificateur général du Québec à l'Assemblée nationale pour l'année 2010-2011	

Factsheet no.	9
Project	Elektronische Gesundheitsakte - ELGA (Electronic Health Record Initiative)
Project Owner	ELGA GmbH
Country/Region	Austria
Current Status	Detailed concept phase finished 2008, currently implementation.

Main objectives

"Integrated health supply" which is supposed to build and strengthen information interchange between hospitals and external healthcare providers is a primary objective of Austria's health politics [1]. The ELGA approach accommodates this objective by "making all previous information which is relevant for treatment accessible to the treating physician and by establishing permanent electronic access for a patient to his or her own data". [2]

Expected results

The expected result is an online electronic health record, using international communication standards to interoperate with different healthcare IT systems and providing information access to all authorised stakeholders.

Implemented services overview

Master Patient Index: Unique identification of patients. Go-live planned for Q2 2011.

Healthcare Provider Index: List of healthcare provider including unique identification. Ongoing project planning at the Ministry of Health.

Document register: Central register for patient related documents, pointing to decentralised data sources. Provider-spanning pilot systems are currently in selection process.

Security framework: Currently in progress by ELGA working group.

Portal: Phase 1, Non-patient related general health information: Complete. Phase 2, Patient access to EHR: not specified. Implemented by the Ministry of Health.

Planned core applications: Discharge information (e.g. discharge letter), lab results, radiology results, electronic medication (Project started/ongoing.)

The respective financing partners are in charge of selecting their suppliers. This information has not been disclosed yet.

Budget overview

30 million EUR, comprising services for architecture definition and implementation

Project financing

1. Republic of Austria;
2. States (*Bundesländer*);
3. Social security (*Hauptverband der österreichischen Sozialversicherungsträger*).

Planning

Start Date	Targeted end date
September 1, 2006	2013

Further analysis

Options for further analysis	Limitation of further analysis
1. IHE and further international standards. 2. Project is currently being implemented. 3. Decentralised storage of document with a central document register	1. Healthcare context is different in Luxembourg

Conclusions & Recommendations

The project is apparently concentrating on implementing international standards such as IHE. It is interesting for further evaluation.

Other

Information sources	Main contacts
1. Austrian government programme for the XXIII. Legislation period, www.bka.gv.at 2. www.arge-elga.at/fileadmin/user_upload/uploads/download_Papers/Arge_Papers/ELGA_Umsetzung_Phase1__V2.0.pdf (01/06/2010) 3. www.arge-elga.at/index.php?id=13 (01/06/2010) 4. www.arge-elga.at/index.php?id=27 (01/06/2010) Additional sources: - www.arge-elga.at/ - www.bmgfj.gv.at/cms/site/thema.html?channel=CH0709 - www.initiative-elga.at	Dr. Susanne Herbek, CEO, ELGA GmbH Dr. Martin Hurch, ELGA GmbH

Factsheet no.	10
Project	Elektronische Patientenakten - EPA 2015 (NRW)
Project Owner	Ministry of Work, Health and Social Affairs, Germany in cooperation with Zentrum für Telematik im Gesundheitswesen - ZTG (Center for Telematics in Healthcare)
Country/Region	Land Nordrhein-Westfalen (State North Rhine-Westphalia), Germany
Current Status	Implementation, 2 out of 3 stages complete

Main objectives

The project's objective is amongst other things the development of specifications and regulations for an interoperable, institution-spanning electronic patient record and a reference architecture with defined interoperability definitions and migration concepts. Communication between information systems of various actors in the health sector is limited today. Through the development and use of standards for non-proprietary interoperability of electronic records, sharing of information between healthcare institutions will be made easier. Complete information related to treatment can thus be quickly made available.

Expected results

- One single standard;
- Better quality of care;
- Creation of new intersectoral forms of treatment;
- Augmented efficiency;
- Better planning reliability and investment security.

Implemented services overview

- Milestone 1: Presentation of conceptual project paper;
- Milestone 2: Interface for medical documents interoperability;
- Milestone 3: Processing of structured medical meta data (diagnosis);
- Milestone 4: Access rights and data protection, implementation of IHE/XDS, structured medical meta data (procedures, symptoms), processing of emergency data.

The project is implemented by an interdisciplinary team of experts with an economic, scientific or healthcare institutional background.

Industry (examples):

- Agfa Health Care, GWI AG;
- Cisco Systems GmbH;
- CompuGROUP Holding;
- HL7 Benutzergruppe in Deutschland e.V.;
- IBM Deutschland GmbH;
- InterComponentWare AG;
- iSOFT Deutschland GmbH;
- Microsoft Deutschland GmbH;



- Oracle Deutschland GmbH;
- Siemens AG;
- T-Systems International GmbH;
- VHITG - Verband der Hersteller von IT-Lösungen für das Gesundheitswesen, e.V.

Payer and practitioner organisations, government: (examples):

- Ärztekammer Nordrhein;
- Ärztekammer Westfalen-Lippe;
- AOK Rheinland Hamburg;
- BARMER GEK;
- DKV Deutsche Krankenversicherung AG;
- Knappschaft Bahn See;
- KVNO - Kassenärztliche Vereinigung Nordrhein;
- Ministerium für Arbeit, Gesundheit und Soziales NRW.

Science:

- Fachhochschule Dortmund;
- Fraunhofer ISST;
- Institut für Medizinische Informatik, Biometrie und Epidemiologie, Universitätsklinikum Essen.

Budget overview

Undisclosed

Project financing

The project EPA 2015 is financed by the Ministry of Health of NRW and with own resources.

Planning

Start Date	Targeted end date
July 5, 2006	Ongoing

Further analysis

Options for further analysis	Limitation of further analysis
1. IHE and further international standards.	1. Budget information has been deliberately withheld although it had been requested.

Conclusions & Recommendations

The project is apparently concentrating on implementing international standards such as IHE. However, it may be challenging to obtain detailed data.



Other

Information sources	Main contacts
www.egesundheit.nrw.de/content/elektronische_patientenakten/index_ger.html	Christian Suelmann, Project Manager, Dennis Lohwien ZTG Zentrum für Telematik im Gesundheitswesen GmbH



Factsheet no.	11
Project	KP Health Connect
Project Owner	Kaiser Permanente
Country/Region	Colorado (USA)
Current Status	In Production

Main objectives

Kaiser Permanente - comprising the Kaiser Foundation Health Plan, Kaiser Foundation Hospitals, and Permanente Medical Groups and serving 8,6 million members in eight US regions - is the largest nonprofit integrated healthcare delivery system in the United States. Its mission is to provide affordable, high-quality healthcare services to improve the health of its members and the communities it serves. KP HealthConnect is a health information system that integrates an electronic health record with the tools to support physicians in delivering evidence-based medicine, coupled with an online patient portal that enhances members' access to and involvement in their care.

Expected results

In 2003, Kaiser Permanente launched a health information system called KP HealthConnect that links its facilities US-wide and represents the largest civilian installation of EHRs in the United States. As of April 2008, the system was successfully implemented in outpatient clinics in all eight Kaiser regions. Every Kaiser hospital has the essential components of the system and 25 had implemented all modules as of December 2008.

Implemented services overview

The EHR is the heart of KP HealthConnect (purchased from vendor Epic Systems Corp.) and provides a longitudinal record of member encounters across clinical settings and includes laboratory, medication, and imaging data.

Supported services:

- Electronic prescribing and test ordering (CPOE, Computerised Physician Order Entry) with standard order sets to promote evidence-based care;
- Population and patient-panel management tools such as disease registries to track patients with chronic conditions;
- Decision support tools such as medication-safety alerts, preventive-care reminders, and online clinical guidelines;
- Electronic referrals that directly schedule patient appointments with specialty care physicians;
- Performance monitoring and reporting capabilities;
- Patient registration and billing functions.

The EHR service provider is Epic Systems Corp.

Budget overview

The overall budget of the project represents 4 billion USD.



Project financing

Requested

Planning

Start Date	Targeted end date
2003	2008

Further analysis

Options for further analysis	Limitation of further analysis
1. major coverage of priority service preferences for Luxembourg	1. Healthcare context and dimensions are different in Luxembourg 2. Several attempts to reach people in charge of KP Health Connect - in vain

Conclusions & Recommendations

Interesting and well-advanced initiative, covering many services that are interesting for Luxembourg, too. However, it might be challenging to obtain information by KP as people in charge were unreachable and e-mails were not answered.

Other

Information sources	Main contacts
1. "Kaiser Permanente: Bridging the Quality Divide with Integrated Practice, Group Accountability, and Health Information Technology", case study, The Commonwealth Fund, June 2009	Ravi Poorsina, Communications Manager, Kaiser Permanente

Factsheet no.	12
Project	Dossier Pharmaceutique/Pharmaceutical Record
Project Owner	Conseil National de l'ordre des pharmaciens
Country/Region	France
Current Status	In Production

Main objectives

The pharmaceutical file (dossier pharmaceutique, DP) is a professional tool designed for pharmacists, whose goal is to secure the delivery of medications and provide better care for patients. After the patient's consent, the DP registers all drugs purchased by patients in any pharmacy over the past four months. The pharmacist is thus able to detect and prevent the risk of duplication of treatment or drug interactions. The upgrade of pharmacy software is a prerequisite to the deployment of the DP. This project was initiated in 2006 with all publishers of the sector. In late March 2008, 15 programmes have integrated the module. The authentication of pharmacists is done using a healthcare professional card (HPC). The data consulted in pharmacies is stored on an external host of health data (SANTEOS). The year 2009 marked a milestone for pharmacists. It was the first year of widespread use of pharmaceutical record (PNR) after the authorisation granted by the CNIL end of 2008 and the publication of Decree.

Expected results

The DP will be gradually deployed throughout the territory (23 000 pharmacies) and is intended to feed the DMP (Dossier Médical Personnel) as the drug record component of the DMP.

Overall results:

- Over 60 % of French pharmacies are now connected to the pharmaceutical record (PNR);
- Nearly 13 900 pharmacies (of 22 462) and 15 colleges (of 24) are connected and more than 7,2 million DPs were created as of March 22, 2010;
- The national rate of connecting pharmacies exceeds 61 %.

Implemented services overview

Dossier Pharmaceutique (DP) is a professional tool that secures the dispensing of medicines for the health of patients.

It allows to:

- Identify redundant or undesirable interactions between treatments;
- Improve the pharmacist's advice;
- Offer patients a therapeutic drug monitoring;
- Supply the drug component of future personal medical record (DMP) when it is created.

The EHR service provider is Epic Systems Corp.

Budget overview

The total cost of DP is around 5 million EUR p.a. since 2007.



Project financing

Mainly funded by the Conseil National de l'Ordre des Pharmaciens (CNOP), government subsidies representing less than 25 % of the overall financing.

Planning

Start Date	Targeted end date
2005	No targeted end date, the project is still in production but is planned to be included in the French national DMP

Further analysis

Options for further analysis	Limitation of further analysis
1. Deployment approach and key success factors for pharmacists adoption	1. Nationwide French project

Conclusions & Recommendations

The implementation in Luxembourg of the a similar approach can be a first step to achieve the goal of deploying a progressive electronic prescribing in Luxembourg. The first step will allow to validate also the changes to be made to the national drug database. As a nationwide project in France, it might be overdimensioned.

Other

Information sources	Main contacts
1. Présentation du projet Dossier Pharmaceutique sur le site de l'ASIP Santé, http://www.asipsante.fr/index.php?option=com_content&task=view&id=385&Itemid=391 (26/05/2010) 2. Le dossier pharmaceutique, http://www.ordre.pharmacien.fr/DP/index.htm	Olivier Porte, National Board of the Society of Pharmacists Sylvain Iemfre, National Board of the Society of Pharmacists

Factsheet no.	13
Project	Health and Social Care Information System (CRS-SISS)
Project Owner	Direzione Generale Sanita Lombardia
Country/Region	Lombardia (Italy)
Current Status	In Production

Main objectives

The objectives of this project are to facilitate communication and information exchange between all Lombardian stakeholders in healthcare, to automate complex administrative processes, and to improve the medical care of citizens. To reach these objectives, 9 million smartcard-based health cards (CRS) have been delivered to all health professionals and all citizens of the region. With this card, physicians can quickly and securely access health information of patients, whereas doctors can access all major medical emergency data of the patient. For the citizen, the card could be used to access electronic services or to receive documentation of medical treatments and medications taken. The CRS is supported by a "Healthcare Extranet" (SISS) that links professionals, social services, public and private organisations and citizens in the region of Lombardia. The SISS provides value-added eHealth services and tracks all the events that occur in patient treatment. Consequently, the SISS aims at facilitating access to the healthcare system, sharing and exchanging information between healthcare users and providers, improving diagnostics and the medical environment, simplifying administrative processes, minimising costs, and supporting budget control.

Expected results

In December 2007, more than 80 % of GPs and paediatricians, and 100 % of all pharmacies were connected to the network. In the same year, about 60 million transactions were realised. These statistics present the scale of the benefits realised. One of the main benefits is the improved quality of care: the continuity of the healthcare provision is supported significantly as CRS-SISS allows easy access to the patient's medical data for all healthcare providers that may need them; this in turn leads to an enormous improvement of the quality of care as the healthcare professionals have all the required information immediately available. Facilitated prescribing procedures additionally reduce the risk of an error. The implementation of the CRS-SISS has facilitated health administrative processes in the region of Lombardia. An internal study has estimated that, after six years, revenues approximately equal expenses and thus break-even has been reached.

Implemented services overview

CRS-SISS has integrated the following services:

- Citizen Identification: Regional General Registry and Citizen Card;
- ePrescription management system: to enable a digital use of prescriptions during their life cycle;
- Electronic Health Record (EHR): sharing of clinical data among healthcare professionals (including events, prescriptions, reports, care profile, ...), and allowing online access for citizens;

- Online booking and payment services for all healthcare providers connected to the regional system;
- Business intelligence and data warehouse to analyse and foresee epidemiological trends and thus to manage and forecast regional healthcare expenditures;
- Digitalisation of all medical and administrative documents in order to improve efficiency and effectiveness of processes;
- Accounting information management: incremental records of administrative data in order to ensure online updating of the business intelligence and the data warehousing systems;
- Electronic signature, mailing system, encryption functionality.

A consortium of companies, including Siemens Informatica, a joint venture of Siemens Business Services and Telecom Italia.

Budget overview

100 million EUR between 1999 and 2002 to launch the project, 90 million EUR p.a. since 2002 (operating cost).

Project financing

The project is funded from the budget of the region of Lombardia.

Planning

Start Date	Targeted end date
1999/2000	2005

Further analysis

Options for further analysis	Limitation of further analysis
1. Regional General Registry and citizen Card 2. Electronic prescription 3. Electronic Health Record	1. Healthcare context is different in Luxembourg

Conclusions & Recommendations

Well-advanced initiative, a number of modules could be analysed further.

Other

Information sources	Main contacts
1. Beretta, Claudio/Bresciani, Luciano/Ferrari, Enrica/Zuffada, Roberto (2006): The CRS-SISS project: a regional strategy for e-Health; 2. Health Optimum 2006, Venice, eHealth experiences in Lombardia; 3. Etat des lieux et perspectives des Plate-formes régionales de services, ASIP Santé, 2009; 4. eEurope Awards for eHealth 2003.	Claudio Beretta, Health head office, Lombardy Roberto Zuffada, Health head office, Lombardy

Factsheet no.	14
Project	NHS "Connecting for Health"
Project Owner	Department of Health Task Force
Country/Region	UK
Current Status	Implementation

Main objectives

The four countries of the UK (England, Scotland, Northern Ireland, Wales) have their own health services, named NHS (National Health Service). They operate independently, but their close cooperation and collaboration is to ensure the same quality of care for all citizens. NHS Connecting for Health is the agency of the UK Department of Health responsible for delivering the National programme for IT (NpIT) in England. One of the crucial IT architecture elements with regard to eHealth is "The Spine". The Spine

- Stores personal characteristics of patients, such as demographic information;
- Will store summarised clinical information which may be important for the patient's future treatment and care, such as allergies, current medications and adverse reactions to drugs;
- Ensures the security of systems required to restrict access to the national and local systems;
- Provide a Secondary Uses Service (SUS), using anonymised data for business reports and statistics for research and planning purposes;
- Interfaces with all the local IT systems within the National programme.

Expected results

For patients:

- Easier, secure access to a summary of their health information known as their Summary Care Record using the secure website HealthSpace. This will enable patients to be more informed and involved in decisions about their care and treatment;
- Faster, safer diagnosis and treatment because vital information will be available to healthcare professionals, including in an emergency, out of hours or when the patient is away from home elsewhere in England;
- A faster, easier way to make hospital appointments at a convenient time, date and place using the electronic referral system Choose and Book, whilst at the GP surgery or later via a call centre or the internet;
- A more convenient, safer way to obtain medication with prescriptions sent electronically from the GP to the dispenser, reducing transcription errors and enabling patients to nominate their preferred dispenser.

For clinicians and other NHS staff:

- Ready access to accurate, up-to-date patient information and a fast, reliable and secure means of sending and receiving information;
- Streamlining clinical practice and smoother handovers of care, supporting multidisciplinary team working;

- Online decision support tools, easier access to best care pathways and faster access to specialist opinions and diagnosis;
- Guidance on referral procedures and clear protocols for clinical investigations;
- More efficient referrals, alerts to conflicting medicines, and early detection of disease outbreaks;
- Reduced administration, paperwork, repetition, duplication and bureaucracy – less time spent chasing missing notes, x-rays, referral, admission or discharge information.

For the NHS:

- Value for money and millions of pounds of savings on hardware and software through national procurement of IT;
- Further savings over the lifetime of IT contracts through direct negotiation with prime contractors and - Enterprise Wide Arrangements with around 80 sub-contractors;
- Better intelligence on how the NHS works, and on the health of citizens, with anonymised information collected nationally. Real numbers, in real time, not just a sample from spotter practices;
- Better outcomes for the same resources;
- Real improvements in every patient's experience of care.

Implemented services overview

Examples of services:

SCR (Summary Care Records): The purpose of NHS SCR is to store information about patients' medical treatments nationally. The patient will be able to visualise their SCR online once his GP has created it using a secure website called HealthSpace. After that, each time the patient uses any NHS health service, the records are updated with details about any health problems, summaries of care and the professionals that accessed to the patients SCR. Caregivers need the permission of the patient to access the patient's Summary Care Record. When this is not possible, for example in an emergency case, the patient will be informed later. This service is free of charge. Each patient's electronic NHS Care Record will comprise two main components:

- 1) Multiple Detailed Care Records (DCRs) held on computers where treatment is provided (such as the GP practice or hospital), with each record containing comprehensive clinical information pertaining to care episodes; and
- 2) An SCR stored on the Spine (a central database store of all of the SCRs) that holds a smaller set of key clinical information, such as allergies, medications and diagnoses. This is the information that is considered most useful in an urgent or unscheduled care situation.

HealthSpace also enables patients to record information about their own care and access their SCR.

ePrescription (EPS): Prescriptions that are being sent to a nominated dispensing contractor can be signed and sent electronically. Normal hand signed paper prescriptions will continue to be used for all other prescriptions. As with all NHS Connecting for Health services, access will be controlled through the use of smartcards and a smartcard pass code. These smartcards will give to individual

users different levels of access depending on their role. They are similar to a chip and PIN credit or debit card. A user's Smartcard is printed with his name, photograph and unique user identity number.

Register: Everyone registered with the NHS in England and Wales has his own NHS number. It is the only national unique patient identifier, used to help healthcare staff and service providers to find the health records.

ePharmacy: At the Chelsea and Westminster Hospital in London they established a system which includes electronic prescribing, dispensing, distribution, stock management, and procurement of drugs. Nearly 65 % of all dispensary transactions are performed by a dispensing robot. The robot is provided with the information for each prescription. It then picks the items from stocks and either transfers them to the dispensary staff for dispatch to wards, or hands them to the appropriate patients waiting at the dispensary. The system warns prescribers if prescribing a medicine that interacts negatively with another, or when the patient is allergic to a medicine.

Service provider information requested but not obtained.

Budget overview

The overall cost of the National programme for IT is 12,4 billion GBP over 10 years.

Project financing

Requested

Planning

Start Date	Targeted end date
2005	ongoing

Further analysis

Options for further analysis	Limitation of further analysis
1. Spine storage architecture 2. complete coverage of service preferences for Luxembourg	1. Healthcare context and dimensions are different in Luxembourg 2. still in implementation stage 3. a number of serious issues have arised during implementation

Conclusions & Recommendations

Advanced but overdimensioned for Luxembourg.

Other

Information sources	Main contacts
1. Etat des lieux et perspectives des Plate-formes régionales de services, ASIP Santé, 2009 2. www.connectingforhealth.nhs.uk (01/06/2010)	Tony Afuwape Stuart Adaire

Factsheet no.	15
Project	Be-Health - eHealth platform in Belgium
Project Owner	Belgian Ministry of Health and the Secretariat of State for Informatics
Country/Region	Belgium
Current Status	In Production

Main objectives

The main objective of the platform is to provide a secure common access to telematics in the healthcare sector for healthcare professionals as well as social security actors, citizens and patients. The users have access to value-added services and to information already available within various organisations in a secure way by using authenticated, validated sources and tables of access. For the 2009/2011 period, the Be-Health project should reach the following objectives:

- Country wide mutual electronic access for healthcare providers/institutions to relevant data stored in electronic healthcare records;
- Simplification and computerisation of healthcare providers/institutions' administrative burden;
- Making legally valid electronic prescriptions;
- Country wide patient electronic referring between healthcare providers/institutions;
- Providing coded or anonymised information to actors in the healthcare sector, policymakers and researches.

Expected results

For the patient:

- Added value in terms of health care quality and patient safety;
- In certain cases, quicker service;
- More transparency.

For the health care provider:

- Less administrative formalities, enabling to spend more time on health care;
- Improved support for executing his/her profession;
- Connection to one electronic platform is sufficient for using several applications;
- Easier referring between health care providers/institutions;
- Support of cooperation, also local and regional.

For public services:

- Improved policy support;
- Maximum investment of available means in health care rather than in administrative formalities.

Implemented services overview

Be-Health has implemented a portal environment (<https://www.eHealth.fgov.be>) available for healthcare professionals, social security actors, citizens and patients. It includes a content management system, a search engine and an integrated user and access management. It also



provides each healthcare provider with a personal electronic mailbox. Be-Health allows online ordering of care prescription forms and agreement strips for healthcare providers (Medattest). Electronic sending of third party invoices by nurses to sickness funds, electronic consultation of healthcare insurance status by nurses, as well as support of electronic care prescriptions within hospitals are services being tested within the Be-Health project. ePrescription in the ambulatory sector is also being studied.

Since over 15 years, several dedicated private networks addressing the needs of the healthcare professionals and using the "public" infrastructure have been in place. Some are deployed nationally (e.g. MediBRIDGE), others more regionally (Mexxi, Mediring) or as a network of hospitals (Charleroi).

Carenet is another national network, initiated by the sick funds, used for social security purposes, especially for the transfer of billing data by hospitals, healthcare institutes and pharmacies.

A national eHealth backbone is also being implemented at this time (BeHealth). Authentication services and a patient master index will be provided on that backbone.

Budget overview

First envelope of 1,8 million EUR but intensive use of previous massive investments in e-government.

Project financing

The FPS Public health, the NSIII and the Secretariat of state for state computerisation participate to the funding of the costs of development of the Be-Health platform.

Planning

Start Date	Targeted end date
1998	ongoing

Further analysis

Options for further analysis	Limitation of further analysis
<ol style="list-style-type: none"> 1. content management system 2. search engine 3. integrated user and access management 4. personal electronic mailbox 	<ol style="list-style-type: none"> 1. Healthcare context different in Luxembourg

Conclusions & Recommendations

Interesting initiative with many possible options for further analysis.

Other

Information sources	Main contacts
1. La plate-forme eHealth: un état d'avancement, Juin 2010, Frank Robben 2. eHealth strategy and implementation activities in Belgium, Report in the framework of the eHealth ERA project, 2006 3. www.eHealth.fgov.be	Frank Robben, General manager eHealth-platform

Factsheet no.	16
Project	Digital Health Record in Estonia
Project Owner	Estonian Ministry of Social Affairs
Country/Region	Estonia
Current Status	In Production

Main objectives

The main objective of the system is to create a countrywide integrated network of health data, relying on the centrally administered Digital Health Record (DHR) that gathers essential medical information of a patient to a central register and passes it on to the relevant parties. Wider spreading of the system seeks to increase usability, availability and content quality of services, for example by enabling a much higher degree of personalisation of service provision, which should enhance the user orientation of online health services. Consequently, the DHR system should enable exchanging health data between healthcare professionals all over Estonia, providing citizens with better access to high-quality health services and accelerates the processing of health information.

Expected results

The project is still in an initial phase and therefore outcomes are not yet available. However, it is expected that the system will help to provide patients with a more accurate overview of their health status and current treatment leading to better informed, empowered patients. As paperwork is expected to decrease rapidly and the doctors to be better informed about their patient's medical condition, they have more time that can be used for treating the patient more thoroughly. The system helps to avoid duplicate analysis and tests leading to cost savings and increased quality of treatment. Since doctors and other healthcare providers have the possibility to obtain the patient's full medical account and condition very quickly, the medical service for the patient will become faster. Medical statistics are more accurate and better to use, and this enables to plan and arrange better and effective healthcare for every citizen of the country. The project should also help to guarantee better quality and accuracy of the necessary data for organising healthcare and to standardise the digital use and transmission of medical information. It should lead to a broader use of e-services in the country.

Implemented services overview

eHealth in Estonia is based on one core project - the Digital Health Record (DHR) - and several side projects - Digital Prescription, Digital Images and Digital Registration.

1. Digital Health Record includes three types of data:
 - o Patient's primary information (for example the contact information, insurance information, allergies, important drug information etc);
 - o Link directory that points to other sources which include some medical data about the patient (for example IT systems of hospitals and GPs);
 - o Centrally stored medical records.

2. Digital Prescription is a single national database for exchanging and storing prescription information between doctors, pharmacies, the individuals and the Electronic Health Information Network (EHIF);
3. Digital Images is a database where all digital snapshots or video material of the patient will be stored and will be available online through a single portal;
4. Digital Registration is an online tool that can be used both by the patients and the providers. A central database will store the referral notes and manage the appointment booking, changing and reminders. It is also planned to be used for the central supervision of the waiting lists. Patients can book the visits online instead of using many different platforms/web-pages to contact their health professional.

Service provider information is unavailable at this stage.

Budget overview

In 2007

- 1,6 million EUR were spent on Digital Health Record, of which 1,16 million EUR were funded by EU structural funds;
- 0,19 million EUR were spent on the digital appointment module, of which 0,15 million EUR were funded by EU structural funds;
- 0,24 million EUR were spent on the Digital Prescription system, of which 0,18 million EUR were funded by EU structural funds;
- 0,19 million EUR were spent on Digital Medical Image database, of which 0,14 million EUR were funded by EU structural funds.

Other relevant information collected:

- From 2004 to 2006, Estonia has received a total sum of 1,63 million EUR from EU structural funds for e-Health projects;
- For the budgetary period from 2007 to 2013, the total amount of EU assistance to Estonia to be spent on information technology is planned to be 62,6 million EUR. For the latter amount, e-Health projects compete with other initiatives.

Project financing

The Digital Health Record system is established by the Ministry of Social Affairs of Estonia with financial help of EU structural funds, Estonian eHealth Foundation, National Health Insurance Fund and the Ministry of Social Affairs itself.

Planning

Start Date	Targeted end date
2002	ongoing

Further analysis

Options for further analysis	Limitation of further analysis
1. Digital Health Record 2. Digital prescription 3. Healthcare context similar to Luxembourg	None

Conclusions & Recommendations

Interesting initiative led in a country where healthcare context is similar to Luxembourg. It could be worth analysing further.

Other

Information sources	Main contacts
1. eHealth Initiatives in Estonia, Erkki Leego 2. eHealth in Estonia, Kristiina Rebane 3. eHealth – ERA full report 4. www.docstoc.com/docs/430499/eHealth-Projects-in-Estonia (01/06/2010) 5. Estonian e-Health Foundation http://eng.e-tervis.ee/	Mr Madis Tiik, Estonian E-Health Foundation

Factsheet no.	17
Project	National Electronic Health Record (EPD/EMD/WDH)
Project Owner	National Institute for Healthcare (NICTIZ, Nationaal ICT Instituut in de Zorg)
Country/Region	Netherland
Current Status	Implementation

Main objectives

The Dutch government in cooperation with the National Institute for healthcare (NICTIZ) and health professionals together have created the initiative for nationwide electronic communication and exchange of medical data in the healthcare sector. As the Dutch data privacy regulation does not allow centralised storage of data, a central repository holds links/references to documents in the systems of hospitals and doctors.

Expected results

The project is still in progress. The basic infrastructure and initial data exchange have already been developed and are ready for broad implementation.

Milestones for 2010:

- 100 % connection of GP practices, after-hour clinics, hospitals and pharmacists;
- National accessibility of medication information and GP patient observation records;
- 100 % of the Dutch have access to their own access logging, referral and authorisation data;
- Information on intolerances, contra-indications and allergies are available for medication monitoring.

Milestones for 2013:

- Professional summaries in place for transfer, referral and feedback;
- National availability of results of diagnostic testing (pathology, clinical chemistry, medical microbiology, radiology, nuclear medicine);
- Care sector connected to medication and observation records;
- Extensive patient access to EPD.

Milestones for 2014:

- Entire medication chain (electronic prescriptions, medication monitoring, discharge medication, repeat prescriptions) established;
- Diabetes care chain: communication between diabetes care providers takes place in accordance with Dutch Diabetes Foundation standard, standardised quality reports;
- Diabetes patient can access self-records.

Implemented services overview

EPD is a secured environment in which client/patient data, stored in different systems, can be retrieved, exchanged and displayed to authorised healthcare providers to support the healthcare processes. This virtual electronic health record is compiled from a collection of applications connected to the national AORTA infrastructure. The AORTA infrastructure is used for the secure and reliable exchange of medical information. It consists of several components, such as a National Switch Point (NSP), which provides a reference index for routing, identification, authentication, authorisation and logging. An extensive identification and authentication system for both patients and healthcare providers ensure the systematic and secure storage of medical data.

Examples of services:

1. Electronic Medication Record (EMD): Enables healthcare providers to get a look on the medication history of specific patients, via their own software system. This information resides on the source side (e.g. in pharmacy, in hospital information systems, ...);
2. General Practitioner's Record (WDH): A GP Record will provide to health professional a summary of the patients' medical history;
3. Electronic Medication Record (EMD): Enables healthcare providers to get a look on the medication history of specific patients, via their own software system. This information resides on the source side (e.g. in pharmacy, in hospital information systems, ...).

A European tender has been issued at the beginning of the project where the contract was awarded to CSC. A new tender is in progress.

Budget overview

A total of 97 million EUR from 2002 to 2008 has been granted.

Project financing

NICTIZ, Ministry of Health, CIBG (Centraal Informatiepunt Beroepen Gezondheidszorg, identity management body for healthcare providers), SBV-Z (Sectorale Berichten Voorziening in de Zorg, provides national security number).

Planning

Start Date	Targeted end date
2002	2007, prolonged to 2012, probably even longer

Further analysis

Options for further analysis	Limitation of further analysis
1. Decentralised data storage 2. holistic platform approach 3. SNOMED CT as terminology standard	1. Healthcare context and dimensions are different in Luxembourg 2. still in implementation stage

Conclusions & Recommendations

Interesting initiative in a geographically near country. The decentralised approach is worth deeper investigation. The platform architecture is already in an advanced stage.

Other

Information sources	Main contacts
1. www.nictiz.nl	Ellen Havenaar, strategy and external affairs, Nictiz - Nationaal ICT Instituut in de Zorg

Factsheet no.	18
Project	Strategic eHealth projects in Catalonia
Project Owner	TIC Salut Foundation - Agency in charge of developing eHealth in Catalonia under the leadership of the Catalan Ministry of Health
Country/Region	Catalonia (Spain)
Current Status	In Production

Main objectives

The main objective of these projects is, for the Catalan Ministry of Health, to develop and incorporate ICT into the health system, as described in the 2008-2011 Strategic Plan for ISICT (Information Systems and ICT). This plan has established 6 strategic axes and 35 action plans. Its principal projects are:

- Shared clinical history in Catalonia (HC3);
- Electronic prescriptions (Rec@t);
- Medical image digitalisation plan;
- Telemedicine and teleassistance;
- Personal health folder.

Expected results

The 5 key strategic eHealth projects should provide direct benefits:

- For the public: greater access to information and to test results, and a reduction in the risks associated with the duplication of tests and treatments. This information allows patients and practitioners to assume a greater measure of joint responsibility for the patient's health;
- For healthcare professionals and centres: faster and cheaper transfer of information as well as better coordination of the available resources, leading to better clinical and financial management and improved services.

Individually, each project has reached or shall reach the following objectives:

- HC3: by June 2010, there should be 472 centres connected and sharing 25 million clinical documents;
- Rec@t: 1,2 million patients have used this system and more than 24 million electronic prescriptions have been dispensed;
- Medical image digitisation plan: generates 4 million examinations annually, representing 50 % of the total for Catalonia.

Implemented services overview

As stated above, the Catalonia is currently developing tools to be incorporated into the provision of healthcare services. They should enable the following services:

- HC3: aggregates all the documents containing data, information and clinical assessments on the state and progress of a patient's health throughout their clinical history. The HC3 is based on a decentralised management model, connected via interoperable systems using common standards. It allows doctors to access all the relevant information available on their patients,

irrespective of the healthcare service or geographical location involved, thus helping to ensure continuity of healthcare, to integrate information and to avoid mistakes and the unnecessary repetition of examinations and/or procedures;

- Rec@t: facilitates coordination among health professionals, physicians and pharmacists. Rec@t provides a patient's medication plan, that improves the safety of drugs utilisation and the accessibility of patients to pharmaceutical services;
- Medical images digitisation plan: digitises x-ray images and establishes a basis for the digitisation of other types of medical images;
- Telemedicine and teleassistance plan: provides real-time communication between healthcare centre professionals and the patient, promotes telemonitoring for patients with chronic diabetes, respiratory and cardiac disorders and facilitates communication between professionals in different parts of the service on the production of diagnostic reports;
- Personal health folder: is a digital file that patients can consult, giving them secure, confidential access to their personal health information. The project is currently still being designed and implemented. In the first stage, patients had access to the main detail contained in the HC3: medication prescribed and vaccinations given, medical reports and test results and complementary examinations carried out.

The second stage will enable personalised access to other information about the patient's health and to all the e-services and administrative procedures that can be provided on-line: requesting a doctor's appointment, changing the details on the Health Card, following the progress of complaints and requests for health certificates.

Service provider information requested but not obtained.

Budget overview

Unavailable at this stage.

Project financing

Unavailable at this stage.

Planning

Start Date	Targeted end date
2005	Ongoing

Further analysis

Options for further analysis	Limitation of further analysis
<ol style="list-style-type: none"> 1. Shared Medical Record 2. Electronic prescription 3. Personal Health Folder 	<ol style="list-style-type: none"> 1. Healthcare context different than in Luxembourg

Conclusions & Recommendations

Interesting initiative to be kept in the short list and to be considered only, if further information can be made available.

Other

Information sources	Main contacts
<ol style="list-style-type: none"> 1. Catalan Ministry of Health, www.gencat.cat/salut 2. Catalan Agency for Health Technology Assessment and Research, www.aatrm.net 3. TicSalut Foundation, www.ticsalut.cat 4. eHealth in Catalonia, we are connected! 5. 2008-2011 Strategic Plan for ISICT 	<p>Francesc Moya Olvera, Manager for Telemedicine and Technique sectors, TicSalut Foundation, Spain</p>

Factsheet no.	19
Project	Plate-forme régionale de Picardie/Picardie eHealth Platform
Project Owner	GCS eSanté Picardie
Country/Region	Picardie (France)
Current Status	In Production

Main objectives

With the Dossier Santé Picard (DSP), the project initially aimed to promote the exchange of medical data between healthcare professionals with a priority linking of physicians/hospitals. In a second stage, the project aims at preparing the roll-out of the DMP in the region. All stakeholders in the health sector shall be involved by supporting services around a true collaboration.

Main objectives include:

- Organising the deployment of facilities and medicine;
- Stimulating the use of a DSP with enhanced support (initial and additional quality study, identification checks, regular monitoring) to optimise the creation of DSP in healthcare institutions and by the local GP;
- Strengthening partnerships with IT providers;
- Developing a culture of sharing around the DSP by communication among both health professionals and among patients;
- Assessing user satisfaction and analysing problems in order to optimise the tool;
- Converging from DSP to DMP.

Expected results

Expected results for the end of 2010:

- Operate 143 000 DMP;
- Include 530 healthcare providers and 3 270 healthcare professionals in healthcare organisations (27 public and private hospitals), and one healthcare network.

Implemented services overview

A dedicated workflow has been developed in the context of the DSP that allows access to enable the exchange and storage of data:

- Public and private institutions are connected to the DSP through an exchange platform (PFE), which allows both to filter outbound medical data and access to medical data produced outside of internal Sis;
- General practitioners, biological laboratories, radiologists and healthcare networks, have the ability to connect to the DSP platform through integrated connectors, web access for the Liberals without using specific information systems;
- A unique patient identifier was set up, based on Sesam Vitale Card, using a dedicated algorithm;
- Health professionals identification and authentication is done using Professional Health Cards (Carte Professionnelle de Santé) and a specific certificate awarded by the institution GIP CPS.

Industrial providers include:

- SANTEOS (Hosting and service delivery);
- Imagine Edition (Hellodoc), CompuGroup (Axilog v4), CLM (crossway ville, eglantine v4, docware 6, cardiolute 6/General Practitioners' information systems).

Budget overview

The cost to build the overall platform is about 2,5 million EUR.

Project financing

No reliable information on the financing of the Franche Comté eHealth platform has been found until now. However, an evaluation report conducted by ASIP Santé on French regional platforms indicated that regional platforms are fully publicly funded, including financing by Assurance Maladie (FAQSV then FIQCS), Ministry of Health plan (Hôpital 2007, Hôpital 2012), FEDER funds, and other minor regional funds.

Planning

Start Date	Targeted end date
2006	Ongoing projects, planed to be part of the national DMP project

Further analysis

Options for further analysis	Limitation of further analysis
1. Almost comparable size with Luxembourg (Picardie has 1 900 000 inhabitants)	1. Not the "best of breed" of French projects 2. Every regional platform in France can rely on national basic components such as health professional identifier cards or patient identifier cards

Conclusions & Recommendations

A further regional experimentation in France, led by SANTEOS, the company that will develop the national DMP. To be considered as a second choice if a regional initiative is to be retained for further steps.

Other

Information sources	Main contacts
<ol style="list-style-type: none"> 1. Présentation du projet régional Picardie sur le site de l'ASIP Santé (www.asipSante.fr/index.php?option=com_content&task=view&id=367&Itemid=232 (26/05/2010)) 2. Relance DSP DMP, Dossier Santé Picardie (12/05/2009) 3. GCS e-Santé Picardie: un bel exemple de coopération entre professionnels de Santé, TICSanté (www.ticSante.com/show.php?page=story&newsPage=5&id=477&story=477 (26/05/2010)) 4. Etat des lieux et perspectives des Plate-formes régionales de services, ASIP Santé, 2009 5. En Picardie, médecins et patients testent le dossier médical personnel, par Cécile Prieur, Le Monde du 19 juin 2008 	Dr Christine Boutet-Rixe, Medical Director DSP, GCS e-sante Picardie

Factsheet no.	20
Project	Slovenian eHealth experience
Project Owner	Slovenian Ministry of Health and the Institute of Public Health of the Republic of Slovenia
Country/Region	Slovenia
Current Status	In Production

Main objectives

The strategic goal of the Slovenian eHealth project is to use an efficient and flexible IT to support the objectives of the national healthcare system serving the needs and best interests of citizens, healthcare professionals, healthcare organisation management, healthcare service purchasers and healthcare system administrators. The aim is thus to facilitate interlinking of existing isolated information systems in order to facilitate access to information and direct communication across the administrative and organisational boundaries to and from both citizens and healthcare professionals.

The Slovenian eHealth Strategy and operational plan 2007-2010 have 3 main focus areas:

1. To upgrade the basic information infrastructure for the safe and transparent exchange of information between patients, healthcare service providers and payers:
 - o Establish a private network of the healthcare sector;
 - o Introduce a Public Key Infrastructure;
 - o Define most important health informatics standards and classifications.
2. To define and introduce interoperable healthcare records and integrate it into the daily work of medical and allied professionals with patients;
3. To introduce and sustain the national healthcare portal and implement data exchange between patients, various healthcare providers, payers and other stakeholders.

Expected results

Citizens:

- Promote information, responsibility and active role of the citizen in the care for own health.

Healthcare (HC) professionals:

- Information integration of clinical processes, facilitation of access to information sources, expert systems, secure communication between service providers.

HC organisation management and HC service purchasers:

- Timely management information.

HC system administrators:

- Information integration of the overall HC system (organisations, levels);
- National HC statistics;
- Prompt information to support decision making.



Implemented services overview

In the future, the core of the healthcare information system will consist of the three strategic pillars:

- The central zVEM portal, ensuring communication between back-office systems and healthcare operators, will offer citizens and expert members of the public a range of e-services in the area of healthcare such as, for example, e-appointments;
- The zNET network, which provides a secure and reliable environment with suitable capacity and throughput for data exchange;
- Unification of electronic health records pertaining to individuals.

Until now, different projects have been completed at the country level among which:

Insurance Card system, which is based on the network of databases maintained by the Health Insurance Institute of Slovenia (HIIS). It aims at:

- Improving the quality of services provided by the Institute and by other healthcare service providers;
- Simplifying and improving communication between the Institute, the physicians and healthcare institutions;
- Improving the security of personal data within the information systems.

EHR, which has been implemented in 2007. This EHR is based on a basic information infrastructure and a standard dataset.

The ICT-architecture has been developed mainly by Siemens and Gemplus.

Budget overview

The project value amounts to 31 million EUR.

Project financing

85% of the funding is provided by the European Funds.

Planning

Start Date	Targeted end date
2000	Ongoing

Further analysis

Options for further analysis	Limitation of further analysis
Slovenia is currently developing a central portal and a country-wide network	A certain amount of information has been unavailable on the Internet. Contact with the Slovenian Project Manager should be established.

Conclusions & Recommendations

May be kept in the short list under the condition that the Slovenian healthcare context is similar to Luxembourg and that further information can be obtained.

Other

Information sources	Main contacts
<ol style="list-style-type: none"> 1. eHealth activities in Slovenia 2. The European Files (Nr 10, May - June 2010) - eHealth in Europe 3. eHealth2010: Slovene Health Information System Strategy 	<p>Marjan Sušelj, Advisor to the Minister of Health Tit Albreht, Institute of Public Health of the Republic of Slovenia</p>

7.5 Details of short listed projects

Reasons for choosing short-listed projects are presented below:

1. Project 2: *Dossier Médical Personnel* (DMP), ASIP Santé, France: The outcomes of the French DMP project could be partially reused for Luxembourg. It is also interesting to study the lessons learned that have led to the project relaunch in 2009;
2. Project 4: *Franche-Comté regional eHealth platform, Groupement de Coopération Sanitaire EMOSIST*, Franche-Comté (France): The French regional projects (Franche-Comté and Rhône-Alpes) have been selected as they have been successfully implemented and they show interesting differences in their respective architectures, e.g. centralised vs. decentralised EHR management approach. Franche-Comté also has a comparable healthcare context with regard to the number of inhabitants and has implemented a shared virtual temporary repository that has even been deployed nationally in Israel;
3. Project 5: SIS-RA platform and its services, GCS and SIS-RA, Rhône-Alpes (France): Rhône-Alpes has implemented one of the leading regional eHealth platforms in France with an advanced technical maturity. A positive factor of the French initiatives is also the geographical vicinity;
4. Project 9: ELGA (Electronic Health Record Initiative), ELGA GmbH, Austria: The Austrian ELGA project has been retained as it implements a unique identification of patients and of healthcare providers. It also provides patients with a central register containing every document related to their health pointing to decentralised data sources. One of the main objectives of the ELGA project is to build and strengthen information interchange between every Austrian healthcare actor - an objective compatible with the eHealth initiative in Luxembourg. Moreover, the Austrian eHealth project seeks alignment with the international eHealth initiative IHE (Integrating the Healthcare Enterprise). An initial phone contact with the ELGA project manager has also revealed the interest to collaborate with the Ministry of Health and PwC on the study;
5. Project 10: EPA 2015 - *Elektronische Patientenakten*, German Ministry of Work, Health and Social Affairs, North Rhine-Westphalia State, Germany: The North Rhine-Westphalia EPA project has been shortlisted as it has developed specifications and regulations for an interoperable, institution-spanning electronic patient record and a reference architecture with defined interoperability definitions and migration concepts, which are of interest for the Luxembourg eHealth platform. Moreover, the Ministry of Health has strong support from the EPA project team. It should help us to obtain detailed information for the comparative analysis;
6. Project 16: Digital Health Record in Estonia, Ministry of Social Affairs, Estonia: Estonia has developed an interesting eHealth initiative that is focused on a centrally administered Digital Health Record (DHR) that gathers essential medical information of a patient to a central register and passes it on to the relevant parties. In addition to the DHR, Estonia is developing the Digital Prescription project as a single national database for exchanging and storing

prescription information between doctors, pharmacies, the individuals and the Electronic Health Information Network (EHIF). There is furthermore a Digital Images project consisting of a database where all digital snapshots and video material of the patient will be stored and will be available online through a single portal. An interesting initiative is also the Digital Registration that is an online tool used both by patients and providers: a central database will store the referral notes and manage the appointment booking, changing and reminders. The final point is the number of inhabitants in Estonia which provides a similar healthcare context compared to Luxembourg;

7. Project 18: Strategic eHealth projects in Catalonia, TIC Salut Foundation, Catalonia (Spain): The eHealth projects currently managed in Catalonia have been retained as they developed tools which should enable different services that interest the Luxembourg Ministry of Health. The Catalan initiative is centred in a shared clinical history (HC3) which aggregates all the documents containing data, information and clinical assessments on the state and progress of a patient's health throughout their clinical history. In addition to HC3, Catalonia is currently designing and implementing a personal health folder that patients can consult, giving them secure, confidential access to their personal health information.

Table 29: Comparison of short listed eHealth initiatives

Country/Region	France	Franche Comté (France)	Rhône-Alpes (France)	Austria	Land Nordrhein-Westfalen (State North Rhine-Westphalia), Germany	Estonia	Catalonia (Spain)
Project	Dossier Médical Personnel	Plate-forme régionale Franc-Comtoise/Franche Comté regional eHealth platform	Plate-forme régionale Rhône Alpes/SIS-RA platform and its services (DPPR, PEPS, Trajectoire, ...)	Elektronische Gesundheitsakte - ELGA (Electronic Health Record Initiative)	Elektronische Patientenakten - EPA 2015 (NRW)	Digital Health Record in Estonia	Strategic eHealth projects in Catalonia
Stakeholder management	<ul style="list-style-type: none"> Core parties directly involved: the project management team, the industrial chosen to develop the DMP repository, the subcontractors for project management Parties indirectly involved, such as patients, healthcare professionals and institutions, software providers, are invited to working groups and/or information meetings 	Information not provided by the respondents	<ul style="list-style-type: none"> Core parties directly involved in a cooperation working group (GCS): 3 regional hospitals, some other healthcare authorities as well as GPs Specific meetings are organised with parties indirectly involved on a regular basis Patients' action group should be more represented in the GCS 	<ul style="list-style-type: none"> Health stakeholders (Medical, dentists, pharmacies associations, states, hospitals, Ministry of Health, public social service, software providers) are included depending on the sub-project Public health officers, company physicians and funding entities of healthcare services were not included: 	Core parties directly involved in an interdisciplinary team of experts with an economic, scientific or healthcare institutional background, which is composed of representatives from industry, payer and practitioner organisations, government, as well as universities	<ul style="list-style-type: none"> Develop a voluntary beta testers (ideally a representative of each stakeholder) who would be invited to give their opinion on the pilot functionalities Organise regular meetings (four times a year) to share new information and ask for feedback to indirectly involved parties 	Core parties directly involved in the CIS strategic plan: hospitals, primary health centres, research centres, pharmacies, health transport...

Country/Region	France	Franche Comté (France)	Rhône-Alpes (France)	Austria	Land Nordrhein-Westfalen (State North Rhine-Westphalia), Germany	Estonia	Catalonia (Spain)
Key success factors	<ul style="list-style-type: none"> • Provide rapidly a set of services that could provide a minimum of functionalities for field tests and adoption. The evolution and improvement of the versions could occur with the time • Involve of all stakeholders, especially software suppliers by designing and communicating the overall interoperability framework in which they must comply 	<ul style="list-style-type: none"> • Strong political and financial support • Strong control on the project from the project management team • High involvement of the governance structure • Promote projects' sharing within the hospital sector in order to downsize costs and limit waste • Separate the exploitation of the IT structure from the exploitation of patient information which must remain under the supervision of public authority 	<ul style="list-style-type: none"> • Projects should be owned and launched by the healthcare professionals to motivate them from the beginning and ensure the services newly implemented are pertinent • Communication is essential since people are the key to success 	<ul style="list-style-type: none"> • Security • Availability • Performance • Usability • Trust 	<ul style="list-style-type: none"> • Implement according to objectives • Ensure user acceptance • Protect your data • Establish realistic field tests 	<ul style="list-style-type: none"> • Involve medical staff and society from the beginning, so that they would be aware of the changes to come and feel motivated to go along with it • Be compliant with the legislation (e.g. regulate the access to data, data to be sent to health care providers etc.) 	Cooperation between stakeholders

Country/Region	France	Franche Comté (France)	Rhône-Alpes (France)	Austria	Land Nordrhein-Westfalen (State North Rhine-Westphalia), Germany	Estonia	Catalonia (Spain)
Project risks	<ul style="list-style-type: none"> • Shift schedule • Difficulties in interfacing the various softwares • Difficulties in recovering existing medical data • Change management process • Confidentiality issues • Incentives for the healthcare providers to use the DMP 	<ul style="list-style-type: none"> • Select the right contractor with the right level of "standardized" product • Difficulties to find appropriate IT skills on the labour market • Limitation of budgetary resources allocated to infrastructure 	<ul style="list-style-type: none"> • Protect the data • Be aware of the future healthcare technologies to change if necessary the overall program strategy on time • Create a service which is not needed or which doesn't correspond to stakeholders' requirements • Resistance to change (mainly from the patient and GPs) • Complexity of the deployment • Complexity of the governance • Favour short-term projects (3 to 5 years) to long-term ones 	<p>A risk analysis has been conducted for each sub-project</p>	<ul style="list-style-type: none"> • Participation and motivation of the involved project partners • Complex process of coordination when too many parties are involved 	<ul style="list-style-type: none"> • Opinion and negative feedbacks from GPs or patients • Respect of deadlines and budget 	<p>A risk analysis was conducted before beginning each project</p>

Country/Region	France	Franche Comté (France)	Rhône-Alpes (France)	Austria	Land Nordrhein-Westfalen (State North Rhine-Westphalia), Germany	Estonia	Catalonia (Spain)
Governance structure	<ul style="list-style-type: none"> • Project decisions taken by the management board, which is composed of the main national government health bodies. The board also manages different organisations/committees (the ethics and professional conduct council, the liaison and cooperation committee, the ASIP Santé conference, ...) • Sub-project decisions taken by a project team composed of internal and external participants 	Information not provided by the respondents	<p>Two governance layers:</p> <ul style="list-style-type: none"> • A political layer composed of the ARS (Regional Health Agencies), the Regional Council, the URML (GPs Regional Action Group) and the Patients' action group, meeting each other on a regular basis during Steering Committees • An operating layer: the GCS SISRA, which decides on the pilot establishments for each project. The GCS SISRA is composed of the Organisation and Information Systems Director from the 5 founder establishments. 	<ul style="list-style-type: none"> • ELGA GmbH is composed of Republic of Austria, federal states and public social insurance members • ELGA GmbH controls the progress and objectives of the eHealth project, with stakeholders and associations • ELGA organisation provides technical and architectural concepts, project management and marketing 	The regional government is responsible for the project• A Public Private Partnership (ZTG GmbH) has been founded to deal with the project management	<ul style="list-style-type: none"> • The Ministry of Social Affairs has initiated the projects and is responsible for the administration, coordination and supervision of the four eHealth projects as a whole • The Estonian eHealth Foundation leads each project and manages the operating system 	<ul style="list-style-type: none"> • The governance of all projects of the CIS Strategic Plan is located in the Agency of Information, Evaluation and Quality of Health • The TicSalut foundation drives the development and the use of TIC in the regional healthcare sector

Country/Region	France	Franche Comté (France)	Rhône-Alpes (France)	Austria	Land Nordrhein-Westfalen (State North Rhine-Westphalia), Germany	Estonia	Catalonia (Spain)
Key information related to the platform	<ul style="list-style-type: none"> The common platform is currently on development, thus its features are not all properly defined yet The platform will be operated by a consortium led by ATOS Origin and LA POSTE 	<ul style="list-style-type: none"> The platform is a third party based product, supported by 2 data centres implemented in Franche-Comté, shared with other healthcare networks The GCS Emosist is in charge of operating the system 4 FTE have been allocated to infrastructure matters 	<ul style="list-style-type: none"> The platform, its operations and project management are outsourced Only the governance is managed in-house The platform takes over the operational project strategy including the implementation of tools and the connection of regional health structures, networks and physicians The platform is a third party based product 	<ul style="list-style-type: none"> Based on international standards Architecture adjusted according to Austrian circumstances 	EPA2015 does not implement any platforms but defines standards, recommendations and implementation concepts	<ul style="list-style-type: none"> eHealth services are managed through the X-road platform, a technical infrastructure used for every eGovernment services developed in Estonia X-road platform is an independent standard interface ensuring secure data processing, connecting all Estonian public sector databases and facilitating information exchange The Estonian eHealth Foundation is in charge of the functioning of EHR central system While the Estonian Informatics Centre, which is a subdivision of the Ministry of Economic Affairs and Communications, is responsible for the infrastructure 	<ul style="list-style-type: none"> eHealth services are managed through the TicSalut ring It is a structure/ infrastructure on which healthcare professionals can/must connect to use all the available services TicSalut ring gathers human resources, technologies and materials, previously dispatched in several departments and institutions

Country/Region	France	Franche Comté (France)	Rhône-Alpes (France)	Austria	Land Nordrhein-Westfalen (State North Rhine-Westphalia), Germany	Estonia	Catalonia (Spain)
Information Security rules	<ul style="list-style-type: none"> • Patients will be able to access via their Web Browser, after a strong authentication involving a username, password and a One-Time Password OTP (experimentation) • Patients will manage the access rights to their DMP (for health professionals, health facilities) and express opposition to some access modes • Professionals will access through strong authentication processes (using their professional cards or electronic certificates) 	Information not available	Information not available	Security rules are currently in development and can therefore not be depicted yet	<ul style="list-style-type: none"> • Compliance to German data protection laws • Access limitations on the level of the respective field of specialization • Written confirmation of the patient/user is mandatory before granting data access to any other stakeholder. • Confidentiality of data • Integrity of data • Availability of data • Assignability of data to stakeholders • Definition of utilization scope of data • Quality and validity of information • Auditing acceptability (tracking who has done what and when) 	<p>Requirement:</p> <ul style="list-style-type: none"> • Ensure safety of the sensitive personal data to prevent and prevent from adverse events by applying complex authentication methods How? • All health care providers must send mutually agreed data to HER • All access rights and data use is regulated by law • Access is only enabled to licensed medical professionals • A patient's data can only be viewed by their attending physician • ID cards are used to authenticate and provide digital signatures • Patients can access their own data through the Patient's Portal • Patients have the right to set access restrictions on all personal information • Patients can monitor every incidence of access to their personal medical records 	<p>The different services implemented should respect the Organic Law of Data Protection, ensure the physical security of information and infrastructures, and use common security solutions. The most significant processes are:</p> <ul style="list-style-type: none"> • The reorganization of the Information Security Programme, by enhancing juridical and strategic competencies • The creation of the Technical Office of Security, which assumes the technical aspects of CIS security and its coordination • The creation of a technological security model • The mensual reporting of CIS security risks and the corresponding action plan for mitigation

Country/Region	France	Franche Comté (France)	Rhône-Alpes (France)	Austria	Land Nordrhein-Westfalen (State North Rhine-Westphalia), Germany	Estonia	Catalonia (Spain)
Development or the acquisition of an interoperability framework	<ul style="list-style-type: none"> • A national interoperability platform has been developed and it should be reused by the different French regional similar initiatives • The framework is strongly recommended to healthcare providers and health ICT providers when medical data are exchanged outside of the DMP • Some agreements are signed between ASIP-Santé and national agencies (e.g. INCA, national Cancer Institute) to design their own information system and to evaluate the interface with the DMP project 	<p>There is not strictly speaking part an interoperable framework; however solutions have been implemented to ensure information exchange at regional level, such as:</p> <ul style="list-style-type: none"> • Connecting patient identities: Identity Server - IdeoPass* (developed by the SQLI company) - has been implemented to host 1 million patients identities • Connecting the DMP with existing healthcare professionals' solutions has been facilitated by the setting up of connectors • Identifying health professionals through directories 	<p>A regional interoperability framework has been implemented</p> <p>The framework is mandatory to every actor</p> <p>To install it the region:</p> <ul style="list-style-type: none"> • Each hospital has to invest 15 000 Euros to connect to the platform (among which 5 000 Euros for the hardware) • GPs received a financial help to do so and had the possibility to benefit from an hotline provided by software editors 	<ul style="list-style-type: none"> • A corresponding law is in preparation • It is expected that a participation in the ELGA system will be mandatory for each healthcare provider due to the patients' legal rights to participate in his/her medical processes 	<ul style="list-style-type: none"> • The EPA 2015 project develops suitable specifications that should apply nationwide • However, there is no obligation to use EPA 2015 standards • Motivation for the implementation by industry stakeholders is expected to result from the industry's own interest 	<p>The EHR is a nationwide framework with a standardised central information exchange function</p> <p>The EHR is mandatory to every actor</p>	<ul style="list-style-type: none"> • Each Spanish region including Catalonia has developed its own interoperability policy, depending on the nature of its healthcare system • However, based on requirements established by the Ministry of Health of Spain, Catalonia has developed an interoperability framework which guarantees connectivity with the rest of Spain and Europe • This framework is not mandatory, but the common sense is that every Catalonia healthcare actors uses it

Country/Region	France	Franche Comté (France)	Rhône-Alpes (France)	Austria	Land Nordrhein-Westfalen (State North Rhine-Westphalia), Germany	Estonia	Catalonia (Spain)
Standards	<ul style="list-style-type: none"> • Medical contents: CDA R2 • Images: DICOM • Service layer: IHE XDS-b et XDM • Transport layer: IHE XUA • Certificates: x509 V3, IAS 	Information not available	Information not available	<ul style="list-style-type: none"> • Base line: IHE standards • Documents: CDA, preferably level 2 or higher • Radiology images: DICOM v.2 or higher • Security: OASIS (e.g. xACML) • Structured documentation: LOINC and ICD 	<ul style="list-style-type: none"> • Implement pilot scenarios based on presentation platform • Induct further on IHE/XDS as technical transport platform • Extract meta data attributes from international standards (e.g. HL7 CDA Rel. 2, VHTG-Arztbrief, HL 7 v2 MDM Nachrichten, IHE XDS) • Maxim for the development of the reference scheme is practicability, understandability and implementability by avoiding immoderately generic approaches 	<ul style="list-style-type: none"> • EHR uses SOAP, DIGIDOC (for digital signature and authentication), HL7 v3 (Normative and Ballot Editions), and CDA • The system functions perfectly for 1,5 years. It contains 1 500 000 medical documents • HL7 standard have also been used for recently launched projects • Other standards are still in use. Estonia will continue to do so. 	DICOM, HL7, IHE, LOINC, SNOMED, NANDA, ICPC, EQPF

Project	Dossier Médical Personnel
Project Owner	ASIP Santé
Country/Region	France
Current Status	Implementation

General information related to the project

Is the eHealth project part of an overall healthcare delivery plan of the country/region?

Yes, ASIP Santé is in charge of health IT projects at the national level (definition of the interoperability framework - i.e. standards, identification of patients, professionals... - the DMP, the dossier by specialties, the exchange of lab results, telemedicine...).

Details on sub-projects

What sub-projects have been defined in the context of the eHealth project?

1. DMP information system;
2. Portal;
3. Support information system;
4. Management information system.

For each sub-project, what are the main objectives, start date, end date as well as key milestones?

Main objectives of each sub-project:

1. The DMP information system will be used to create, add to and consult electronic health records. Healthcare professionals (with the patient's permission) and the patients will be able to consult and add data to the DMP. This complex project is itself composed of several sub-projects, since the DMP must be accessible through different channels – via an Internet browser, and in the form of web services enabling healthcare professionals to integrate the DMP into their normal work environment. If patients give their consent, their DMP will also be interfaced with external data sources such as their health insurance reimbursement history and their pharmaceutical file. They must also be interfaced with health professional card (CPS) systems so that healthcare professionals can be reliably authenticated;
2. The portal will make a vast amount of information available to patients and healthcare professionals. Information pages, testimonies, graphics and videos will provide answers to common questions: e.g. why create DMPs? Who can create them? Who can access them? How are they accessed? How do you add to them?;
3. The support information system will allow hotline staff to input questions from users request for information, questions about problems using the DMP, or reports of technical

malfunctions. The statistical information fed back by this system will provide a real-time view of the questions asked and difficulties encountered by users;

4. The management information system will allow a variety of statistical information fed back by the three information systems mentioned above to be aggregated, giving the ASIP Santé teams a complete picture of how the project is operating. This information will provide them with real-time knowledge of the number of opened DMPs, the number of users and views, the number of documents entered into the system, the level of information sharing, the load on the servers, incidents detected, etc, to enable rapid responses to any faults and above all, to anticipate how the system will evolve in order to better support it.

Start date of each sub-project:

The four modules were started in March 2010.

End date of each sub-project:

1. DMP version 1: end of 2010;
2. Portal: end of 2010;
3. Support information system: end of 2010;
4. Management information system: first quarter of 2011.

Key milestones of each sub-project:

- July 2010: provision of DMP compatibility technical specifications, which will enable publishers to develop the software required to interface with the DMP;
- September 2010: provision of a development kit containing some sample code and testing tools, so that the publishers can test the software they have developed;
- November 2010: implementation of the DMP compatibility procedure, to allow publishers to attest that their software can be integrated with the DMP and that it can therefore provide a quality service for users.

What parties are involved in each sub-project?

- Directly: the ASIP-santé Project management team, the industrial chosen to develop the DMP repository, the subcontractors for project management;
- Indirectly: patients and healthcare professionals, software providers, healthcare institutions, regional health IT teams, technical platforms, etc.

Does each sub-project achieve its milestones within time and budget? Which ones did not and why not?

On-going project (no feedback yet).

Details on the health project

What parties are not directly involved in the eHealth project and how did they manage them?

Parties not directly involved are invited to working groups and/or information meetings.

Key success factors

- To provide rapidly a set of services that could provide a minimum of functionalities for field tests and adoption. The evolution and improvement of the versions could occur with the time;
- Involvement of all stakeholders, especially software suppliers by designing and communicating the overall interoperability framework in which they must comply.

Project risks

- Shift schedule;
- Difficulties in interfacing the various softwares;
- Difficulties in recovering existing medical data (from existing systems, for example in the regions);
- Change management process;
- Confidentiality issues;
- Incentives for the healthcare providers to use the DMP.

Are the services managed through a common platform?

Yes.

If a common platform exists, what are its features? Is the common platform based on a third party product or has it been developed individually?

The common platform is currently in development. Features are not all properly defined yet. A consortium led by ATOS Origin and LA POSTE will operate the platform.

Have they developed a regional/national interoperability framework? Is it mandatory to every actor?

Yes, they have developed a national interoperability platform, which is a prerequisite to connect to the DMP platform.

The framework is strongly recommended to healthcare providers and health ICT providers when medical data are exchanged outside of the DMP and it could become mandatory in the near future.

Further interesting information provided by the respondents:

- Overall project communication is done through their communication portal;
- Some agreements are signed between ASIP-Santé and national agencies (e.g. INCA, national Cancer Institute) to design their own information system and to evaluate the interface with the DMP project. Concerning the regional information systems, the “DMP amorçage” program will allow the transfer for the medical data - currently managed and stored by some regions - into the future DMP repository.

Overview and status on services of interest for the Luxembourg platform

Electronic Prescription	Decision Support	Statistics	Affiliation Control	Result Server	Shared & Distributed Patient Record
No	No	Under Dvt	Under Dvt	Under Dvt	Under Dvt

Financial information

What is the annual budget allocated to each sub-project from its conception to its implementation?

The budget for hosting the DMP1 is - for a minimum of four years, extendable by one year - 50 million euros excluding VAT (nearly 60 million euros tax included).

What is the annual budget allocated to each sub-project since its implementation (maintenance and continuous improvement)?

Not applicable yet.

What is the annual cost for adapting primary healthcare systems to the interoperability framework?

Not applicable yet.

How the budget of the project is split (e.g. costs for concept, development, tests, deployment...)?

Not applicable yet.

Who is providing the budget?

The project is fully publicly funded (Assurance Maladie).

Do the users pay for the platform and the services? Is there an affiliation or a usage fee? Is there a sponsorship from private actors of the healthcare sector?

Information not available.

Governance and legal rules information

Governance structure for the whole eHealth project

ASIP-santé is the governance structure for the overall project.

Key project decisions are taken by the management board, which is the guarantor of ASIP Santé's general policy. Its head is the president of the group, a qualified public figure appointed by the Minister for Health. All members are represented in the board. The state is represented by the three main government health bodies: the General Directorate of Health, the General Directorate of Healthcare Organization, and the Social Security Directorate. The French national health insurance fund for salaried employees and the national solidarity fund for autonomy are the two other members of the management board. The management board manages different organisations/committees, among which:

- The Ethics and Professional Conduct Council aims to assist the management board and the director. It formulates opinions and recommendations, in a fully independent manner, on questions of ethical and professional conduct relating to projects and services managed or supervised by ASIP Santé. The council produces an annual report for the management board which is also published. The council consists of representatives of healthcare profession associations, patient representatives and qualified public figures, all appointed by the management board at the suggestion of its president. It is chaired by the representative of the French Medical Association. The vice presidency is assumed by a users' representative;
- The Liaison and Cooperation Committee links up representatives of the healthcare professions with the people responsible for implementing the projects initiated by ASIP Santé. As well as representatives of healthcare profession associations, the committee's other members come from the national union of healthcare professions, specialist societies, and medical committees attached to health institutions. This committee is chaired by Michel Gagneux. He is kept informed of the group's activities and is consulted on general strategies, and projects that specifically affect the healthcare professions. The liaison and cooperation committee, along with healthcare professionals, issues advice on subjects referred to it by the director or the president of the management board;
- The ASIP Santé Conference brings together a wide variety of representatives of shared health information systems stakeholders. Information and debates ASIP Santé's general strategies, its programme of activities and the methods for successfully implementing its projects are presented;

- Subject-specific Consultation Committees have been created to explore specific subjects requiring action or discussion, and have a fixed lifespan.

Governance structure for each sub-project

A classical project team organisation with internal and external project reviews.

Governance rules of the common platform

Information not available.

Who is in charge of technically operating the platform/the service(s)?

A centralised platform is currently in development. A consortium led by ATOS Origin and LA POSTE will operate it.

Is there any incentive program to facilitate end users adoption of the services?

Calls for tenders will soon be launched by ASIP Santé to support regional initiatives, with the aim of:

- Reinforcing their organization to enable stakeholders to become more closely involved in the projects: “DMP Emergence” - first half of 2010;
- Trialling new services:
 - Healthcare office software: first half of 2010;
 - Telemedicine: first half of 2010.
- Deploying the DMP:
 - Beginning: second half of 2010.
- Rollout: first quarter of 2011.

What are the Information Security rules?

- The patients will be able to access via their Web Browser, after a strong authentication involving a username, password and a One-Time Password OTP (experimentation). They will manage the access rights to their DMP (for health professionals, health facilities) and express opposition to some access modes;
- The professionals will access through strong authentication processes (using their professional cards or electronic certificates).

Information on interoperability and standards

What technical communication standards are applied? To what extent are these standards used?

Every standards requested to exchange with DMP are detailed in a document edited by ASIP Santé (CI SIS, Cadre d'Interopérabilité des Systèmes d'information de Santé).

Overview of the proposed standards :

- Medical contents: CDA R2;
- Images: DICOM;
- Service layer: IHE XDS-b and XDM;
- Transport layer: IHE XUA;
- Certificates: x509 V3, IAS.

These standards do not only apply to the DMP exchanging modalities, but is intended to be integrated by every system exchanging healthcare related information.

What is the current status and what are the future plans concerning the adoption and implementation of technical health ICT standards?

Same as above according to the respondents.

Other

Information sources

1. Rapport d'activité 2009 de l'ASIP Santé
2. Site internet de l'ASIP Santé (<http://www.asipsante.fr>)

Main contacts

Jean-Yves Robin, CEO, GIP Asip Santé – Groupe d'Intérêt Public Agence des Systèmes d'Information Partagés de santé

Project	Plate-forme régionale Franc-Comtoise/Franche Comté regional eHealth platform
Project Owner	Groupeement de Coopération Sanitaire EMOSIST (Ensemble pour la Modernisation des Systèmes d'Information de Santé et de Télémédecine)
Country/Region	Franche Comté (France)
Current Status	In Production

General information related to the project

Is the eHealth project part of an overall healthcare delivery plan of the country/region?

Yes. Even though the first initiatives were launched opportunely, the regional healthcare policy structured them through the SROS 3 (Schéma Régional d'Organisation des Soins). An overall Information Systems delivery plan has been established between regional hospitals, GPs and existing healthcare networks. In the frame of the recent creation of the Regional Healthcare Agencies (ARS), the Franche Comté project governance will be supervised at a national level to ensure coherence between the different regional initiatives, especially regarding the use of the interoperability framework established by ASIP Santé.

Priorities of the SROS Franche Comté related to telemedicine are:

- Database (simplify and unit existing databases, improve user certification, secure information...);
- Patient identity (IdeoPass project);
- DMP (implement electronic health records accessible for regional healthcare professionals and patient).

Details on sub-projects

What sub-projects have been defined in the context of the eHealth project?

GCS Emosist ensures the project ownership of the services platform, for every actor. The Shared Health Folder (Dossier Médical Partagé) Franc-Comtois (DMP-FC) is a secured space where information about patient's care can be exchanged between healthcare professionals. DMP FC is the only one regional french HER, allowing a remote access for patient.

For each sub-project, what are the main objectives, start date, end date as well as key milestones?

At the regional plan, Franche-Comté initiative has been carried by GCS Emosist and promoted by the Regional Agency of Hospitalisation (ARH). It is part of the "eS@nté" (2000-2002) financing and of the development of care network. Since 2003, the initiative is defined by a broadband transport infrastructure linking health establishments, a regional portal, a healthcare professionals directory, an patient identification server, and network folder application.

Patients informations included in health networks are exchanged between speciality folders and a minimum-shared medical folder which contains administrative data, past history, on-going treatments.

A second version of the platform is the framework of important structuring projects and in development since 2007-2008, such as a shared medical folder with a patient access, financed by ARH and the GIP DMP (Mutualisation of two patient folder applications in a ASP mode: Millenium de Cerner for 6 health establishments, and a PSI of ASC2i for 13 other health establishments).

Since december 2008, Franche-Comté region received the National Commission of Informatics and Liberties (CNIL) agreement on proposing personal folders to the patients. This project could realise thanks to the regional platform set since 2002.

What parties are involved in each sub-project?

Information not available

Does each sub-project achieve its milestones within time and budget? Which ones did not and why not?

Information not available

Details on the health project

What parties are not directly involved in the eHealth project and how did they manage them?

Information not available

Key success factors

- Financial participation of the ARH;
- Presence of the project in the Information System section of the Regional Scheme of Health Organisation (SROS);
- Strong and centralised project ownership within GCS Emosist frame: the constitution of a Group for Health Cooperation (GCS) allowed regional professionals participation and was a main asset for the project's development;
- The promotion of projects mutualisation in the hospital sector aimed at enhancing the development of the hospital information system, to save money and time and to initiate a procedure in phase with the implementation of health territories (shared infrastructure, constitution of a regional project ownership, definition of an Information System common to health networks in relation with the constitution of regional references);
- A visible implication of the governance;
- A separation of the exploitation of the informatic structure (entrusted with an operating industrial) from the exploitation of the information which must stay under the supervision of the public authority.

Project risks

Informatic teams within GCS Emosist have both AMOA functions and MOE services. Most difficulties are:

- Tension on informatics skills (labour market);
- Limitation of budget resources for the structures;
- Non standard informatic solutions.

Are the services managed through a common platform?

Yes, Emosist-Fc owns two hosting data centers in Franche-Comté, used by health establishments members of the GCS (Millenium, Cerner, PSI, Solware (ex-ASC2i) patient folder users).

The servers also host data present in the regional health networks, in the experimental DMP, in regional imaging network applications dedicated to radiologists, and in the telemedicine software platform developed by Covalia.

Emosist is the transmitting of a call in relation with the project ownership in Franche-Comté of a picture archiving and communication system of medical imaging (PACS), gained early may by McKesson and HP. The hoster could leverage 500 000 exams per year.

If a common platform exists, what are its features? Is the common platform based on a third party product or has it been developed individually?

The platform is a third party based product.

Have they developed a regional/national interoperability framework? Is it mandatory to every actor?

There is not strictly speaking part an interoperable framework. However solutions have been implemented to ensure information exchange at regional level, such as:

- Connecting patient identities: Identity Server - IdeoPass* (developed by the SQLI company) - has been implemented to host 1 million patients identities;
- Connecting the DMP with existing healthcare professionals' solutions has been facilitated by the setting up of connectors. XDS profiles have been implemented (XDS infrastructure were completed with three pre-requisites: patient identity management (PIX), healthcare professionals directory and authentication/authorisation functionalities);
- Identifying health professionals through directories.

Overview and status on services of interest for the Luxembourg platform

Electronic Prescription	Decision Support	Statistics	Affiliation Control	Result Server	Shared & Distributed Patient Record
Yes	Yes	Yes	Yes	Yes	Yes

Financial information

What is the annual budget allocated to each sub-project from its conception to its implementation?

Information not available.

What is the annual budget allocated to each sub-project since its implementation (maintenance and continuous improvement)?

For DMP, the cost is less than 1 euro per patient and per year.

What is the annual cost for adapting primary healthcare systems to the interoperability framework?

Information not available.

How the budget of the project is split (e.g. costs for concept, development, tests, deployment...)?

Information not available.

Who is providing the budget?

Main sources of funding are the ARH (most important), the GIP DMP, and the URCAM (Group of Regional health insurance), less important.

Do the users pay for the platform and the services? Is there an affiliation or a usage fee? Is there a sponsorship from private actors of the healthcare sector?

Information not available.

Governance and legal rules information

Governance structure for the whole eHealth project

The regional project owner structure (GCS Emosist) has both strategic and operating roles.

Governance structure for each sub-project

Information not available.

Governance rules of the common platform

Information not available.

Who is in charge of technically operating the platform/the service(s)?

GCS Emosist is in charge of operating the system.

21 staff work in the GCS:

- Functioning of Emosist, for all the projects: 6 FTE;
- Skill components (Health establishments, ambulatory care and networks): 7 FTE;
- Transversal components (DMP, directories, identity attentiveness): 4 FTE;
- Infrastructure components: 4 FTE.

The mutualisation of the resources could be an improvement axis for the MOA functioning:

- Assistance request to MOA from other regions or at a national level;
- Need of technical expertise;
- Share of experience.

Is there any incentive program to facilitate end users adoption of the services?

Information not available.

What are the Information Security rules?

Information not available.

Information on interoperability and standards

What technical communication standards are applied? To what extent are these standards used?

Information not available.

What is the current status and what are the future plans concerning the adoption and implementation of technical health ICT standards?

Information not available.

Other

Information sources

1. Expérience Plate-forme régionale Franc-Comtoise: Management et structure régionale de coopération, Journée de la sécurité, Rennes, 3 juin 2009
2. Présentation du projet régional Franche Comté sur le site de l'ASIP Santé, www.asipSante.fr/index.php?option=com_content&task=view&id=278&Itemid=232 (26/05/2010)
3. Etat des lieux et perspectives des Plate-formes régionales de services, ASIP Santé, 2009

Main contacts

Bruno Grossin, CEO, GCS Emosist - Groupement de Coopération Sanitaire Emosist

Hervé Barge, Telemedicine Policy officer, ARS – Agence Régionale de Santé Franche Comté



Project	Plate-forme régionale Rhône Alpes/SIS-RA platform and its services (DPPR, PEPS, Trajectoire, ...)
Project Owner	GCS (groupement de coopération sanitaire) de la plateforme régionale de télésanté SIS-RA (Système d'information de santé de la région Rhône-Alpes)
Country/Region	Rhône-Alpes (France)
Current Status	In Production

General information related to the project

Is the eHealth project part of an overall healthcare delivery plan of the country/region?

Yes:

- At a regional level, the SIS-RA platform and its services have been defined in the SROS 3 (*Schéma Régional d'Organisation Sanitaire 2005/2010*) and the future PRS (*Plan Régional de Santé*) in its IT section;
- At a national level, some of the best practices developed in Rhône-Alpes like the cancer plan have been reused in other regions with coordination and support from the GCS SIS-RA.

Details on sub-projects

What sub-projects have been defined in the context of the eHealth project?

The SIS-RA platform hosts many services which intercat through the platform:

- DPPR (*Dossier Patient Partagé et Réparti/Shared and Distributed Patient Record*);
- STIC (*Serveur télématique d'identification communautaire*);
- PEPS (*Plateforme d'échanges entre les professionnels de santé*);
- TRAJECTOIRE;
- Cancer research centres;
- Digital Medical images;
- SPIRAL.

For each sub-project, what are the main objectives, start date, end date as well as key milestones?

The SIS-RA platform was founded to take over the operational project strategy including the implementation of tools and the connection of regional health structures, networks and physicians.

In its history, the platform has undergone many steps:

- 1995: first attempt with the Oncora network - implementation of a shared cancer file;
- 1999: the project management agreed to review it entirely;

- 2000: 3-days seminar where they agreed to outsource data hosting, appoint a project manager in each hospital implied in the project and to better interact with the French DMP project;
- 2002: Launch of PEPS and connexion with DPPR (cf. below);
- 2004: Publication of the SROS where every stakeholder of the project is introduced, creation of a Steering Committee and signature of a project agreement.

Since 2002, many services have been implemented interacting with each other through the platform:

- The DPPR results from a regional initiative in Rhône-Alpes to create a region-wide federated patient health record using existing EHR systems or other personal health data sources. It is made accessible to authorised hospital-based or privately practising health professionals. The DPPR tool was specifically designed as a solution to share clinical information about multiple conditions between healthcare providers. Health professionals who concur to deliver healthcare to a patient can now identify, view and download patient related clinical information which can be stored in several remotely distributed data sources (hospitals, integrated networks, private surgeries, etc). Moreover, patients have permanent access to their own data. More than 450 000 records were managed by SIS-RA at the end of 2009. The objectives for the end of the year 2010 are to include 1 050 GPs (810 at the end of 2009) and 85 sources of information/healthcare organisations (74 at the end of 2009). Another objective of the DPPR tool is to manage one million patient files before the end of 2010;
- The STIC is a persistent regional patient ID server designed to help match the different identifiers used for a given patient in different systems. The system went live in April 2004. Broadly speaking, it is based on the comparison (by scoring and search for potential errors, such as character inversion) of five traits, namely, name, first name, gender, date of birth and post code of place of birth. Following a set of specifications for patient identification adopted at the regional level (*Charte régionale d'identification*), 2 000 000 patients were identified in the STIC by Summer 2010;
- The PEPS is a system designed for secured data communication and sharing between healthcare professionals in clinical networks. The PEPS has been developed to fulfil three functions:
 - PEPS Réseaux (Networks) collects and centrally stores any structured clinical information that is shared between health professionals within integrated clinical networks. These networks have been established in 1996 with a law on health networks, enforcing communication between hospitals and primary care, focusing on particular diseases. There are 25 different networks including: cancer/oncology, diabetes, paediatric obesity, pain, heart failure, gerontology, antenatal diagnosis, and emergency services. The pioneering network for the DPPR and SISRA, ONCORA, is the cancer network. While their cooperation was initially limited to the organisational level, the networks now use common electronic records and share data. PEPS additionally allows for the retrieval of statistical information to assess the activities of those networks;

- PEPS Hébergement (Host) connects those healthcare facilities that do not use a consistent EHR system yet. PEPS Host also serves those facilities that have systems incompatible to STIC, or cannot directly connect their system to DPPR for another reason. PEPS allows these facilities to nevertheless safely share and transfer patient information to DPPR and access it;
- Hospitals that have no clinical information system implemented yet store some medical reports, such as discharge and referral letters in a simple text format. These files are uploaded to PEPS, which stores them and provides access to them through STIC and DPPR. Some of these healthcare facilities use PEPS Host as a kind of outsourced clinical information system by accessing their own records via DPPR rather than searching for the original printed copy;
- PEPS Ville is a relatively small database that collects clinical data from GPs' EHR systems. GPs can upload their patient information for overnight access. PEPS allows them to provide their data around-the-clock without their information systems working continuously.
- Trajectoire is a market place for hospital beds and supports the organisation of follow-up treatment. Since 2008, all hospitals need to report their free capacity daily. For those facilities connected to Trajectoire, an order screen summarises the requests, allows for manual comments to be added. A request is constructed subject to conditions defined by the referring hospital. The request is matched to the available beds and sent out to the respective facilities. Once a receiving facility confirms that it accepts the patient, all other requests concerning this patient are cancelled. Trajectoire allows:
 - To identify facilities close to his home or that of his family;
 - To manage electronically the whole patient placement process;
 - To provide the regional healthcare authorities with patient orientation data in order to better understand patient flows in hospitals.
- Cancer research centres are currently used 7 000 times. This number is still growing;
- Digital Medical images;
- SPIRAL is an application connecting the different emergency actors.

What parties are involved in each sub-project?

The GCS SISRA (Groupement de Coopération Sanitaire), which is composed of:

- The three University hospitals in the region: Lyon, Grenoble and Saint-Etienne;
- The Cancer Centre Léon Bérard, also acting as a link to the regional cancer network ONCORA, which connects more than 50 hospitals in the region;
- The *Association pour le Développement du Système d'Information Médical Libéral* (Association for the development of the medical information system for the privately practicing physicians in the Rhône-Alpes region) (ADSIMIL).

SISRA is influenced directly by four political bodies, which were involved in establishing the regional health information network back in 1990s:

- ARH (*Agence Régionale d'Hospitalisation*), the regional representative of the Health Ministry and in charge of coordinating all hospitals in the region;
- URCAM (*Union Régionale des Caisses d'Assurance Maladie*), the social security body, responsible for care outside of hospitals;
- URML (*Union Régionale des Médecins Libéraux*), regional unions of self-employed doctors;
- The Regional Council, which is responsible for prevention. The Council functions as mediator between the different stakeholders.

Does each sub-project achieve its milestones within time and budget? Which ones did not and why not?

Each sub-project has encountered issues at one time of its lifecycle. Main issues are:

- Resistance to change (mainly from the patient and GPs);
- Complexity of the deployment;
- Necessity to change the overall strategy due to feedback received from GPs or patient, or because of new and more efficient technologies;
- Complex governance;
- The SIS-RA project manager advises us to be reactive concerning the program strategy and favour short-term projects (3 to 5 years) to long-term ones. For example, phase 1: definition and conception (2 years max), phase 2: pilot (around a year), phase 3: deployment among every project stakeholders (2 years).

Details on the health project

What parties are not directly involved in the eHealth project and how did they manage them?

- Patients' action group should be more represented in the GCS (Group for Health Cooperation) and less in the Steering Committee;
- Software vendors are also not directly involved in the eHealth program. Specific meetings are organised with them on a regular basis.

Key success factors

- Use a Bottom-Up model: projects should be owned and launched by the healthcare professionals to motivate them from the beginning and ensure the services newly implemented are pertinent;
- Communication: people are the key to success. However, when communicating, you should keep an eye on political stakes.

Project risks

- Data protection;
- Possibility of the future healthcare technologies to significantly influence the current strategy;
- Creation of services which are not needed or which do not correspond to stakeholders' requirements.

Are the services managed through a common platform?

Yes.

If a common platform exists, what are its features? Is the common platform based on a third party product or has it been developed individually?

The platform, its exploitation and project management are outsourced. Only the governance is managed in-house. The platform takes over the operational project strategy including the implementation of tools and the connection of regional health structures, networks and physicians. The platform is based on a third party product.

Have they developed a regional/national interoperability framework? Is it mandatory to every actor?

A regional interoperability framework has been implemented and is recommended to every actor. To install it the region:

- Each hospital has to invest 15 000 Euros to connect to the platform (including 5 000 Euros for the hardware);
- GPs received financial help to do so and had the possibility to benefit from a hotline provided by software editors.

Overview and status on services of interest for the Luxembourg platform

Electronic Prescription	Decision Support	Statistics	Affiliation Control	Result Server	Shared & Distributed Patient Record
No	No	No	No	Yes	Yes

Financial information

What is the annual budget allocated to each sub-project from its conception to its implementation?

Since the beginning of the project, 19 M€ have been spent on the SIS-RA program. The Annual budget is currently of 3,5 M€:



- Overheads represent 0,15 M€, whereas 3 485 M€ are allocated to the different projects;
- Breakdown in the budget allocated to projects in 2010:
 - 1/3 to develop new projects or to update implemented ones;
 - 1/3 operating costs;
 - 1/3 change management costs.
 (to compare, 80 % of the budget allocated to projects were conception costs)

What is the annual budget allocated to each sub-project since its implementation (maintenance and continuous improvement)?

Information not available yet.

What is the annual cost for adapting primary healthcare systems to the interoperability framework?

Information not available yet.

How the budget of the project is split (e.g. costs for concept, development, tests, deployment...)?

Please see above.

Who is providing the budget?

Information not available yet.

Do the users pay for the platform and the services? Is there an affiliation or a usage fee? Is there a sponsorship from private actors of the healthcare sector?

Some of the services are not free: e.g. TRAJECTOIRE costs 30 000 Euros to each member.

Governance and legal rules information

Governance structure for the whole eHealth project

Two governance layers:

- A political layer composed of the ARS (Regional Health Agencies), the Regional Council, the URML (GPs Regional Action Group) and the Patients' action group, meeting each other on a regular basis during Steering Committees;
- An operating layer: the GCS SISRA, which decides on the pilot establishments for each project. The GCS SISRA is composed of the Organisation and Information Systems Director from the 5 founder establishments.

Governance structure for each sub-project



Information not available yet.

Governance rules of the common platform

Information not available yet.

Who is in charge of technically operating the platform/the service(s)?

Information not available yet.

Is there any incentive program to facilitate end users adoption of the services?

Information not available yet.

What are the Information Security rules?

Information not available yet.

Information on interoperability and standards

What technical communication standards are applied? To what extent are these standards used?

Information not available yet.

What is the current status and what are the future plans concerning the adoption and implementation of technical health ICT standards?

Information not available yet.

Other

Information sources

1. Plateforme SIS-RA - Guide pour les établissements de Santé
2. Plateforme de téléSanté SIS-RA: fréquentation en hausse, site TICsanté, www.ticSante.com/show.php?page=story&id=444 (26/05/2010)
3. Etat des lieux et perspectives des Plate-formes régionales de services, ASIP Santé, 2009
3. Présentation du projet régional Rhône Alpes sur le suite de l'ASIP Santé, www.asipSante.fr/index.php?option=com_content&task=view&id=278&Itemid=232 (consulté le 26/05/2010)
4. Site web de l'Institut International Recherche Systèmes d'information Santé et télé-médecine, www.iisist.org (01/06/2010)

Main contacts

Thierry Durand, Administrator, GCS –
Groupement de Coopération Sanitaire

Project	Elektronische Gesundheitsakte - ELGA (Electronic Health Record Initiative)
Project Owner	ELGA GmbH
Country/Region	Austria
Current Status	Detailed concept phase finished 2008, currently implementation.

General information related to the project

Is the eHealth project part of an overall healthcare delivery plan of the country/region?

Yes.

Details on sub-projects

What sub-projects have been defined in the context of the eHealth project?

- Master Patient Index (MPI);
- Health Care Professional (HCP) Index;
- Document register;
- Portal;
- Security framework;
- Harmonization of documents (currently: discharge information, lab results, document register, radiology results, electronic medication).

For each sub-project, what are the main objectives, start date, end date as well as key milestones?

Please refer to section "Services provided by the common platform if applicable" for summaries. Detailed plans are currently in development.

What parties are involved in each sub-project?

All directly concerned parties are involved. For example:

- Concerning the HCP-Index and the security framework the medical, dentists' and pharmacies' associations, the states (*Bundesländer*) on the behalf of the hospitals and the Ministry of Health are involved;
- Concerning the MPI patients' representatives, the public social service and participating healthcare providers such as physicians and pharmacists were involved;
- Concerning the harmonization of documents also resident doctors and software providers are included.

Does each sub-project achieve its milestones within time and budget? Which ones did not and why not?

All sub-projects are currently on schedule and in budget. The sub-projects for the MPI, the HCP index and the electronic medication are ongoing, the selection for the document register is currently in progress. The portal which is developed by the Ministry of Health has reached its first milestone (provision of validated patient independent health information). Most of the document harmonization tasks (discharge information, lab results and radiology results) are currently in piloting state. Concerning the security framework, the governance rules are currently in development. Project start for the actual implementation of security and auditing functions will be in Q3 2010.

Details on the health project

What parties are not directly involved in the eHealth project and how did they manage them?

Due to legal regulations the following stakeholders will not have access to patient related data and will - if at all - only be marginally involved into the project:

- Public health officers;
- Company physicians;
- Funding entities of healthcare services (public health insurances).

Key success factors

- Security;
- Availability;
- Performance;
- Usability;
- Trust.

Project risks

A risk analysis has been conducted for each sub-project. However, they are currently being revised and consolidated and are hence not available yet.

Are the services managed through a common platform?

Yes.

If a common platform exists, what are its features? Is the common platform based on a third party product or has it been developed individually?

Based on international standards (see 20 and 21) an architecture was designed which has been adjusted according to Austrian circumstances.



The ELGA organization only provides technical and architectural concepts as well as program/project management and marketing. All technical implementation aspects are delegated to corresponding sub-projects. Each sub-project is allowed a high degree of self-governance, ranging from selection of 3rd party products to individual software development.

Have they developed a regional/national interoperability framework? Is it mandatory to every actor?

Yes. A corresponding law is currently in preparation. It is expected that a participation in the ELGA system will be mandatory for each healthcare provider due to the patients' legal rights to participate in his/her medical processes.

Overview and status on services of interest for the Luxembourg platform

Electronic Prescription	Decision Support	Statistics	Affiliation Control	Result Server	Shared & Distributed Patient Record
No	No	No	No	Under Dvt	Under Dvt

Financial information

What is the annual budget allocated to each sub-project from its conception to its implementation?

Allocation currently not possible, because the funding/budget has been confirmed only recently and the overall project planning is currently ongoing.

What is the annual budget allocated to each sub-project since its implementation (maintenance and continuous improvement)?

Cannot be depicted because an evolution of software releases is expected due to the early definition of common standards.

What is the annual cost for adapting primary healthcare systems to the interoperability framework?

It is expected that vast parts of connectivity features will be part of the commercially available 3rd party software products. As the vendors drive individual sales policies the costs the costs adapting primary healthcare systems to the interoperability framework cannot be depicted.

How the budget of the project is split (e.g. costs for concept, development, tests, deployment...)?

No, because the funding/budget has been confirmed only recently and the overall project planning is currently ongoing.



Who is providing the budget?

The budget is funded as follows: 1/3 by Republic of Austria, 1/3 by the 9 federal states, 1/3 by public social insurance system.

Do the users pay for the platform and the services? Is there an affiliation or a usage fee? Is there a sponsorship from private actors of the healthcare sector?

No.

Governance and legal rules information**Governance structure for the whole eHealth project**

By means of a strong association (ELGA GmbH) the associated parties Republic of Austria, federal states (Bundesländer) and the public social insurance control the progress and objectives together with the affected stakeholders including patients' representatives.

Governance structure for each sub-project

The same as for the whole eHealth project.

Governance rules of the common platform

Governance rules are currently in development, core results are expected in October 2010. The rules will be based on ISO 2700x and will affect the implementation of the security framework.

Who is in charge of technically operating the platform/the service(s)?

This will be discussed during the implementation and integration of the different components. As mentioned, currently all technical aspects are delegated to different sub projects.

Is there any incentive program to facilitate end users adoption of the services?

The only incentive is a content wise improvement of information availability and the provision of central national server. Monetary bonuses are not foreseen.

What are the Information Security rules?

Security rules are currently in development and can therefore not be depicted yet.

Information on interoperability and standards

What technical communication standards are applied? To what extent are these standards used?

- Base line: IHE standards;
- Documents: CDA, preferably level 2 or higher;
- Radiology images: DICOM v.2 or higher;
- Security: OASIS (e.g. xACML);
- Structured documentation: LOINC and ICD.

What is the current status and what are the future plans concerning the adoption and implementation of technical health ICT standards?

- National harmonization of particular documents such as discharge information for inpatient cases, radiology results, lab results, e-medication;
- Development of information exchange based on IHE profiles;
- Approximation of Austria's system architecture towards the European specification concerning epSOS.

Other

Information sources

1. Austrian government programme for the XXIII. Legislation period, www.bka.gv.at
 2. www.arge-elga.at/fileadmin/user_upload/uploads/download_Papers/Arge_Papers/ELGA_Umsetzung_Phase1__V2.0.pdf (01/06/2010)
 3. www.arge-elga.at/index.php?id=13 (01/06/2010)
 4. www.arge-elga.at/index.php?id=27 (01/06/2010)
- Additional sources:
- www.arge-elga.at/
 - www.bmgfj.gv.at/cms/site/thema.html?channel=CH0709
 - www.initiative-elga.at

Main contacts

Dr. Martin Hurch, ELGA GmbH

Project	Elektronische Patientenakten - EPA 2015 (NRW)
Project Owner	Ministry of Work, Health and Social Affairs, North Rhine-Westphalia, Germany in cooperation with Zentrum für Telematik im Gesundheitswesen - ZTG (Centre for Telematics in Healthcare)
Country/Region	Land Nordrhein-Westfalen (State North Rhine-Westphalia), Germany
Current Status	Implementation, 2 out of 3 stages complete

General information related to the project

Is the eHealth project part of an overall healthcare delivery plan of the country/region?

The project is a part of eGesundheit.nrw, the telematics initiative of the government of North Rhine-Westphalia (see www.egesundheit.nrw.de). With the initiative eGesundheit.nrw, the Ministry of Work, Health and Social Affairs has created a family brand, that bundles a series of activities, projects and initiatives related to the eHealth topic.

This includes in particular the development of standards and guidelines for the interoperability of institution-spanning electronic patient records, the development of distribution models and operational scenarios for electronic health professional cards as well as the trial and the introduction of electronic health insurance cards including associated applications in the test region Bochum-Essen.

The project is rounded off by training options and consulting offers as well as internet portals on health specific topics.

The objective of eGesundheit.nrw is the development of a broad telematics infrastructure for healthcare which integrates outpatient and inpatient facilities, enables new forms of services and telematical applications to leverage quality and efficiency in medical treatment.

Since November 2006 the "Informationszentrum Telematik im Gesundheitswesen NRW" (Information Center for Telematics in Healthcare) in Bochum is available for the practical presentation of currently used solutions or for solutions which are about to be introduced (including eGesundheit.nrw).

The projects of eGesundheit.nrw are relevant across the state borders and set standards and guidelines for telematics activities at federal level.

Details on sub-projects

What sub-projects have been defined in the context of the eHealth project?

The project "EGA.nrw – Electronic Health Records" is a spin-off of the EPA 2015-project.

For each sub-project, what are the main objectives, start date, end date as well as key milestones?

Based on the project initiative EPA 2015, an additional project regarding the utilization of electronic health records was introduced at the end of 2007. This project was mainly encouraged by German health insurances. Besides other forms of patient records, such files administered by the patient himself are already in place.

Objectives of the project EGA:

- Considerations of aspects of acceptance of electronic health records against the background of a task appropriate use of such files by the patient and his medical care provider;
- Consideration of aspects of utilization of electronic health records especially in consideration of the limitation to electronic patient records;
- Implementation especially with regard to the interoperability to systems of payers as well as providers (PVS);
- Investigation of specific aspects of data security referring to special application of an EGA.

Milestones:

- Phase 1: Determination of pilot scenarios;
- Phase 2: Determination of the organizational framework for the field test;
- Phase 3: Execution of the field test;
- Phase 4: Evaluation of the project results.

What parties are involved in each sub-project?

The project is implemented by an interdisciplinary team of experts with an economic, scientific or healthcare institutional background.

Industry (examples):

- Agfa Health Care, GWI AG;
- Cisco Systems GmbH;
- CompuGROUP Holding;
- HL7 Benutzergruppe in Deutschland e.V.;
- IBM Deutschland GmbH;
- InterComponentWare AG;
- iSOFT Deutschland GmbH;
- Microsoft Deutschland GmbH;
- Oracle Deutschland GmbH;
- Siemens AG;
- T-Systems International GmbH;
- VHITG - Verband der Hersteller von IT-Lösungen für das Gesundheitswesen, e.V.

Payer and practitioner organisations, government (examples):

- Ärztekammer Nordrhein;
- Ärztekammer Westfalen-Lippe;
- AOK Rheinland Hamburg;
- BARMER GEK;
- DKV Deutsche Krankenversicherung AG;
- Knappschaft Bahn See;
- KVNO - Kassenärztliche Vereinigung Nordrhein;
- Ministerium für Arbeit, Gesundheit und Soziales NRW.

Science:

- Fachhochschule Dortmund;
- Fraunhofer ISST;
- Institut für Medizinische Informatik, Biometrie und Epidemiologie, Universitätsklinikum Essen.

Does each sub-project achieve its milestones within time and budget? Which ones did not and why not?

Yes.

Details on the health project

What parties are not directly involved in the eHealth project and how did they manage them?

All relevant parties are represented in this project (e.g. industry, science, politics). EPA 2015 has a high degree of cross-linking.

Key success factors

Consented specifications for the interoperability, implementation according to objectives, acceptance with doctors and citizens, data protection mechanisms, insuring information related self-determination, realistic field tests.

Project risks

The main risk is the voluntariness of the participation of the involved project partners. The motivation for the participation is based on the expected benefit and the future business opportunities of the parties concerned. Furthermore numerous participants have to be consented which causes a complex process of coordination.

A dedicated risk analysis is not available.

Are the services managed through a common platform?

A platform is not being developed within the EPA 2015 project. The project deals with the development of communication standards for patient files. Afterwards the standards should be used by the platforms to exchange data cross-sectional.

If a common platform exists, what are its features? Is the common platform based on a third party product or has it been developed individually?

Omitted at this point.

Have they developed a regional/national interoperability framework? Is it mandatory to every actor?

The EPA 2015 project develops suitable specifications that should apply nationwide. However, there is no obligation to use EPA 2015 standards. The motivation for the implementation by industry stakeholders is expected to result from the industry's own interest.

Overview and status on services of interest for the Luxembourg platform

Electronic Prescription	Decision Support	Statistics	Affiliation Control	Result Server	Shared & Distributed Patient Record
No	No	No	No	No	No

Financial information

What is the annual budget allocated to each sub-project from its conception to its implementation?

Information not available.

What is the annual budget allocated to each sub-project since its implementation (maintenance and continuous improvement)?

Information not available.

What is the annual cost for adapting primary healthcare systems to the interoperability framework?

Information not available.

How the budget of the project is split (e.g. costs for concept, development, tests, deployment...)?

Information not available.

Who is providing the budget?

As for the EPA 2015 project, the EGA project is financed by the Ministry of Health of NRW and with its own resources.

Do the users pay for the platform and the services? Is there an affiliation or a usage fee? Is there a sponsorship from private actors of the healthcare sector?

Information not available.

Governance and regal rules information**Governance structure for the whole eHealth project**

The government of NRW is responsible for the project EPA 2015. ZTG GmbH is assigned with the project management.

Governance structure for each sub-project

The same as EPA 2015.

Governance rules of the common platform

Omitted at this point.

Who is in charge of technically operating the platform/the service(s)?

Omitted at this point.

Is there any incentive program to facilitate end users adoption of the services?

Omitted (EPA 2015 develops specifications and definitions/specifications of interoperability that can be adopted by service providers later).

What are the Information Security rules?

Non-disclosure agreement to ensure that the participating parties have an advantage (knowledge edge) through the participation and are thereby motivated to participate.

Information on interoperability and standards

What technical communication standards are applied? To what extent are these standards used?

Different European and international standards were analyzed. The meta data attributes were extracted from the standards for the message types respectively the clinical documents (HL7 CDA Rel. 2, VHITG-Arztbrief, HL 7 v2 MDM Nachrichten, IHE XDS) and were opposed in a cross reference.

International standards for reference architectures respectively data models.

The standards listed above were analyzed and opposed with regard to the containing model aspects. Also the present results from the project "eFallakte" are included in the analysis.

As a result a reference scheme has been developed that is closely aligned with the structures of the RIM of the HL7 group. This scheme is less abstract in many parts and includes additional opportunities for the aggregation of record objects. It was inherited from the ISO/CEN/DIN 13606 standard and the openEHR model which are considered "Best of Breed" approaches.

The considered models and standards are partially highly generical, hence an implementation without appropriate interpretation is hardly possible. Therefore the project specifications for the models were specialized in greater detail. Maxim for the development of the reference scheme is practicability, understandability and implementability by avoiding immoderately generic approaches.

What is the current status and what are the future plans concerning the adoption and implementation of technical health ICT standards?

- 1) Implementation of pilot scenarios based on a presentation platform;
- 2) Further induction of IHE/XDS as technical transport platform.

Other

Information sources

www.egesundheit.nrw.de/content/elektronische_patientenakten/index_ger.html

Main contacts

Christian Suellmann, Project Manager,
ZTG - Zentrum für Telematik im
Gesundheitswesen GmbH

Project	Digital Health Record in Estonia
Project Owner	Estonian Ministry of Social Affairs
Country/Region	Estonia
Current Status	In Production

General information related to the project

Is the eHealth project part of an overall healthcare delivery plan of the country/region?

It is part of the Estonian Information Society Strategy 2013, which is a sectoral development plan, setting out the general framework, objectives and respective action fields for the broad employment of ICT in the development of knowledge-based economy and society in Estonia in 2007-2013.

Details on sub-projects

What sub-projects have been defined in the context of the eHealth project?

Primarily there were 4 sub-projects: Electronic Health Record, Digital Image, Digital Registration and Digital Prescription (the last mentioned is lead by the Estonian Health Insurance Fund). The EHR, Digital Image and Digital Registration projects were launched in 2005. The result of implementing eHealth projects is the Estonian health information system that was launched on December 17th 2008. Today we are developing additional functionalities for central EHR platform – decision support, e-paramedics, e-laboratory, e-schoolhealth and personal healthrecord.

For each sub-project, what are the main objectives, start date, end date as well as key milestones?

For new projects the exact timetable and budget is not set yet.

DECISION SUPPORT - Finland's clinical decision support system DUODECIM. As a result of the project an additional module (EBMeDS: Evidence-Based Medicine electronic Decision Support) will be installed to the central system. This enables to create service prototypes that will be tested together with the solution with at least two health care providers.

E-PARAMEDICS - Integrates digital data resulting from ambulance crew's work with Estonian Health Information System. E-paramedics information system helps to increase quality of emergency care service as it allows paramedics to access patient's previous medical information. It also offers a reliable monitoring and statistics on ambulance crew's work.

E-LAB - LOINC classifier and RELMA programme (device for using LOINC standard) implementation in medical laboratories' work with the purpose of creating a standard for laboratory analyses.

E-SCHOOLHEALTH - Data on children's health monitoring and immunization carried out in schools will be digitally forwarded to Estonian Health Information System to facilitate better information exchange between family doctors and school doctors.

PERSONAL HEALTH RECORD - During this project Patient's Portal will be transferred to a new platform and a number of new functionalities will be added to it:

- Entering medical data;
- Communicating with third party (declarations of intention, interfaces);
- Immunisation passport;
- Automatically generated certificates;
- Decision support and self-service based health check.

What parties are involved in each sub-project?

Two piloting hospitals (East Tallinn Central Hospital and North-Estonia Regional Hospital) and General practitioners (Järveotsa Perearstikeskus) are involved in the sub-projects. While developing the Patient's Portal we invited voluntary beta testers to give their opinion on the functionalities. In the e-Paramedics project also experts of Paramedics are involved.

Does each sub-project achieve its milestones within time and budget? Which ones did not and why not?

Time and budget lines are very strict since the developments are highly dependent on EU Structural Funds subsidizing. No conclusion can be drawn at the moment since the project is still in development.

Details on the health project

What parties are not directly involved in the eHealth project and how did they manage them?

We think it is important to also involve medical software developers so that they could take into account the forthcoming changes in technical standards and other requirements. For this we have organised regular meetings four times a year to share new information and ask for their feedback.

Key success factors

Most important success factor was involving the medical staff and the society from the beginning, so that they would be aware of the changes to come and feel motivated to go along with it. For this we organized many public discussions and round-tables with stakeholders, asked the professional's opinions and cooperated as much as possible. Another key factor was the legislation aspect - to regulate the access to data, data sending obligations for the health care providers etc. Also the opt-in vs. opt-out policy for the patients in which case Estonia decided to use the opt-out approach.

Project risks

On the side of technological risks the biggest risk was seen in the negative public opinion. The risk analysis is unfortunately in Estonian.

Are the services managed through a common platform?

Yes.

If a common platform exists, what are its features? Is the common platform based on a third party product or has it been developed individually?

The state has established and maintains a nationwide technical infrastructure called the X-road platform. X-road is a platform independent standard interface for secure data processing, connection of all Estonian public sector databases and information exchange. Other IT-solutions such as digital signatures and ID-card authentication are recent innovations, and their use is comprehensively regulated by national law. These developments are the bases of implementing sectoral policies like creating country wide health information system.

Have they developed a regional/national interoperability framework? Is it mandatory to every actor?

A critical aspect of establishing such a system has always been a clear definition of rights and obligations. As EHR forms part of the state information system, the content of the centrally stored information was decided upon and fixed in statutory law (for further information, see The Health Services Organisation Act and Associated Acts Amendment Act, §59¹ section 1, available online at [<https://www.riigiteataja.ee/ert/act.jsp?id=12909773>]). In essence, the EHR is a nationwide framework with a standardised central information exchange function. However, EHR does not replace the in-house information system of health care providers, which supports their health service process. In other words, health care service provider organizations are responsible for creating their own information systems. In order to interface with the central system i.e. to send data to and obtain information from other health care institutions, each local information system must be updated and modified in a way that enables data exchange according to the technical specifications set by the system's administrator.

The national interoperability framework is mandatory to every actor.

Overview and status on services of interest for the Luxembourg platform

Electronic Prescription	Decision Support	Statistics	Affiliation Control	Result Server	Shared & Distributed Patient Record
Yes	Under Dvt	Under Dvt	Yes	Under Dvt	Yes

Financial information**What is the annual budget allocated to each sub-project from its conception to its implementation?**

- Electronic Health Record 1,6 M€;
- Digital Registration 0,2 M€;
- Digital Images 0,2 M€;
- Digital Prescription 0,24 M€.

What is the annual budget allocated to each sub-project since its implementation (maintenance and continuous improvement)?

All the new projects are part of the development of EHR functionalities and for this the annual budget in 2010 is 175 000 €. The budget for EHR maintenance is approximately 1,05 mln€. Maintenance costs include the expenses incurred in sustaining the main services of the Estonian eHealth Foundation as well as the development of EHR functionality and its general administration.

What is the annual cost for adapting primary healthcare systems to the interoperability framework?

We do not have the exact number since it depends largely about the previous ICT-capacity of health care providers which can be very different, but it is estimated that 65 % of investment costs are borne by health care providers.

How the budget of the project is split (e.g. costs for concept, development, tests, deployment...)?

The structure of the costs is not stabilised yet since the system was launched in the end of 2008 and the implementation- and development phase will continue until 2013. From 2005-2008 all the costs were bounded with development.

Who is providing the budget?

The government.

Do the users pay for the platform and the services? Is there an affiliation or a usage fee? Is there a sponsorship from private actors of the healthcare sector?

At the moment the users do not have to pay anything. This will probably change in the future but not before 2012.

Governance and legal rules information

Governance structure for the whole eHealth project

The Ministry of Social Affairs initiated the projects, partially financed by the EU Structural Funds, and played the coordinating and directing role in the implementation process. It is important to note that the eHealth projects were not merely large-scale IT projects, but a partnership involving several partners with different interests and viewpoints working towards a common goal. As mentioned previously, alongside the implementation of new information technology concepts, the process included many other aspects such as medical standardisation, ethics and legislation. To ensure even more effective management of the projects, the Estonian eHealth Foundation was established in 2005 by the Ministry of Social Affairs and several other health care providers to lead the projects. Currently, the division of roles is similar to the initial phase in 2005. The Ministry of Social Affairs is responsible for the administration of the four projects as a whole, while the Estonian eHealth Foundation manages the operating system. To elaborate, the Estonian eHealth Foundation is responsible for the standardisation and development of digital medical documents, maintenance of EHR, international and scientific cooperation.

Governance structure for each sub-project

The same as above.

Governance rules of the common platform

The same governance rules apply for all eHealth projects.

Who is in charge of technically operating the platform/the service(s)?

The Estonian eHealth Foundation is in charge of the functioning of EHR central system and the Estonian Informatics Centre, which is a subdivision of the Ministry of Economic Affairs and Communications, is responsible for the infrastructure (coordination and implementation of the development of state registers, computer networks and data communication, standardisation, IT public procurement, monitoring Estonian IT situation, etc). The leading principle in designing the EHR has been to make as much use as possible of existing and functioning infrastructure and IT solutions – e.g. X-Road (<http://www.ria.ee/index.php?id27309>), the Estonian ID card and the IT systems of health care providers.

Is there any incentive program to facilitate end users adoption of the services?

No. We organized free training-programs for the end-users to learn how to use the EHR.

What are the Information Security rules?



Since all of the eHealth projects involve a significant amount of sensitive personal data, ensuring the safety of this information is an extremely important issue. Therefore, great effort has been put into designing the most appropriate and comprehensive security solutions to prevent any adverse events. To correctly identify a specific EHR user, it is necessary to apply complex authentication methods. A good example of this is the ID card and its coding system, which enables Estonian citizens to provide electronic signatures and to identify themselves. The most important rules that ensure the proper use of access rights are:

- All health care providers must send mutually agreed data to EHR (as set out in legislation – the Health Services Organisation Act and Associated Acts Amendment Act);
- All access rights and data use is regulated by law (statutes of the Health Information System);
- Access is only enabled to licensed medical professionals;
- A patient's data can only be viewed by their attending physician i.e. the person currently associated with the patient's treatment, who is a health care employee registered with the Health Care Board under the Ministry of Social Affairs;
- ID cards are used to authenticate and provide digital signatures;
- Citizens can access their own data through the Patient's Portal, where it is also possible to declare their intentions and preferences regarding certain subjects. More specifically, patients have the right to set access restrictions on single documents, cases of illness and all personal information in EHR. In short, access restrictions can be set on one specific document or applied to the complete set of data in HER;
- EHR records how and why all information is used (logging data) enabling citizens to monitor every incidence of access to their personal medical records. By ensuring that people are able to determine the sources of retrieval of their personal information at any time, it is possible to detect any unwanted action. As each log-in is registered, patients can immediately inform the Estonian eHealth Foundation or the Estonian Data Protection Inspectorate when an unjustified log-in is identified.

Information on interoperability and standards

What technical communication standards are applied? To what extent are these standards used?

EHR uses SOAP, DIGIDOC (for digital signature and authentication), HL7 v3, CDA. From HL7-st we have used NORMATIVE as well as Ballot Editions. With these standards we have realized:

- Managing and exchange of patient's demographic data;
- Medical documents: Discharge letters (in-patient, out-patient, day care, nursing), Digital Prescription, Referrals, Dental Card, Orthodontic Card;
- Managing the access;
- Assembling time-critical data;
- Assembling Health Record information;

- Opening and closing illness cases;
- Registration;
- Links to Digital images in archive;
- Viewing the logs of inquiries;
- DICOM is use for storing images in Image Bank. The standard is not used in the EHR central system.

What is the current status and what are the future plans concerning the adoption and implementation of technical health ICT standards?

The system has been successfully functioning for one and a half years containing today over 1 500 000 medical documents. The plan is to cover more medical issues using the HL7 standard – e-Paramedics, communicable diseases notice, medical certificates, and laboratory. We are planning to continue using technical standards that are currently in use.

Other

Information sources

1. eHealth Initiatives in Estonia, Erkki Leego
2. eHealth in Estonia, Kristiina Rebane
3. eHealth – ERA full report
4. www.docstoc.com/docs/430499/eHealth-Projects-in-Estonia (01/06/2010)
5. Estonian e-Health Foundation <http://eng.e-tervis.ee/>

Main contacts

Ms Margit Loikmaa, Communications Manager, Estonian eHealth Foundation

Project	Strategic eHealth projects in Catalonia
Project Owner	TIC Salut Foundation - Agency in charge of developing eHealth in Catalonia under the leadership of the Catalan Ministry of Health
Country/Region	Catalonia (Spain)
Current Status	In Production

General information related to the project

Is the eHealth project part of an overall healthcare delivery plan of the country/region?

The Health Department of Catalonia government is developing a strategic plan CIS (Communication and Information System) from 2008 to 2011 which only concerns the region of Catalonia. The strategic plan CIS gathers several eHealth projects which are realised by the Department of Health of Catalonia, and the Agency of Information, Evaluation and Quality of Health. There are also other projects which are developed in the private sector in cooperation with the Catalanian government. However, there is no information available for these projects.

Phase 1: Development of major systems and first implementations HC3 (Shared Clinical Historica in Catalonia), Rec@t (Electronic Prescription), TM (Telemedicine), CPS (Personal Health Folder): began 01/08/2008 and finished 31/07/2009

Phase 2: Extention of the implementation of the systems: began 03/08/2009, will finish the 20/10/2010

Details on sub-projects

What sub-projects have been defined in the context of the eHealth project?

The strategic plan CIS has 6 strategic axes and 35 action plans.

The main projects are the Personal Health Folder, the Shared Clinical History in Catalonia (HC3), the Electronic Prescriptions (Rec@t), the Medical Image Digitalisation Plan and Telemedicine

For each sub-project, what are the main objectives, start date, end date as well as key milestones?

- Personal Health Folder:
 - Design: beginning 06/02/2007;
 - Digital space secured by a digital certificate in which the citizen can find and use his/her personal health information. At the moment, the information that can be seen is the prescribed medication, the immunization profile and medical reports. In the future, the citizen will have access to all e-services and papers via the Internet (appointment by Internet, editing of personal data, complaints, health certificates requests...);
 - Results of a satisfaction study: 97 % of interviewees considered the information as useful, and navigability is good or very good for 73 % of them.

- Shared Clinical History in Catalonia: HC3:
 - First step of deployment and determination of pilot centres: 01/01/2007;
 - Improvement of the Health System by avoiding redundant medical tests or examinations. The system ensures continuously updated medical information for the corresponding healthcare providers. It facilitates professionals' tasks by sharing the information in all public health establishments;
 - Results: Almost the whole region of Catalonia is covered by HC3.
- Electronic prescription (Rec@t):
 - Approval of the director plan: 27/03/2007;
 - Completion of the extension and implementation: 31/12/2009;
 - To obtain real-time information on medication use, to coordinate the prescription and distribution process, to facilitate the patient follow-up, to improve the assistance quality and increment its access, to improve safety on medication use;
 - Results: 2/3 of all prescriptions are conducted electronically. The whole region of Catalonia is able to prescribe and to lavish electronically.
- Medical Image Digitalization plan:
 - Design: 01/02/2008;
 - To give equipment and software for radiologic image digitalization to all health centres. Future: Implementation of the digitalization of non radiological image in the whole region of Catalonia and creation of a central repertory of medical images;
 - Results: 85 % of radiologic images are digitalised.
- Telemedicine:
 - Layout of the experience sheets: 01/01/2008;
 - Accelerate the implementation of key technological applications by telecommunication, improve the quality, the efficacy and the equity of health services in Catalonia. Real-time communication between the patient and professionals present in a reference centre, telemonitorization promotion for chronic patients, and facilitate communication between professionals of different level of assistance.

What parties are involved in each sub-project?

Hospitals (for shared clinical history), Primary health centers, Research centres (for health network with added value services), Pharmacies (for electronic prescription), Health transport and centres in other territories (e.g. hospitals not in Catalonia) are involved in the strategic plan CIS.

Does each sub-project achieve its milestones within time and budget? Which ones did not and why not?

Despite a fragmented healthcare sector, the acceptance of the CIS Strategic Plan was very high, and can be considered as a success.

Details on the health project

What parties are not directly involved in the eHealth project and how did they manage them?

Most of the healthcare sector actors participated in the CIS strategic plan.

Key success factors

It was a Middle-out approach:

- Collaborative governing strategy;
- ICT introduction and deployment on a participative base;
- Continuity of care;
- Interoperability using standards;
- The model chosen by the Minister of Health of Catalonia was based on cooperation.

Project risks

A risk analysis was conducted before beginning each project. No information are available on that.

Are the services managed through a common platform?

The "Anilla TicSalut" (TicSalut ring)'s goal is to gather all human resources, technologies and materials, previously dispatched in several departements and institutions, by developping and enhancing the basic nucleus of the SISCAT (Public Health System in Catalonia) interoperability to guarantee the viability of the projects of the strategic plan, by deploying and guaranteeing the operation of different interoperability systems, to generate economies of scale and a better quality, and by facilitating and improving the conection between the public and private health sectors through a 20 Mb upstream bandwidth and a 100 Mb downstream bandwidth.

If a common platform exists, what are its features? Is the common platform based on a third party product or has it been developed individually?

The TicSalut ring is a structure/infrastructure in a ring format on which all professionals of the healthcare sector can/must connect to use all the available services.

Have they developed a regional/national interoperability framework? Is it mandatory to every actor?

The solution proposed and implemented in Catalonia guarantee connectivity with the rest of Spain and Europe.

Each Spanish region develop its own interoperability policy, depending on the nature of its healthcare system. However, the Ministry of Health of Spain established requirements for each

region to be able to connect to the central nucleus of the National System of Health. At the European level, the framework depends on the project typology.

It is not mandatory, but the common sense is that all actors use it.

Overview and status on services of interest for the Luxembourg platform

Electronic Prescription	Decision Support	Statistics	Affiliation Control	Result Server	Shared & Distributed Patient Record
Yes	Yes	Yes	Yes	Yes	Yes

Financial information

What is the annual budget allocated to each sub-project from its conception to its implementation?

No public information available.

What is the annual budget allocated to each sub-project since its implementation (maintenance and continuous improvement)?

No public information available.

What is the annual cost for adapting primary healthcare systems to the interoperability framework?

No public information available.

How the budget of the project is split (e.g. costs for concept, development, tests, deployment...)?

No public information available.

Who is providing the budget?

Catalonian government (most important source of financing), Ministry of Health of Spain and CatSalut (Catalan Health Service : purchaser of services).

Do the users pay for the platform and the services? Is there an affiliation or a usage fee? Is there a sponsorship from private actors of the healthcare sector?

The users have to pay to have access to the platform, but the price depends on the service.

Governance and regal rules information

Governance structure for the whole eHealth project

CatSalut defines the CIS strategy. The Agency of Information, Evaluation and Quality of Health operationalizes the CIS strategy and works with TicSalut foundation. TicSalut foundation's mission is to drive the development and the use communication and information technologies (TIC) in Health, moving towards a model based on personal and human care for everyone.

- Tic Salut Information Systems works with health providers and manages the information by creating system knowledge;
- Tic Salut services centre works with technology and service providers and gives infrastructures and TIC services to the public health system.

Governance structure for each sub-project

The governance of all projects of the CIS Strategic Plan is located in the Agency of Information, Evaluation and Quality of Health.

Governance rules of the common platform

The same governance rules apply for all e-health projects.

Who is in charge of technically operating the platform/the service(s)?

TIC Salut Services center's mission is the governance of the Anilla TicSalut, in order to enhance the use of CIS by increasing the Catalonian health system quality, by means of transparency, efficiency, efficacy and interoperability.

Is there any incentive program to facilitate end users adoption of the services?

Information not available

What are the Information Security rules?

Respect the Organic Ley of Protection of Datas, physical security of information and infrastructures and the development of common security solutions. The most significative processes are:

- The reorganization of the Information Security Programme, by enhancing legal and strategic competencies;
- The creation of the Technical Office of Security, which assumes the technical aspects of CIS security and its coordination;
- The creation of a technological security model;
- The monthly reporting of CIS security risks and the corresponding action plan for mitigation.

Information on interoperability and standards

What technical communication standards are applied? To what extent are these standards used?

DICOM, HL7, IHE, LOINC, SNOMED, NANDA, ICPC, EQPF.

What is the current status and what are the future plans concerning the adoption and implementation of technical health ICT standards?

Information not available.

Other

Information sources

1. Catalan Ministry Ministry of Health, www.gencat.cat/salut
2. Catalan Agency for Health Technology Assessment and Research, www.aatrm.net
3. TicSalut Foundation, www.ticsalut.cat
4. eHealth in Catalonia, we are connected!
5. 2008-2011 Strategic Plan for ISICT

Main contacts

Francesc Moya Olvera, Manager for Telemedicine and Technique sectors, TicSalut Foundation

7.6 Further cost model source data

Table 30: Salary table

Code	Role	Minimum salary/month incl. employer contributions to social security charges	Maximum salary/month incl. employer contributions to social security charges
RH1	Director	13 560 €	16 000 €
RH2	ICT infrastructure and information security manager	10 000 €	14 000 €
RH3	Value-added services manager	10 000 €	14 000 €
RH4	Deployment and service promotion manager	9 040 €	14 000 €
RH5	Project managers	7 000 €	10 000 €
RH6	Platform manager	10 000 €	12 000 €
RH7	System administrator/webmaster	4 500 €	5 500 €
RH8	Administrative officer	5 500 €	6 000 €
RH9	Financial controller	7 000 €	8 000 €
RH10	Legal counsel	7 000 €	7 500 €
RH11	Service Desk Analysts(s)	3 000 €	3 500 €

The employer contribution to social security charges has been estimated at 11 %.

Table 31: Agency staff evolution (minimum budget scenario)

Code	Title	Annual headcount FTE					Total salary cost (including employer's social security contributions)				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
RH1	Director	0,5	1	1	1	1	81 360 €	162 720 €	162 720 €	162 720 €	162 720 €
RH2	ICT infrastructure and information security manager	0,5	1	1	1	1	60 000 €	120 000 €	120 000 €	120 000 €	120 000 €
RH3	Value-added services manager	0,5	1	1	1	1	60 000 €	120 000 €	120 000 €	120 000 €	120 000 €
RH4	Deployment and service promotion manager	0,5	1	1	1	1	54 240 €	108 480 €	108 480 €	108 480 €	108 480 €
RH5	Project managers	3,5	4	5	5	5	294 000 €	336 000 €	420 000 €	420 000 €	420 000 €
RH6	Platform manager	0,5	1	1	1	1	60 000 €	120 000 €	120 000 €	120 000 €	120 000 €
RH7	System administrator/webmaster	0,5	1	1	1	1	27 000 €	54 000 €	54 000 €	54 000 €	54 000 €
RH8	Administrative officer	0,5	1	1	1	1	33 000 €	66 000 €	66 000 €	66 000 €	66 000 €
RH9	Financial controller	0,5	1	1	1	1	42 000 €	84 000 €	84 000 €	84 000 €	84 000 €
RH10	Legal counsel	0,5	0,5	0,5	0,5	0,5	42 000 €	42 000 €	42 000 €	42 000 €	42 000 €
RH11	Service Desk Analysts(s)	0	2	4	4	4	- €	72 000 €	144 000 €	144 000 €	144 000 €
	Total	8	14,5	17,5	17,5	17,5	753 600 €	1 285 200 €	1 441 200 €	1 441 200 €	1 441 200 €

Table 32: Agency staff evolution (maximum budget scenario)

Code	Title	Annual headcount FTE					Total salary cost (including employer's social security contributions)				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
RH1	Director	0,5	1	1	1	1	96 000 €	192 000 €	192 000 €	192 000 €	192 000 €
RH2	ICT infrastructure and information security manager	0,5	1	1	1	1	84 000 €	168 000 €	168 000 €	168 000 €	168 000 €
RH3	Value-added services manager	0,5	1	1	1	1	84 000 €	168 000 €	168 000 €	168 000 €	168 000 €
RH4	Deployment and service promotion manager	0,5	1	1	1	1	84 000 €	168 000 €	168 000 €	168 000 €	168 000 €
RH5	Project managers	3,5	4	5	5	5	420 000 €	480 000 €	600 000 €	600 000 €	600 000 €
RH6	Platform manager	0,5	1	1	1	1	72 000 €	144 000 €	144 000 €	144 000 €	144 000 €
RH7	System administrator/webmaster	0,5	1	1	1	1	33 000 €	66 000 €	66 000 €	66 000 €	66 000 €
RH8	Administrative officer	0,5	1	1	1	1	36 000 €	72 000 €	72 000 €	72 000 €	72 000 €
RH9	Financial controller	0,5	1	1	1	1	48 000 €	96 000 €	96 000 €	96 000 €	96 000 €
RH10	Legal counsel	0,5	0,5	0,5	0,5	0,5	45 000 €	45 000 €	45 000 €	45 000 €	45 000 €
RH11	Service Desk Analysts(s)	0	2	3	5	5	- €	84 000 €	126 000 €	210 000 €	210 000 €
	Total	8	14,5	16,5	18,5	18,5	1 002 000 €	1 683 000 €	1 845 000 €	1 929 000 €	1 929 000 €

Table 33: Platform ICT infrastructure setup and operations

Prices:

- One-shot

Network	Routers	200 000,00 €
	Switches	
Security	FW	300 000,00 €
	AV	
	IDS	
	PROXY	
Server		250 000,00 €
OS		100 000,00 €
Applications		200 000,00 €
Datawarehouse		200 000,00 €
SAN		200 000,00 €
IP Telephony		80 000,00 €
Total ICT infrastructure investment		1 530 000,00 €
Trusted Third Party solution (TTP)		300 000,00 €
Total investment incl. generic services		1 830 000,00 €

- Recurrent cost p.a.

Managed services annual fee	382 500,00 €
DRC + Resilience service	99 600,00 €
Annual maintenance on TTP	60 000,00 €
Total annual cost	542 100,00 €

- Detail of DRC + Resilience service cost p.a.

DRC	Disaster Recovery Center fee	80 000,00 €
	Power + Air Conditioning	10 000,00 €
Resilience	Service fee	9 600,00 €
Total DRC + Resilience service		99 600,00 €

Assumptions:

1. General assumptions:
 - o The Agency owns the ICT infrastructure;
 - o The Agency manages the continuous improvement of its IT infrastructure (includes Capacity Management with input from external Service Delivery Manager);
 - o The Agency can rely on a "Managed Services contract" for the operational support activities of the ICT infrastructure.
2. Architecture assumptions:
 - o Two redundant sites;
 - o Disaster Recovery Centre (DRC) hosted at external service provider;
 - o Resilience services managed by external service provider;
 - o Twelve servers including fail-over solution;
 - o Moderate volume of data storage (medical imaging data not stored, link repository with links to storage location only).



Conditions:

- Total investment includes ICT infrastructure for two sites;
- Managed services annual fee includes maintenance + monitoring service, technical support, Service Delivery Manager, estimated fee: 25 %;
- DRC: One dedicated room (27 m²), capacity for 12 racks, 1 rack included in price;
- Resilience service fee includes a "white room", and resilience services. Office space and resilience services by same provider:
 - 8 desks including phone and PC available within 2 h in case of a disaster (if the DRC is within provider's premises), 100 € per position and month, (100 € x 8 x 12 => 9 600 € p.a.);
 - 2 test-days/year;
 - Max. 3 consecutive months in the resilience room.



7.7 Acknowledgements

We would like to thank the following institutions:

- The participants from the eHealth initiatives:
 - Hervé Barge, Telemedicine Policy officer, ARS – Agence Régionale de Santé Franche Comté, France;
 - Thierry Durand, Administrator, GCS – Groupement de Coopération Sanitaire, France ;
 - Dr. Martin Hurch, ELGA GmbH, Austria;
 - Christian Suelmann, Project Manager, ZTG - Zentrum für Telematik im Gesundheitswesen GmbH, Germany;
 - Margit Loikmaa, Communications Manager, Estonian eHealth Foundation, Estonia;
 - Ellen Havenaar, Manager strategy and external affairs, Nictiz - Nationaal ICT Instituut in de Zorg, The Netherlands;
 - Francesc Moya Olvera, Manager for Telemedicine and Technique sectors, TicSalut Foundation, Spain;
 - Marjan Sušelj, Advisor to the Minister of Health, Slovenia.
- The participants in the Strategy Workshop:
 - Mike Schwebag, Ministry of Health, Luxembourg;
 - René Krippes, Ministry of Health, Luxembourg;
 - Roger Consbruck, Ministry of Health, Luxembourg;
 - Carlo Back, Ministry of Health, Luxembourg;
 - Françoise Berthet, Ministry of Health, Luxembourg;
 - Carole Theisen, Ministry of Health, Luxembourg;
 - Marc Mertens, General Inspection of Social Security, Luxembourg;
 - Raymond Wagener, General Inspection of Social Security, Luxembourg;
 - Jean-François Bajiot, National Health Fund, CNS - Caisse Nationale de Santé, Luxembourg.

The PwC project team:

Project supervision and management:

- Philippe Pierre, Partner, PricewaterhouseCoopers, Luxembourg;
- Christine von Reichenbach, Manager, PricewaterhouseCoopers, Luxembourg.

The analysis team:

- Christine von Reichenbach, Manager, PricewaterhouseCoopers, Luxembourg;
- Markus Ruppel, Manager, PricewaterhouseCoopers, Germany;
- Cyril Miel, Manager, PricewaterhouseCoopers, Luxembourg;
- Jean-Charles Dron, Senior Consultant, Health Management Solutions;
- Christophe Gence, Advisor, PricewaterhouseCoopers, Luxembourg;
- Stéphane Soulard, Advisor, PricewaterhouseCoopers, Luxembourg.

The review team:

- Michelle Rieger, Senior Auditor, PricewaterhouseCoopers, Luxembourg;
- Laura Hutt, Auditor, PricewaterhouseCoopers, Luxembourg.

7.8 Literature

Books, press articles and presentations:

- Agence Régionale de l'Hospitalisation Franche-Comté (2009): "Expérience Plate-forme régionale Franc-Comtoise: Management et structure régionale de coopération", Journée de la sécurité, Rennes, 3 juin 2009, [http://www.parhtage.sante.fr/re7/bre/doc.nsf/VDoc/14F1EC817ACFF179C12575D0004B81F2/\\$FILE/5%20%20EMOSIST%203%20juin.pdf?bcsi_scan_24DE0A96D2B59F70=0&bcsi_scan_filename=5%20-%20EMOSIST%203%20juin.pdf](http://www.parhtage.sante.fr/re7/bre/doc.nsf/VDoc/14F1EC817ACFF179C12575D0004B81F2/$FILE/5%20%20EMOSIST%203%20juin.pdf?bcsi_scan_24DE0A96D2B59F70=0&bcsi_scan_filename=5%20-%20EMOSIST%203%20juin.pdf), accessed 25/05/2010
- ASIP Santé (2008): "La lettre des porteurs des projets du DMP", Initiatives, N° 3, March 2008, www.asipsante.fr/initiatives/numero3/, accessed 26/05/2010
- ASIP Santé (2009): "Etat des lieux et perspectives des Plate-formes régionales de services", www.esante.gouv.fr/printpdf/1055, accessed 20/05/2010
- ASIP Santé (2009): "Présentation du projet régional Franche Comté", www.asipsante.fr/index.php?option=com_content, accessed 19/05/2010
- ASIP Santé (2009): "Présentation du projet régional Rhône Alpes", www.asipsante.fr/index.php?option=com_content, accessed 19/05/2010
- ASIP Santé (2010): "Présentation du projet Dossier Pharmaceutique", www.asipsante.fr, accessed 02/06/2010
- ASIP Santé (2010): "Rapport d'activité 2009", www.asipsante.fr/docs/ASIP_Sante_Rapport_d_activite_2009.pdf, accessed 25/05/2010
- Aymé S., Kole A., Groft S. (2008): "Empowerment of patients: lessons from the rare diseases community", *Lancet*, Jun 14;371 (9629):2048-2051
- Beretta, Claudio et al. (2006): "The CRS-SISS project: a regional strategy for e-Health", *Health Optimum* 2006, Venice, kb.good-ehealth.org/, accessed 11/05/2010
- eHealth ERA (2006): "eHealth strategy and implementation activities in Belgium", http://www.ehealth-era.org/database/documents/ERA_Reports/Belgium_eHealth-ERA_country-report_final_30-06-2007.pdf, accessed 26/05/2010
- EHTO Enterprise (2003): "Networking in Health Care: An Issue of Connection or Co-operation? - The Evolution of Sjunet, the Swedish Health Care Network", <http://www.ehto.org/ehealth2003/sjunet.html>, accessed 20/05/2010
- GCS e-Santé Picardie (2009): "Relance DSP DMP, Dossier Santé Picardie", [http://www.parhtage.sante.fr/re7/pic/doc.nsf/VDoc/8291842B2BFFA438C12575BE00508C36/\\$FILE/relance%20DSP%20DMP%2012%2005%2009.ppt?bcsi_scan_24DE0A96D2B59F70=1](http://www.parhtage.sante.fr/re7/pic/doc.nsf/VDoc/8291842B2BFFA438C12575BE00508C36/$FILE/relance%20DSP%20DMP%2012%2005%2009.ppt?bcsi_scan_24DE0A96D2B59F70=1), accessed 27/05/2010
- Goldzweig Lubick C., Towfigh A., Maglione M., Shekelle P. G. (2009): "Costs and Benefits of Health Information Technology : New Trends from Literature", *Health Affairs*, Millwood, Vol. 2, 28, p. w282-w293
- HIMSS (2010): "Meaningful Use, Certification Criteria and Standards and HHS Certification Process", <http://www.himss.org/EconomicStimulus/>, accessed 07/06/2010

- Les Dossiers Européens (2009): "eHealth in Europe", The European Files, Nr 17, May - June 2009, http://ec.europa.eu/information_society/activities/health/docs/publications/2009/200906europ-files-ehealth_en.pdf, accessed 18/05/2010
- Luxembourg Ministry of Health (2010): "Livre Blanc sur l'Interopérabilité des Systèmes d'Information de Santé au Luxembourg", Whitebook, Draft v0.8
- Leavitt et al. (2010): "EHR Certification Town Hall", HIMSS10 Conference, Atlanta, USA, <http://www.cchit.org/sites/all/files/EHRCertificationTownHallHIMSS2010.pdf>, accessed 09/06/2010
- OECD (2010): "Improving Health Sector Efficiency: The Role of Information and Communication Technologies", OECD Health Policy Studies, <http://www.oecd-ilibrary.org/content/book/9789264084612-en>, accessed 24/07/2010
- Prieur, Cécile (2008): "En Picardie, médecins et patients testent le dossier médical personnel", Le Monde, 19 juin 2008, http://www.lemonde.fr/societe/article/2008/06/18/en-picardie-medecins-et-patients-testent-le-dossier-medical-personnel_1059697_3224.html, accessed 02/06/2010
- Protti, Denis (2007): "Moving toward a Single Comprehensive Electronic Health Record for Every citizen in Andalusia", Healthcare Quarterly Vol 10. No 4, 2007, <http://www.longwoods.com/content/19336>, accessed 20/05/2010
- Robben, Frank (2010): "La plate-forme eHealth: un état d'avancement", www.law.kuleuven.be/icri/frobben/presentations/20100112%20fr.ppt, accessed 26/05/2010
- SIS Rhône-Alpes (2007): "Plateforme SIS-RA: Guide pour les établissements de Santé", http://www.sante-ra.fr/doc/GuideSISRA.PDF?bcsi_scan_24DE0A96D2B59F70=0&bcsi_scan_filename=GuideSISRA.PDF, accessed 31/05/2010
- Swedish Ministry of Health and Social Affairs (2009): "Swedish Strategy for eHealth - safe and accessible information in health and social care - 2008 Status Report", <http://www.regeringen.se/content/1/c6/11/48/73/bc8a2ecc.pdf>, accessed 19/05/2010
- The Commonwealth Fund (2009): "Kaiser Permanente: Bridging the Quality Divide with Integrated Practice, Group Accountability, and Health Information Technology", <http://www.commonwealthfund.org/Content/Publications/Case-Studies/2009/Jun/Kaiser-Permanente.aspx>, accessed 26/05/2010
- Vérificateur Général du Québec (2010): "Vigie relative au projet Dossier de santé du Québec", Rapport du Vérificateur général du Québec à l'Assemblée nationale pour l'année 2010-2011, http://www.vgq.gouv.qc.ca/fr/fr_publications/fr_rapport-annuel/fr_2010-2011-T1/fr_Rapport2010-2011-T1-Chap05.pdf?bcsi_scan_24DE0A96D2B59F70=0&bcsi_scan_filename=fr_Rapport2010-2011-T1-Chap05.pdf, accessed 25/05/2010

Other online resources:

- Agence des Systèmes d'Information Partagés de Santé: <http://www.asipsante.fr>, accessed 01/07/2010
- Agència d'Informació, Avaluació i Qualitat en Salut: www.aatrm.net, accessed 21/07/2010
- Bundeskanzleramt Österreich, "Austrian government programme for the XXIII. Legislation period": www.bka.gv.at, accessed 21/07/2010
- Bundesministerium für Gesundheit: "Inhalte im Thema ELGA – Die Elektronische Gesundheitsakte", www.bmgfj.gv.at/cms/site/thema.html?channel=CH0709, accessed 21/07/2010
- Canada Health Infoway (2007): "Converging the Silos of Telehealth and eRecords (e.g. EHR's, EMR's) - A Workshop on the Challenges, Issues and Strategies", Workshop report v3.0, http://www2.infoway-inforoute.ca/Documents/Telehealth%20Workshop_Converging%20Silos%20Report_EN.pdf, accessed 25/07/2010
- CapGemini Consulting (2010): "Business models for eHealth", http://ec.europa.eu/information_society/activities/health/docs/studies/business_model/business_models_eHealth_report.pdf, accessed 01/07/2010
- Catalan Ministry of Health: www.gencat.cat/salut, accessed 21/07/2010
- Congress of the United States (2008): "Evidence on the Costs and Benefits of Health Information Technology", a CBO Paper, Congressional Budget Office, May 2008, <http://www.cbo.gov/ftpdocs/91xx/doc9168/05-20-HealthIT.pdf>, accessed 24/07/2010
- eGesundheit: "Elektronische Patientenakten - EPA 2015", www.egesundheit.nrw.de/content/elektronische_patientenakten/index_ger.html, accessed 21/07/2010
- eHealth News (2010): "Global E-Health Forum to Present Strategies, Solutions and Services for Sustainable Healthcare Delivery", <http://www.ehealthnews.eu/events/2119-global-e-health-forum-to-present-strategies-solutions-and-services-for-sustainable-healthcare-delivery>, accessed 24/06/2010



- ELGA (2007): "Die Electronische Gesundheitsakte in Österreich": http://www.arge-elga.at/fileadmin/user_upload/uploads/download_Papers/Arge_Papers/ELGA_Umsetzung_Phase1__V2.0.pdf, accessed 21/07/2010
- ELGA GmbH: "ELGA Projekte der Errichtungsphase (2009 - 2010)", www.arge-elga.at/index.php?id=27, accessed 01/06/2010
- ELGA GmbH: "ELGA Projekte der Detailplanungsphase (2007 - 2008)", www.arge-elga.at/index.php?id=13, 01/06/2010
- ELGA: www.arge-elga.at, 21/07/2010
- Grange, Elodie: "Plateforme de télésanté Sisra: fréquentation en hausse", www.ticSante.com/show.php?page=story&id=444, 26/05/2010
- Estonian e-Health Foundation: <http://eng.e-tervis.ee>, accessed 21/07/2010
- E-Tervis (2007): "eHealth Projects in Estonia", www.docstoc.com/docs/430499/eHealth-Projects-in-Estonia, accessed 01/06/2010
- European Commission, DG Information Society and Media (2009): "Smarter, faster, better eGovernment", 8th Benchmark Measurement, November 2009, accessed 23/07/2010
- European Commission, DG Information Society and Media (2009): "The socio-economic impact of interoperable electronic health record (EHR) and ePrescribing systems in Europe and beyond, EHR Impact", October 2009, http://www.ehr-impact.eu/downloads/documents/EHRI_final_report_2009.pdf, accessed 24/07/2010
- European Commission, Information Society and Media (2007): "eHealth ERA report Priorities and strategies in European countries", http://ec.europa.eu/information_society/activities/health/docs/policy/ehealth-era-full-report.pdf, accessed 24/06/2010
- European Commission, Information Society and Media (2007): "Fact sheet Sweden": www.eHealth-era.org/database/documents/factsheets/Sweden.pdf, accessed 22/07/2010
- Eysenbach G: "What is e-health?", Journal of Medical Internet Research 2001; Jun 18;3(2):e20, <http://www.jmir.org/2001/2/e20>, accessed 29/06/2010
- Groupe de travail eSanté (2006): "Plan d'action eSanté du Luxembourg version détaillée", http://www.sante.public.lu/fr/systeme-sante/programme-esante/esante_plan_actions_detail_060704_060926.pdf, accessed 24/06/2010
- Healthcare Information and Management Systems Society: "Meaningful Use, Certification Criteria and Standards, and HHS Certification Process", www.himss.org/economicstimulus, accessed 01/06/2010
- INERA, www.carelink.se, accessed 21/07/2010
- Inforoute Santé Canada: <http://www2.inforoute-inforoute.ca>, accessed 18/07/2010
- Initiative Elga: www.initiative-elga.at, accessed 21/07/2010
- Insitut Edouard Belin – Insitut International des Systèmes de Santé et de Télémedecine: www.iisist.org, accessed 01/06/2010
- Institut National de la Statistique et des Etudes Economiques (2008): "Personnels et Equipements de santé", http://www.insee.fr/fr/themes/theme.asp?theme=6&sous_theme=1&nivgeo=0&type=2, accessed 01/07/2010
- García, Jorge (2009): "El Diraya no logra buenos resultados y la Consejería de Salud decide sustituirlo", <http://www.20minutos.es/noticia/446764/0/salud/cambia/diraya/>, accessed 22/07/2010
- Journal APM de l'Informatique (2009): "GCS e-santé Picardie: un bel exemple de coopération entre professionnels de santé", www.ticSante.com/show.php?page=story&newsPage=5&id=477&story=477, accessed 26/05/2010
- Nationaal ICT Instituut in de Zorg Website: www.nictiz.nl, accessed 21/07/2010
- NHS connecting for health: www.connectingforhealth.nhs.uk, accessed 01/06/2010
- OECD (2009): "Information Society Strategies: From Design to Implementation - The case of Spain's Plan Avanza", http://www.oecd.org/dataoecd/9/15/44242867.pdf?bcsi_scan_24DE0A96D2B59F70=0&bcsi_scan_filename=44242867.pdf, accessed 23/07/2010
- Ordre national des Pharmaciens: "Le dossier pharmaceutique", <http://www.ordre.pharmacien.fr/DP/index.htm>, accessed 21/07/2010
- Organisation for Economic Co-operation and Development (2010): "OECD Health Data 2010 - Frequently Requested Data", http://www.oecd.org/document/16/0,3343,en_2649_34631_2085200_1_1_1_1,00.html and <http://stats.oecd.org/index.aspx?queryid=23071&lang=fr>, accessed 01/07/2010
- Pagliari et al. (2005): "What Is eHealth (4): A Scoping Exercise to Map the Field", Journal of Medical Internet Research 2005;7(1):e9, <http://www.jmir.org/2005/1/e9>, accessed 29/06/2010
- Portail Santé Grand Duché du Luxembourg : "Programme national eSanté": <http://www.sante.public.lu/fr/systeme-sante/programme-esante/index.html>, accessed 15/07/2010

- Programme gouvernemental annexé à la déclaration gouvernementale de Monsieur le Premier Ministre: <http://www.gouvernement.lu/gouvernement/programme-2009/programme-2009/programme-gouvernemental-2009.pdf>, accessed 24/07/2010
- Quantin et al. (2009): "Centralised versus Decentralised Management of Patients' Medical Records", in K.-P. Adlassnig et al. (Eds.): "Medical Informatics in a United and Healthy Europe", IOS Press <http://www.hst.aau.dk/~ska/MIE2009/papers/MIE2009p0700.pdf>, accessed 21/07/2010
- Resource centre for Healthcare Technologies: "eSanté CARA", <http://www.santec.lu/project/esante/cara/start>, accessed 15/07/2010
- Resource Centre for Healthcare Technologies: "eSanté EFES": <http://www.santec.lu/project/esante/efes/start>, accessed 06/07/2010
- Resource Centre for Healthcare Technologies: "eSanté Labo": <http://www.santec.lu/project/esante/labo/start>, accessed 15/07/2010
- Servicio Andaluz de Salud, Consejería de Salud (2010): "Diraya , Health care information and management integrated system" http://www.juntadeandalucia.es/servicioandaluzdesalud/library/plantillas/externa.asp?pag=/servicioandaluzdesalud/contenidos/gestioncalidad/diraya/DossierDiraya2010_En.pdf, accessed 22/07/2010
- Site Portail de la plate-forme eHealth Belgique: www.eHealth.fgov.be, accessed 21/07/2010
- Site web de l'Institut International Recherche Systèmes d'information Santé et télémédecine (IISIST) (2010), www.iisist.fr/, accessed 03/06/2010
- Synaptica : "El SAS expone su estrategia ante la crisis de Diraya", <http://www.synaptica.es/noticia/el-sas-expone-su-estrategia-ante-la-crisis-de-diraya>, accessed 22/07/2010
- TicSalut Foundation: www.ticsalut.cat, accessed 21/07/2010
- TICsanté (2009): "Plateforme de TéléSanté SIS-RA: fréquentation en hausse", <http://www.ticsante.com/show.php?page=story&id=444>, accessed 28/05/2010
- TICsanté (2010): "Le projet 'région Sans film' attribué à Orange", <http://www.ticsante.com/show.php?id=637&page=story>, accessed 16/05/2010
- U.S. Department of Health and Human Services: "Electronic Health Records and Meaningful Use", <http://healthit.hhs.gov/portal/server.pt?open=512&objID=1325&mode=2>, accessed 29/06/2010

pwc.com