

Business Models for eHealth

Final Report

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Preface

This document contains the final report on a project funded by ICT for the Health Unit, Directorate General Information Society and Media, European Commission. The project explores the intricacies business models for value-creating and sustainable eHealth systems. It concludes with a set of strategic operational guidelines and policy recommendations targeted at the European Commission and other European institutions aimed at fostering the development of value creating and sustainable eHealth services in Europe.

This final report brings together the findings of three interim reports and two expert workshops organised in Brussels in July and November 2009.

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Executive Summary

Objectives

This report presents the analysis of a study funded by the ICT for Health Unit of DG Information Society and Media exploring business models for the implementation of value-creating and sustainable eHealth systems in Europe. It also introduces a set of policy recommendations for the European Commission and other stakeholders. The ultimate objectives being:

- The improvement of the overall quality and efficiency of the provision of health services in general via eHealth services taking into consideration present and future socio-economic and financial challenges faced by national healthcare authorities in Europe;
- The consolidation of eHealth services as a mature market where European industry can play a leading role via the provision of innovative technological and organisational solutions.

The first objective refers to the use of eHealth services and solutions to improve overall healthcare delivery. As argued in the opening stages of the report, these IT-enhance healthcare services can support healthcare delivery organisations and health authorities to provide responses to factors like the aging of Europe's population and the growing prominence of chronic diseases and financial challenges in controlling overall healthcare spending. The second objective refers to the fact that eHealth services and solutions can provide the appropriate responses previously indicated if industry delivers the appropriate technological solutions. Actually, as argued in the report, eHealth represents a substantial market where European industrial players can have a pivotal role.

The achievement of these two objectives, nevertheless, is not an automatic process. eHealth services need to deliver on their operational and strategic objectives by providing value and sustainability. In the context of this report the term "value" is used to identify an eHealth service whose functionalities brings socio-economic and healthcare value to patients and/or healthcare professionals. These involve specific elements such as better clinical care, safety, timeliness of care, quality, effectiveness and efficiency. The expression "sustainability", instead, defines an eHealth system that has passed the pilot phase and is fully operational as to provide data for assessing its overall performance in line with a set of predefined benchmarks and indicators. As argued in the report, value creation and sustainability

require eHealth services to be supported by business models reflecting the interests of all involved stakeholders. More importantly, these business models need to detail the interactions and interdependencies among all of the stakeholders and how the introduction of an IT service is going to affect them.

The report, therefore, looks at the challenges of devising these business models for value creating and sustainable eHealth services. It also provides a set of operational guidelines for overcoming them. It also looks at public policies required for establishing the right conditions for devising these business models as to allow Europe to collect the social and economic benefits of eHealth and to consolidate a commercial market where Europe’s industry can play a leading role.

Approach

This study has applied a number of research approaches in a sequential manner. First, it has undertaken an illustrative literature review and semi-structured interviews with pan-European experts in the field of eHealth. Afterwards, it has examined five illustrative case studies of value-creating and sustainable eHealth systems in Europe. Each case study falls within one of the four market categories identified by eHealth Lead Market Initiative and described in the following table.

Table 1: Lead market initiative: Market sectors

Market	Description	Case-study
Clinical Information System (CIS)	Specialised tools for health professionals within healthcare institutions (e.g., hospitals). Examples are Radiology Information Systems, Nursing Information Systems, Medical Imaging, Computer Assisted Diagnosis, Surgery Training and Planning Systems. b) Tools for primary care and/or for outside the care institutions such as general practitioner and pharmacy information systems.	Telemedescape
Secondary Usage Non Clinical Systems (SUNCS)	This category includes a) systems for health education and health promotion of patients/citizens such as health portals or online health information services. b) Specialised systems for researchers and public health data collection and analysis such as bio-statistical programs for infectious diseases, drug development, and outcomes analysis. c) Support systems such as supply chain management, scheduling systems, billing systems administrative and management systems, which support clinical processes but are not used directly by patients or healthcare professionals.	Centro Unico di Prenotazione Umbria
Telemedicine	Personalised health systems and services, such as disease management services, remote patient monitoring (e.g. at home), tele-consultation, tele-care, tele-medicine, and tele-radiology.	Tactive/University City London Hospital
Integrated Health Network (IHN)	Distributed electronic health record systems and associated services such as e-prescriptions or e-referrals.	Naviva

Additional evidence was then collected during a final workshop where experts were invited to provide opinions and ideas about public policy initiatives aimed at supporting the use of appropriate business models for value-creating and sustainable eHealth systems at the national and pan-European levels. Details of the overall project methodology are available in the annexes.

Devising Business Models for Value-Creating and Sustainable eHealth Services

The evidence suggests that a solid business model is required for developing and implementing a value-creating and sustainable eHealth service. In particular, this business model needs mapping all key supporting activities, value chain relationships and dependencies impacted by the introduction of eHealth service. . This state of affairs is achieved if a set of activities and steps are implemented.

First, the structuring and implementation of such business model requires strong senior management involvement throughout the various phases of the design, development and delivery of an eHealth service. More importantly, senior management should not just act as a project/programme manager. Instead, it should make sure that the eHealth system that he/she is supporting is provided with the required funding throughout its entire development and implementation phases. Essentially, senior management is expected to have a clear vision of what his/her healthcare delivery organisation wants to achieve with a specific eHealth service and system and lead the required operational steps.

Staff involvement is also essential in designing a business model of an eHealth service. They need to be given the opportunity to precisely how the specific service is to change their activity or role. They need to provide evidence for mapping their interactions as to see how the eHealth service is going to improve or modify them. All of these activities are aimed at making sure that business models do not fall short from reflecting the interactions of those actors who are to use them in their day-to-day professional activities.

A business model of a value-creating and sustainable eHealth system is a static entity. It might change as a consequence of technological and organisational evolution. However, it can also evolve following an evaluation aimed at measuring the potential and current impact of the eHealth system. This may require the collection of data concerning activity, costs and benefits. It involves also the need to apply sensitivity analysis as to assess different scenarios through which it is possible to design or modify a business model. Although the literature provides several eHealth evaluation models, their implementation requires strong senior management and process management since regular performance data needs to be collected and examined for assessing current performance and estimate future developments.

Policy recommendations for fostering value-creating and sustainable business models for eHealth

In addition to the application of specific operational guidelines, there is a need for public policy actions supporting the development of value-creating business models for eHealth. These require the involvement of all stakeholders such as national healthcare authorities, health professional associations, healthcare delivery organisations, industry and the research community as well as European perspectives so as to foster the sharing of applicable best practices and experiences. The study, in particular, has identified these specific public policy options targeted to the European Commission that is invited to act as the coordination actor for:

- Launching of pilot actions of eHealth-related projects where different business models are tested or simulated using appropriate modelling approaches;
- Fostering the sharing of specific best practices for the design of business models for value-creating and sustainable eHealth systems;
- Defining benchmarking parameters as to make sure that individual organisations are able to monitor and compare the way they develop and implement business models for eHealth;

- Supporting the development of best practices for funding and financing of individual eHealth systems via specific incentives such as tax breaks and/or different reimbursement procedures or co-funding mechanisms;
- Bringing legal clarity as to facilitate the:
 - identification and authentication of professional health staff accessing and using personal health data;
 - safe exchange of medical data across national borders, respecting the need to protect health data and the personal integrity of the patient, and therefore the rights of patients to give a consent to use of their medical data;
- Working towards the solution of technical issues and the facilitation of market developments via
 - Interoperability;
 - common medical terminologies and tech standards in particular for medical data;
 - pre-procurement activities.

Acknowledgments

The authors would like to acknowledge the support and critical contributions from the experts that were involved in the various phases of the projects. We would also like to thank our project officers, Michael Palmer and Jaakko Aarnio, for their constructive approach and useful feedback, as well as Deputy Head of Unit Ilias Iakovides. Finally, Professor Joanna Chatway and Constantjin van Oranje have contributed very substantially by their thorough reviews of the document.

CHAPTER 1 **Current eHealth policy and commercial environment in Europe: An overview**

Information plays a key role in the provision of healthcare. Providers such as hospitals and doctors generate and process information as they attend to patients. At the same time, patients themselves create, access, process and exchange information about their health situation. Health-related information and communication technologies can play a significant role in the overall management of this data in terms of potential gains in efficiency, financial savings, quality of care and patient safety. This use of technology can also play a pivotal role in the move towards patient-centric care, an approach aiming at building a treatment regime tailored to the individual patient, with much of this delivered outside the traditional hospital context. One of the core elements of patient-centric care, in fact, is the ability of medical professionals to interact with individual patients irrespective of their geographical location, cutting on the economic and operational costs of face-to-face meetings. This involves the use of distant monitoring devices to be implemented at patients' premises.¹ The same technologies can foster healthy lifestyle approaches, where the focus is not exclusively on curing but also on preventing the development of diseases.

This chapter provides an overview of the current eHealth policy and commercial environment in Europe. It is also the first step for supporting the guiding argument of this report and the project: the socio-economic, commercial and policy aspirations of eHealth can be achieved if individual eHealth systems are supported by value creating and sustainable business models. In the context of this report the expression "value creating"

¹ The core elements of patient-centric healthcare are: identification of a patient's main reason for the visit, his or her concerns and need for information; integrated understanding of the patients' world, their whole person, emotional needs and life issues; collaborative definition of the problem faced by the patient and agreement on its management; enhancement of prevention and health promotion; continuing relationship between the patient and the doctor. See Smith M "Towards a global definition of patient centred care" British Medical Journal, n.322 (7284) 2001, pp.444-445. The idea of patient-centric healthcare is clearly discussed in The future of Healthcare: Putting the Patient at the Centre of Care Report prepared by the Economist Intelligence Unit on behalf of Philips, 2007. See also Jo Harknes, "The future of healthcare is patient-centred" in 2050 A Health Odyssey: Thought Provoking Ideas for Policy Making, Report prepared by Health First Europe pp.16-20; although it focuses on the roles and responsibilities of patients when facing eHealth, an interesting perspective is also provided in Albert van Der Zeijden, Chair International Alliances of Patients' Organisations, "Patient Empowerment through Effective eHealth Strategies" Presentation at Clinical Information Systems and Electronic Records and eHealth, London, September 2004

identifies an eHealth service whose functionalities brings socio-economic and healthcare value to patients. These can involve specific elements such as improvement in clinical care, better patient care, more safety or even increased efficiency and effectiveness. The attribute sustainability, instead, defines an eHealth system that has gone beyond the pilot phases and is fully operational and provides data and evidence upon which it is possible to collect data and evidence to assess its overall performance and value contribution.

1.1 Setting the EU eHealth policy context

European healthcare systems are pillars of Europe's social infrastructure. Although they differ in terms of operational and financial structure, they share common goals and priorities such as universality, access to good quality care, equality and solidarity. More importantly, EU states also share common challenges. The first one is population aging with direct impact on the overarching dependency factor and pathological map of Europe. Aging is also changing disease composition with a rise in chronic diseases.² Nevertheless, these are not only linked to aging. It is important to consider also the rise of chronic diseases such as, for example, diabetes and cardio-vascular conditions are directly related to unhealthy behaviour.³ At the same time, citizens as a whole are getting better information about healthcare issues, indirectly pushing national health systems to provide them better quality and safety. This access to better information is also one of the reasons for the support of eHealth and healthy lifestyle approaches for fostering a better life style for the prevention of chronic diseases. The challenges, nevertheless, do not come without financial implications, since they affect the healthcare resource utilisation and expenditures with direct impact on general funding.

Funding of health care among EU member states varies. However, they all rely on a combination of resource funding with the majority of funds directly or indirectly controlled by national state administration. Overall, in Europe there are three different methods of healthcare financing. The first one is a system centred on public taxation (*Beveridge model*). Another approach focuses on compulsory social insurance (*Bismarck model*). The third model is based on private finance through voluntary insurance that operates on top of standard social insurance. In addition to these approaches, there are also several cost-sharing mechanisms through which patients contribute to healthcare financing. These mechanisms, which are not usually applicable to low-income citizens, involve prescribed pharmaceuticals, specialist visits, inpatient hospital care and dental services.⁴ Irrespective of the mechanisms, the evolving socio-economic and cultural

² For an interesting overview of the relationship between chronic diseases, ageing and the impact on EU healthcare systems in Europe refer to Joceline Pomerleau, Cécile Knai and Ellen Nolte "The burden of chronic disease in Europe" in Nolte, E. e McKee, M. [Caring for People with Chronic Diseases: an Health System Perspective](#), (Maidenhead, Open University Press, 2008) pp.15-43

³ An interesting detailed overview of the trends is available in Artman, J. et alia "State of the Art of New ICT-Enabled Models of Healthcare-First Interim Summary" report prepared in the context of project [Scenarios for ICT-Enabled New Models of Healthcare](#), on behalf of the JRC-Institute for Prospective Studies, June 2007, pp.22-28

⁴ Jakubowski, E "Healthcare Systems in the EU: A Comparative study" Working Paper prepared for the Directorate General For Research, European Parliament, October 1998; an overview of health systems of European states (members and non members of the European Union) is compiled by the European

environment of Europe's society is leading to a substantial increase in healthcare expenditures. Therefore, in this context the provision of healthcare services using innovative information and communication technologies is seen as one of the elements helping the containment of healthcare delivery costs⁵ while maintaining the expected levels of quality of care and safety.⁶

The European Commission has recognised this pivotal role in its *2004 eHealth Action Plan* where it indicated a set of actions and initiatives to be taken at the EU and national level.⁷ This was also confirmed in the *2006 Aho Report "Creating an Innovative Europe"* where the importance of ICT technologies in tackling specific healthcare challenges was seen as an area of action for European leadership provided that appropriate policies were developed and legislative obstacles removed.⁸ This second report has recognised Europe's weaknesses in specific eHealth domains such as infrastructure and clinical information systems. It has also indicated the barriers for the development of pan-European eHealth services in Europe.

The provision of such pan-European services, however, is not an easy task from operational, technical⁹ and legal perspectives.¹⁰ In fact, as expressed by the subsidiarity

Observatory on Health Systems and Policies available at <http://www.euro.who.int/observatory/Hits/TopPage>. For a recent overview of the healthcare financing among new EU member states, see "Country Focus: Easter and Central Europe", *Healthcare IT Management*, vol.3, issue 5, 2008, pp.40-46 available at www.hitm.eu

⁵ Japan is also suffering from some of the same socio-economic changes as Europe and eHealth applications are seen as possible avenues to contain costs while maintaining high quality of care and safe. This has been recently confirmed in the evaluation of a recently developed electronic remote monitoring tool targeted at ageing citizens of Nishiaizu, a small town in Japan. Using survey data, it was demonstrated that an e-health system had lower medical expenditure for lifestyle-related illness than non-users. The medical expenditure of e-health users was lower than that of non-users by 15,302 yen (about EUR 100) per year. This amount was approximately 21% of the average annual medical expenditure of the residents. The evaluation also showed that: long-time users of e-health had lower medical expenditure on lifestyle-related illness; long-time users of e-health had lower medical expenditure than those who used it for a shorter time; e-health was more effective for people with diseases than those without. For more information see Yuji Akematsu et alia "An empirical analysis of the reduction in medical expenditure by e-health users", *Journal of Telemedicine and Telecare*, Vol. 15, N 3, 2009, pp. 109-111

⁶ For a comprehensive overview of safety issues connected to eHealth see Stroetman, V. *eHealth for Safety: Impact of ICT on Patient Safety and Risk Management*, Report prepared for ICT for Health Unit, DG Information Society and Media, European Commission, October 2007

⁷ Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions "e-Health - making healthcare better for European citizens: an action plan for a European e-Health Area" {SEC(2004)539}

⁸ Aho Group Report "Creating an Innovative Europe" available at http://ec.europa.eu/invest-in-research/action/2006_ahogroup_en.htm

⁹ For a comprehensive overview of the state of affairs of eHealth technical standards in Europe see *ICT Standards in the Health Sector: Current Situation and Prospects* A Sectoral e-Business Watch study by Empirica n. 108, July 2008 available at http://www.ebusiness-watch.org/studies/special_topics/2007/documents/Special-study_01-2008_ICT_health_standards.pdf (visited on 15 March 2009)

¹⁰ For a comprehensive overview of the potential legal barriers for the delivery of pan-European eHealth system, see Van Doosselaere, C. et alia *Legally eHealth: Putting eHealth in its European Legal Context* Study Report on behalf of DG Information Society and Media, European Commission, March 2008 and Dumortier,

principle, each EU member state is responsible for the operational delivery and financial management of healthcare. Still, this conflicts with the possibility of EU citizens of being in a position to receive treatment irrespective of their geographic location. In order to overcome these barriers, the European Commission has worked towards the establishment of a common framework on the application of patients' rights in cross-border healthcare. In this context, attention is particularly directed to the provision of sufficient clarity about the reimbursement for healthcare provided in other EU member states and requirements for high-quality and safe health services so as to allow European citizens to make informed choices.¹¹ Mobility, nevertheless, is not just related to patients but also healthcare staff as they are expected to move freely within EU member states, which is also thanks to the expected mutual recognition of professional qualifications.¹²

The possibility for the geographical de-localisation of "healthcare" provision requires also access to patient data via health record systems based on commonly agreed standards.¹³ Supported by the push by EU activities in this area, national EU member states have also focused on fostering the exploitation of eHealth within their national health systems. Almost all EU member states have put forward eHealth policies, roadmaps or other relevant documents that are generally consistent with the EU activities and initiatives in the eHealth domain. They also share a similar concept in which ICT-enabled health systems and applications are viewed as pivotal for enhancing affordability, quality and safety of healthcare for citizens as a whole.¹⁴

The pivotal role of eHealth for Europe has also been confirmed at the 2009 EU Ministerial Conference in Prague and by the December 2009 conclusions by the European Council calling for the implementation of safe and efficient healthcare through eHealth. There has been a call for overarching governance structure so as to remove barriers for the

J. Study on Legal Framework of Interoperable eHealth in Europe-Country Reports Study Prepared for ICT for Health Unit, DG Information Society and Media, European Commission, January 2009 (draft report)

¹¹ Communication from the Commission A community framework on the application of patients' rights in cross-border healthcare, {COM(2008) 415final}. Nevertheless, it is important to emphasise that, as of June 2004, European citizens are allowed to access the European Health Insurance Card (EHIC), which provides proof of entitlement to receive necessary emergency medical care in any of EU/EFTA members states; currently, there are more than 170 million EHIC distributed in Europe. A future development associated with the card is to foster electronic reading of the card at healthcare delivery premises. See Noel Nader, "Interstate Access to Healthcare Care in Europe: How to make it easier for citizens?" Presentation at EU Ministerial Conference "eHealth for Individuals, Society and Economy@ Prague, 18-20 February 2009.

¹² This process will be simplified following the consolidation of the EU directive about the recognition of professional qualifications, including in the healthcare domain. See Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications.

¹³ For an overview of the eHealth related projects funded through FP6, see European Commission eHealth Portfolio of Projects, Prepared by the European Commission, DG Information Society and Media, September 2007: for FP7 projects, a detailed summary is available at http://ec.europa.eu/information_society/activities/health/research/index_en.htm

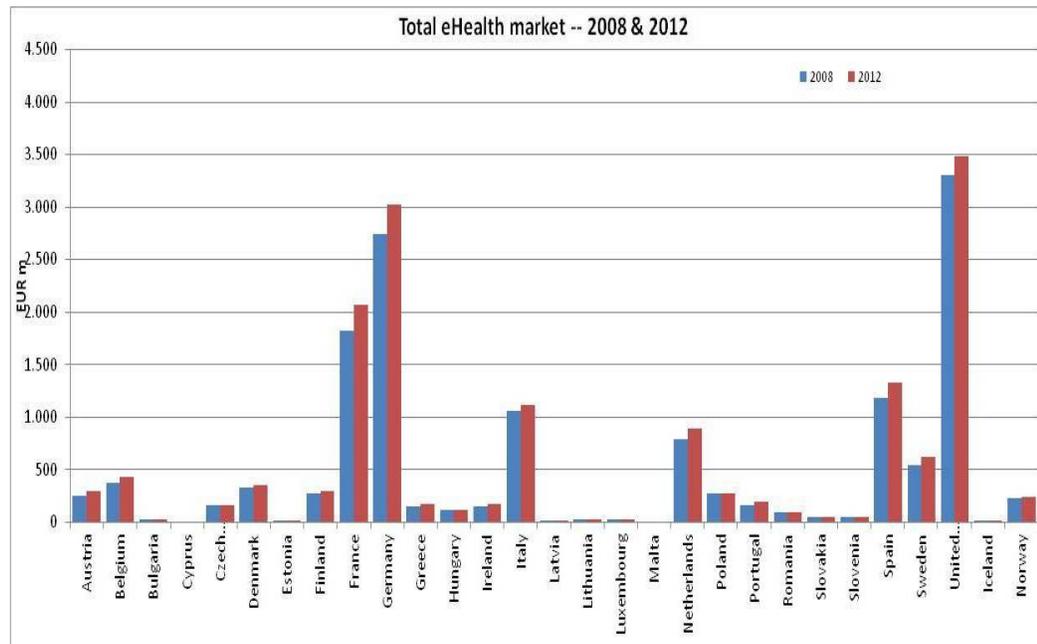
¹⁴ A comprehensive overview is available at eHealth ERA Report Towards the Establishment of a European eHealth Research Area, Report prepared by DG Information Society and Health, European Commission, September 2007; the results of these reports are currently being updated as part of the current project Monitoring eHealth Strategies supported by the unit ICT for Health, DG Information Society and Media <http://www.ehealth-strategies.eu/>

development in eHealth in Europe. This last aspect is extremely important since the socio-economic and policy developments previously indicated have created a large pan-European commercial market for eHealth solutions, as discussed in the following section.

1.2 Current and future market size for eHealth in Europe¹⁵

The combination of social and policy factors described in the previous section have created the basis for a strong European demand for eHealth services and applications. Based on an analysis undertaken by Capgemini Consulting in the context of this project, the European eHealth market has been estimated at EUR 14.269 million in 2008 and is projected to reach EUR 15.619 million by 2012 with a compounded annual growth rate (CAGR) of 2.9%. A per-country analysis of the results confirms that France, Germany, United Kingdom, Spain and Italy are the principal European eHealth markets. However, the analysis also confirms that over the next three years all national eHealth markets will experience some form of growth in this area.

Figure 1: ehealth market in Europe 2008 and 2012



The real difference resides in the current and future market size of the four specific markets identified by the European Lead Market Initiative and is described in the following table.

¹⁵ The findings of these sections have been extracted from Patrick Jansen and Sjoerd Admiral “eHealth: Market Assessment” Deliverable prepared for the European Commission in the context of the current project.

Table 2: Lead market initiative: Market sectors

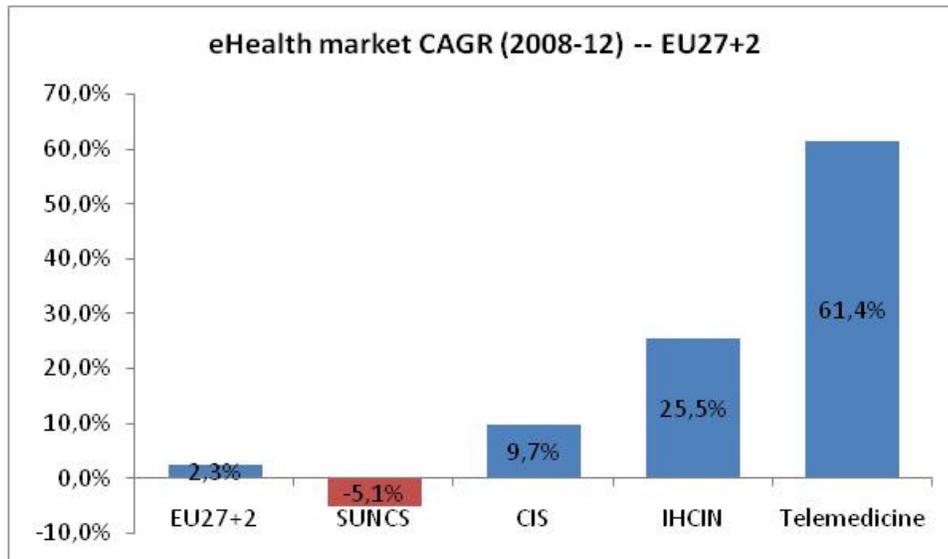
Market	Description
Clinical Information System (CIS)	Specialised tools for health professionals within healthcare institutions (e.g., hospitals). Examples are Radiology Information Systems, Nursing Information Systems, Medical Imaging, Computer Assisted Diagnosis, Surgery Training and Planning Systems. b) Tools for primary care and/or for outside the care institutions such as general practitioner and pharmacy information systems.
Secondary Usage Non Clinical Systems (SUNCS)	This category includes a) systems for health education and health promotion of patients/citizens such as health portals or online health information services. b) Specialised systems for researchers and public health data collection and analysis such as bio-statistical programs for infectious diseases, drug development, and outcomes analysis. c) Support systems such as supply chain management, scheduling systems, billing systems administrative and management systems, which support clinical processes but are not used directly by patients or healthcare professionals.
Telemedicine	Personalised health systems and services, such as disease management services, remote patient monitoring (e.g. at home), tele-consultation, tele-care, tele-medicine, and tele-radiology.
Integrated Health Network (IHN)	Distributed electronic health record systems and associated services such as e-prescriptions or e-referrals.

Capgemini Consulting has concluded that in 2008 Secondary Usage Non Clinical Systems (SUNCS) accounted for 71.6% of the total eHealth market in Europe. Clinical information systems (CIS), instead, represented about 13.5% of the total European eHealth market, while Integrated Health Care Information Networks (IHCIN) fare at about 5%. Finally, telemedicine accounted for a mere 0.9%. The following table provides an overview of the financial quantification of the four markets.

Table 3: Financial quantification of individual markets in 2008

% composition in 2008	Final composition	%
SUNCS	71.60%	
IHCIN	5.00%	
CIS	22.50%	
Telemedicine	0.90%	

Between 2008-2012, however, the situation is to evolve with a major shift from Secondary Usage Systems to Clinical Information Systems (SUCIS). This suggests that eHealth systems are targeted more towards supporting the operational processes of healthcare professionals. Capgemini Consulting has also identified a growing demand for integrated healthcare clinical information systems in light of an increasing need data sharing among healthcare delivery organisations. Together with CIS, IHCINs are expected to be responsible for about 80% of the eHealth market growth in the period 2008-2012. More importantly, both segments (CIS & IHCIN) promise the best prospect for the European eHealth industry in the medium and long term. The market for telemedicine systems and applications, finally, will continue to be small but growing rapidly suggesting that a true



adoption of this technology by providers, professional/medical staff as well as patients will take significant time.

Table 4 eHealth market CAGR (2008-2012) per market sector

These figures confirm what has been said at the beginning of this section: eHealth is not just a policy priority for the European institutions or individual member states. It represents significant commercial opportunity for European industry.

1.3 Concluding remarks

eHealth services can play an important role for the current and current and future delivery challenges to be faced by healthcare services in Europe. They can provide responses to the socio-economic challenges faced by European healthcare systems in the near and long term. Industry is also expected to continue to be involved in the development of these services as eHealth represents a considerable market of European and international industry players. However, in order to tap into these potentials, it is necessary that eHealth services are devised in such a way so as to respond directly to the specific operational needs of healthcare delivery stakeholders towards whom they are targeted. Essentially, eHealth services have to create value for all stakeholders by devising appropriate supporting business models. Failing to do so will just create a situation where healthcare professionals and institutions would lose trust in these solutions and, as a consequence, refrain from exploiting the positive externalities brought by these eHealth systems and solutions.

CHAPTER 2 **Extracting value from eHealth services: Evidence from the applicable literature**

The previous chapter has provided a snapshot of the overall policy developments and commercial environment of eHealth in Europe. This is an area that continues to provide economic and socio-economic potential assuming that eHealth systems continue to bring value to their stakeholders. The satisfaction of this condition requires the development of appropriate business models. Still, as argued in the following paragraphs, there is an evident paucity of comprehensive research activities aimed at the identification of business models supporting sustainable and value-generating eHealth applications. The following paragraphs discuss the findings from an illustrative review of recent EU-funded projects and relevant literature sources in the area of business modelling. This effort aims at extracting an initial set of guidelines for the development of business models for value creating eHealth systems. These will then be tested using the five illustrative case studies described in the next chapter.

2.1 **Value creation in eHealth: an overview of the results of EU-funded projects**

The issue of value creation by eHealth systems has been explored in several EU-funded projects. An initial consolidated attempt has been undertaken by the *European eHealth IMPACT study*. Its objective was to devise a generic, adaptable assessment framework for eHealth applications and services focused on the cost-benefit analyses (CBA) of 10 cases in Europe. Specific effort was made in the collection and analysis of direct and investment costs associated with the development and implementation of each case study, as well as in the estimation of the expected benefits in terms of quality, access and operational efficiency.¹⁶ The analysis also involved sensitivity analysis of multiple scenarios through different utilisation levels, estimation of annual and cumulative benefits and costs, productivity and distribution of benefits among the various stakeholders. The study concluded that the identification of the economic and financial benefits of eHealth needs to take into consideration the overall operational context within which these applications and services lie. More importantly, it has indicated the need to go beyond non-financial elements by considering issues like change management and organisational adaptation

¹⁶ An overview of the full project is available at Karl A. Stroetmann, Tom Jones, Alexander Dobrev, Veli N. Stroetmann [eHealth is Worth it: The economic benefits of implemented eHealth solutions at ten European sites](#), Final report prepared for the European Commission, 2006

within the healthcare delivery organisation for developing a specific eHealth system or application. Therefore, it concluded that future investors should not expect miracles and big-bang-type faultiness from complete eHealth applications, especially in more complex cases where large amounts of data and organisational effort is required. There is always a need for a long term vision.

A similar argument is also substantiated by the US Congressional Budget Office.¹⁷ Building upon the critical analysis of the findings of two US-based endeavours in this domain, it has been concluded that eHealth systems and applications can lead to financial benefits provided a set of non-financial operational conditions are put into place.¹⁸ Still, their adoption is not as rapid as expected since the positive financial returns depend on different factors ranging from implementation challenges, evolving legislative and procurement processes, perceptions of the expected positive results among all involved stakeholders, among others.¹⁹

The complexities of determining economic and financial returns of eHealth systems, which have been identified in the EU funded eHealth Impact study and the US Congressional Budget Office, highlight the challenges for the financing of these services especially because of the increasing mismatch between the health-related societal trends and the available financial resources.²⁰ The *Financing eHealth* study has dealt with this topic by discussing different financing models.²¹ It has opened its analysis with the argument that eHealth financing decisions need to take into consideration the overall “health care value chain” and the involved actors. It is clearly argued that eHealth systems for which investments are sought have to be interoperable, integrated and interconnected, allowing cross access to

¹⁷ US Congressional Budget Office, Evidence of the Costs and Benefits of Health Information Technology, Publication n.2976, May 2008

¹⁸ The study has examined and criticised the results from the following two studies conducted by RAND Corporation and Centre for Information Technology Leadership (CITL). The study conducted by the Health team of RAND Corporation aimed at quantifying US national-level efficiency savings (what results from the ability to perform the same task with fewer resources [money, time, personnel, etc.] brought about by using Health Information Technology (HIT) and comparing them to the costs the nation has to incur in order to be able to realize those savings. The CITL study instead aimed at quantifying US level efficiency savings brought about by using Health Information Technology (HIT) and comparing them to the costs the United States has to incur in order to be able to realize those savings. The focus of this report is primarily on examining the benefits associated with the interoperability of HIT systems. For the results from the RAND report, see Girosi, F. et alia Extrapolating Evidence of Health Information Technology Savings and Costs, Report MG-410, 2005, available on www.rand.org/health. The results of the study have also been presented in Hillestad, Richard and others. “Can Electronic Medical Record Systems Transform Health Care? Potential Health Benefits, Savings, and Costs.” Health Affairs, vol. 24, no. 5 (September–October 2005), pp. 1103–1117. For the Centre for Information Technology Leadership, see CITL, The Value of Healthcare Information Exchange and Interoperability, 2005 available at <http://www.ctil.org>.

¹⁹ This point is also argued in Walker, Jan, “The Value of Health Care Information Exchange and Interoperability.” Health Affairs, vol. 25, no. 6, 2005 Web Exclusive (January 19), pp. w5–10–18

²⁰ Although the analysis is limited to electronic health records, this argument is also confirmed in Garrido, Terhilda, “Effect of Electronic Health Records in Ambulatory Care: Retrospective, Serial, Cross Sectional Study.” British Medical Journal, vol. 330, no. 7491 (March 12, 2005), pp. 581–585.

²¹ The final report of this project is available at Alexander Dobrev et alia, Sources of Financing and Policy Recommendations to Member States and the European Commission on Boosting eHealth Investment, Final Report, December 2008.

data, in order to share data, information and knowledge. However, individual stakeholders have their own specific interests in designing and planning eHealth systems, leading to a situation where each type of eHealth investment has a profile of resources it requires in terms of type, volume and timing, which in turns determines the required financing arrangements.

Due to the multiplicity of actors and interests, the identification of the right supply of financing for the development and implementation of eHealth systems is important. The study concluded that, when examining eHealth investments, it is necessary to go beyond the quantification of financial resources. Instead, attention should be directed towards examining those areas of the healthcare delivery organisation which are expected to receive financial support. It is here that the operational benefits and difficulties are located.²² Therefore, the sustainability and value creation of eHealth investments require that financing should not be directed exclusively towards the coverage of specific direct costs of a new IT solution but has to include “soft” or “indirect” elements such as the development of new organisational capabilities to correctly manage the changes brought by the introduction of the eHealth system.²³

The *Financing eHealth study* has provided the basis for a more detailed analysis of the evaluation of socio-economic impact of electronic health-records as part of the *EHR Impact research* initiative. The study has confirmed the need to examine the issue of effectiveness of eHealth systems using a multidisciplinary approach. In particular, it has highlighted different adoption issues affecting the socio-economic impact of eHealth services, such as electronic health records and e-prescription: reimbursement mechanisms, organisational structures, networks, connectivity, and information governance. The first issue emphasises that healthcare providers have to consider the potential of having their eHealth service reimbursed although this may vary according to specific national systems. The second issue refers, instead, to the fact that the expected benefits of EHR and e-prescription require strong senior leadership and commitment. The last two factors (networks/interconnectivity and information governance) call for open and technologically neutral solutions when devising eHealth systems so as to facilitate their present and future integration with other relevant systems. Still, it is also necessary to consider applicable national and international legislative requirements, including those relating to security and privacy. The strategic objective, at the end, is to achieve positive network externalities, which state that the value of a specific network grows with the number of actors connected.

As clearly argued in the context of this study, the plurality of elements supporting the adoption of an EHR or e-prescription system emphasises the complexity of devising a

²² This point is also argued in Wang, S. “A Cost-Benefit Analysis of Electronic Medical Records in Primary Care” *The American Journal of Medicine*, vol.114, April 1, 2003, pp.397-403, see in particular pp.401-402

²³ The need to look beyond the financial implications when examining the feasibility of an IT system is not just argued within the healthcare research community but involves the large community examining the value of IT systems within organisations. In this context, interesting works are Ahituv, N. “A systematic approach towards assessing the value of an information system”. *MIS Quarterly*, vol.4,n.4, 1980, pp.61-75, Lederer AL et alia, “Process and reality in Information system benefit analysis” *Information System Journal*, vol.8, 1998, pp.145-162, Brynjolfsson, E. “Paradox Lost: Firm-level evidence on the returns to information systems spending” in Willcocks, LP, *Beyond the IT Productivity Paradox*, (John Wiley and Sons, 1999),

comprehensive ex ante or ex-post assessment methodology that embodies the various financial, organisational and technological factors leading to a successful implementation of eHealth systems. Actually, it has been argued that this is also a paradox, where “whilst the number of IT applications in healthcare and software programmes is growing (high dissemination), we still have insufficient understanding of how, why, and under what conditions such interventions might work (low evaluation)”. This argument has also been confirmed at the end of a recent systematic review examining the issue of the value of eHealth. This research endeavour concludes that over the last four years there has been a modest increase in the number of studies examining core factors leading to a successful implementation of health IT systems. Still, this increase has not been matched by a significant rise in research outputs providing in-depth descriptions of the implementation strategy, the overall financial context and the identification of the facilitators and barriers leading to their full delivery and sustainability, upon which it would be possible to devise generalised approaches or applicable best practices.²⁴

It is evident from the conclusions of the previous studies that eHealth systems produce value and achieve sustainability when they explicitly take into account socio-techno-cultural and organisational considerations and ²⁵ the interests of their potential adopters (e.g. patients, physicians, pharmaceutical industry and hospital administrators).²⁶

The previous studies have highlighted the lack of consolidated theoretical approaches for the identification of those financial and non-financial elements whose application can allow healthcare stakeholders to extract value from eHealth services. However, the need to identify the value proposition of IT-enabled applications or systems for the delivery of specific services by or within organisation is not just a requirement of the healthcare delivery organisations. Similar topics have also been discussed in the growing academic and research literature associated with the concept of business models, as briefly discussed in the next section.

²⁴ Southern California Evidence-Based Practice Centre, Cost and Benefits of Health Information Technology, Report prepared for Agency of Healthcare Research and Quality, US Department of Health, AHRQ n.06/E006 April 2006

²⁵ See for example, Bahol Rahimi, “Methods to Evaluate Health Information Systems in Healthcare Settings: A Literature Review” Journal of Medical Systems, vol.31, 2007, pp.397-432; similar conclusions have also been reached in the context of The Impact of eHealth on the Quality & Safety of Healthcare: A Systemic Overview & Synthesis of the Literature, Report prepared for Report for the NHS Connecting for Health Evaluation Programme, 2008, see in particular pp.286-309:

²⁶ The importance of the stakeholders’ operational interests reflected in the functionalities of an eHealth system has been strongly emphasised in the evaluation of It solutions for barcodes, chronic diseases management, Inpatient Computerized Provider Order Entry, by Agency for Healthcare Research and Quality, National Resource Center for Health IT, U.S. Department of Health and Human Services. See, in particular, Hook J, Pearlstein J, Samarth A, Cusack C. Using Barcode Medication Administration to Improve Quality and Safety: Findings from the AHRQ Health IT Portfolio AHRQ Publication No. 09-0023-EF, December 2008.; Dixon BE, Hook JM, McGowan JJ. Using Telehealth to Improve Quality and Safety: Findings from the AHRQ Portfolio AHRQ Publication No. 09-0012-EF, December 2008; Dixon BE, Zafar A. Inpatient Computerized Provider Order Entry (CPOE): Findings from the AHRQ Portfolio AHRQ Publication No. 09-0031-EF, January 2009. The publications are available for download at <http://healthit.ahrq.gov> (visited 10 April 2009)

2.2 Understanding Business Models: An overview of the available literature

The term “business models” has been initially coined as a generic term to describe the overall logic of the activities of an organisation. Although this notion appeared for the first time in academic literature in 1957, its common use started during the 1990s, as has the rise of different definitions.²⁷ Several authors see business models as the description of key components defining a specific business idea.²⁸ Therefore, their research has focused on examining the interactions within a system of suppliers, distributors, commerce service providers and infrastructure providers.²⁹ Others, instead, prefer to examine the notion of business models by identifying roles and relationships among a firm’s customers, allies, and suppliers, major flows of product, information and benefits for all participants.³⁰ Irrespective of the specific differences, these authors consider business models as the way an organisation can organise itself so as to extract value to increase its overall financial value.³¹

Irrespective of the different semantic approaches, there seems to be a consensus about the core components of a business model: *the consolidation of a specific set of strategic objectives, the identification of business scope and associated market segment(s) and, finally, the mapping of products, alliances, key supporting activities and value-chain relationships and dependencies to achieve financial value.*³² This consensus is essential since it allows differentiating the notion of business model from strategy. Business model allows the strategist to consider and reflect upon how activities of an organisation work to execute a specific strategy. Therefore, if the strategy refers to the main activities of a firm, then the business model framework helps to

²⁷ An interesting overview is provided in Hedman, J and Kalling, T. “The Business Model Concept: Theoretical Underpinnings and Empirical Illustrations”, European Journal of Information Systems, vol. 12, n.1, 2003, pp.49-59; see also Pateli, A. “A Framework for Understanding and Analysing eBusiness Models Paper presented at 16th Bled eCommerce Conference “eGlobal” Conference, June 9-11, 2003 available at [http://domino.fov.uni-mb.si/proceedings.nsf/Proceedings/4C84233423603AD0C1256EA1002D1A29/\\$File/25Pateli.pdf](http://domino.fov.uni-mb.si/proceedings.nsf/Proceedings/4C84233423603AD0C1256EA1002D1A29/$File/25Pateli.pdf) (visited 15 March 2009)

²⁸ Seppanen, M. Business Model Concept: Building on Resource Components, Doctoral Thesis, Tampere University of Technology, 22 August 2008, p.3

²⁹ This is the approach taken by Alt. R and Zimmerman, H.D.”Introduction to Special Section: Business Models” Electronic Markets, vol. 11, n.1, 2001, pp.3-9

³⁰ Gordijn, J. “What’s in an Electronic Business Model? Paper presented at Knowledge Engineering and Knowledge Management - Methods, Models, and Tools, 12th International Conference, 2000 available at <http://www.cs.vu.nl/~hans/publications/EKAW2000.pdf> (visited 15 March 2009); see also. Gordijn, J et alia “Business modelling is not process modelling”, In: Conceptual modelling for e-business and the web (ECOMO-2000), Springer-Verlag, LNCS 1921, Salt Lake City, USA, October 9-12, 2000, pp. 40-51., 2000

³¹ This classification is taken from Richardson, James E., The Business Model: An Integrative Framework for Strategy Execution(September 1, 2005). Available at SSRN: <http://ssrn.com/abstract=932998> (visited 15 March 2009)

³² For an comprehensive overview of this approach see Linder, C and Cantrell, S Changing Business Models: Surveying the landscape, Research Report, Accenture Institute for Strategic Change, 24 May 2000, available at http://www.accenture.com/NR/rdonlyres/0DE8F2BE-5522-414C-8E1B-E19CF86D6CBC/0/Surveying_the_Landscape_WP.pdf (visited 15 March 2009)

create a consistent logical picture of how all of the firm's stakeholders and actors interact to form a strategy.³³ In particular, it aims at mapping the interactions among all the stakeholders based on their interests.³⁴ Therefore, as a starting point, it requires the identification of each stakeholder, its roles and value.³⁵ By examining the interactions among them, it would be possible to obtain results about the performance of a specific business model. Irrespective of its sophistication, this methodological approach is inward looking since it focuses on understanding how a specific organisation is expected to extract value from its interactions with all actors involved in a specific market. Stakeholders outside the firms, such as customers or users, are seen as static exogenous factors whose interest is identified in advance.³⁶ Should the interests of these exogenous actors evolve, there is the need for adapting the underlying business model of an organisation serving their interests through the production of goods and services. Dynamic changes of the interactions, therefore, are limited to stakeholders inside an organisation such as business managers responsible for specific operations and procedures.

The previous paragraphs demonstrate that the notion of business model is primarily inward looking and financially focused. This inward looking approach, nevertheless, provides interesting insights if applied to eHealth. It confirms that the value of eHealth requires that the organisations' stakeholders work together towards the same direction and share similar interests and objectives. A business model, therefore, is required to structure and orchestrate these interests. This orchestration involves the development of appropriate technological tools and the implementation of supporting processes and procedures which structure the interactions and relationships mapped by a business model. Finally, literature has also crystallised the difference between strategy and business model. This distinction is extremely useful when applied in an eHealth context. Strategy provides the supporting argument of why a healthcare delivery organisation is to implement a specific eHealth application or system. A business model, instead, defines the operational structure of how this eHealth system is to be implemented. The two elements are to be totally linked since divergences are expected to impact the financial investment on an eHealth system with suboptimal results.

2.3 Linking eHealth to the business model literature

This chapter makes it evident that the identification of potential links between the eHealth literature and literature associated with business modelling is complex. This situation

³³ Magretta, J. "Why Business Models Matter" *Harvard Business Review*, May 2002, pp.86-92

³⁴ See Malone, T, et alia "Do Some Business Models Perform Better Than Others" MIT Sloan Working Paper, Ma6 2006 p.2-4

³⁵ Grasl, O. "Business Model Analysis: A Multimethod Approach" in Dumas, M. and Reichter, M. *Proceedings of Business Process Management*, 6th International Conference, BPM 2008, Milan, Italy, September 2-4, 2008. Published in Lecture Notes in Computer Science, vol.5240, 2008

³⁶ Gordijn, J. "A Design Methodology for Trust and Value Exchanges in Business Models" Paper presented at 16th Bled eCommerce Conference "eGlobal" Conference, June 9-11, 2003 available at [http://domino.fov.uni-mb.si/proceedings.nsf/Proceedings/B79DB31A6F902FA4C1256EA1002D8C1E/\\$File/31Gordij.pdf](http://domino.fov.uni-mb.si/proceedings.nsf/Proceedings/B79DB31A6F902FA4C1256EA1002D8C1E/$File/31Gordij.pdf) (visited 15 march 2009)

should not stop from identifying theoretical guidelines supporting the structuring of business models for creating value from eHealth services.

The first key element linking the surveyed literature is the shared view that the value of business models is not just linked to technology but to the identification of a supporting business model where stakeholders' interests are represented and all appropriate operational elements are considered: customer segmentation, value proposition, communication and distribution channels, customer relationships, revenue streams, key resources, key activities, partner network and cost structure. Still, there are differences in the literature. While in the case of business literature this specific requirement is primarily limited to modelling individuals and activities for extracting value from within an organisation, in the case of eHealth the overall context involves society as a whole. Therefore, when devising a business model for an eHealth system it is necessary to identify the value to be gained by an individual (patient, physicians, nurse, citizens, social security officials etc...).³⁷

The exact connotation of this notion of value differs between business models supporting commercial objectives and those associated with eHealth. While in the first case, the literature equates value with a pure financial return, in the case of eHealth the overall context varies as intangible internal and external elements need to be taken into consideration in addition to specific monetary terms. For internal elements, it is possible to consider specific benefits associated with activities within healthcare delivery organisations such as, the reduction in clinical mistakes, and decline in hospitalisation time, enhancement of executive reporting or the improvement of the image of a healthcare delivery organisation, to name a few. For external elements, it is possible to consider social benefits instead, such as decline in transportation costs and time due to the electronic delivery of a specific cure via telemedicine or less anxiety and stress for patients.³⁸

The starting point is the identification of the overarching business strategy of the specific healthcare delivery organisation associated with the introduction of an eHealth service. This needs to consider the broader healthcare environment within which the organisation operates. It requires, therefore, the identification and modelling of specific socio-economic, funding and regulatory drivers and influences. The starting point is the precise identification of the "as-is" organisational model that the proposed eHealth system is set to serve. This activity involves the development of an agreed understanding of the capabilities and interactions within a specific healthcare delivery organisation, with a specific focus on the identification of specific definitions. Based on the result of this analysis, it is then important to identify the clinical transformation objectives that a specific eHealth system is to achieve by identifying the expected clinical and societal objectives. This process should include all relevant stakeholders and clinical staff since they will need to identify these objectives and, more importantly, prioritise them.

³⁷ This point is strongly argued on a recent qualitative assessment of factors affecting the implementation of eHealth available at David Boddy et alia "The Influence of Context and Process when Implementing e-health", BMC Medical Informatics and Decision Making, vol.9, n.9. January 2009 available at <http://www.biomedcentral.com/1472-6947/9/9/pdf>

³⁸ An interesting approach in this context is Buccoliero, L. "A Methodological and Operative Framework for the Evaluation of an eHealth project", International Journal of Health Planning and Management, vol.23, 2008, pp.3-20 published online on 4t May 2007

These two tasks have to be supplemented by a precise understanding of all applicable national and international regulatory and legal elements that can affect the safe delivery of the eHealth system. More importantly, it is necessary to identify the funding mechanisms for the development and implementation and its following sustainability. In this context, particular attention may be directed to CBA/CBE assessment, although non-financial aspects are to be considered and quantified. Particular attention should be directed to examining issues such as staffing constraints, system operator and maintainer (user) skills; training time available and cost limitations for formal, informal and on-the-job skill development, and acceptable levels of human and system performance. Based on the results of these activities, it would be possible to design a comprehensive business models supporting the introduction of a specific eHealth system.

In the following chapter, the report will test these initial conclusions via a five illustrative case studies of eHealth systems that are financially sustainable and have brought value and sustainability.

CHAPTER 3 **Extracting value from eHealth systems: Lessons from five case studies**

This chapter presents the business models of five value creating and sustainable eHealth systems in Europe in each of the four market segments identified by the European Commission in its Lead Market Initiative.³⁹ Building upon the results of the previous chapter, it provides additional evidence for the identification of guidelines and public policy actions for the development, implementation and delivery of value creating and sustainable eHealth systems in Europe. The chapter opens with a description of the analytical framework used to examine and compare the case study.⁴⁰

3.1 **Case study framework**

Building upon the elements presented in the previous chapters, the following two macro areas have been specifically examined for each case study: business model mapping and performance mapping. The first one describes the elements underpinning the business model of the case study, such as:

- Customer segments – For whom is the *eHealth service* creating value?
- Value proposition – What does the *eHealth service* offer to the market?
- Distribution channels – Through which communication and distribution channels is the *eHealth service* reaching the targeted users?
- Customer relationship – Which different customer relationships are developed and maintained in the business model?
- Revenue streams – What are the revenue streams of the *eHealth service*?
- Core capabilities – What are the core capabilities of the *eHealth service*?
- Value configuration – What are the main activities in developing capabilities into a value proposition?
- Partner network – With which partners have they worked together throughout the eHealth service process?
- Cost structure – What are the most important costs of the *eHealth service*?

³⁹ For information see European Commission, “Lead Market Initiative-Accelerating the Development of the eHealth Market in Europe-Lead Market Initiative” 2007, available at http://ec.europa.eu/information_society/activities/health/docs/publications/lmi-report-final-2007dec.pdf

⁴⁰ Case study selection methodology is available in the annexes

Performance mapping, instead, identifies specific factors whose combination has led to the sustainability of an eHealth system. These are:

- What benefits are provided by the eHealth service to its stakeholders?
- What made the eHealth service successful/sustainable (finance-model, stakeholder adoption, cost reduction, structure)?
- Which building blocks of the business model caused the sustainability of the service?

In order to identify and compare business model and performance mapping for each identified eHealth system, particular attention was directed to describe the following five elements for each case study:

- Situation overview
- Value chain
- Business model analysis
- Impact analysis
- Best practice identification

In the section situation overview specific attention was directed to identifying the overarching socio-economic and operational drivers pushing for the development of the case study. Meanwhile, in the section value chain, the focus has been on mapping all relevant partners and/or other stakeholders involved in the case study, as well as their interactions. The section business model analysis, instead, examines the evolution of the underlying business model of each case study building upon the approach proposed by Osterwalder⁴¹ since it focuses on the identification of both financial and non-financial elements. In particular, Osterwalder focuses on four main areas:

- Offer;
- Client;
- Resources;
- Financial performance.

Each component involves different building blocks as outlined in the following table:

Table 5 The building blocks of a business model (Osterwalder, 2009)⁴²

Business model component	Building blocks
Offer	Value proposition
Client	Client segments
	Distribution channels
	Relationships

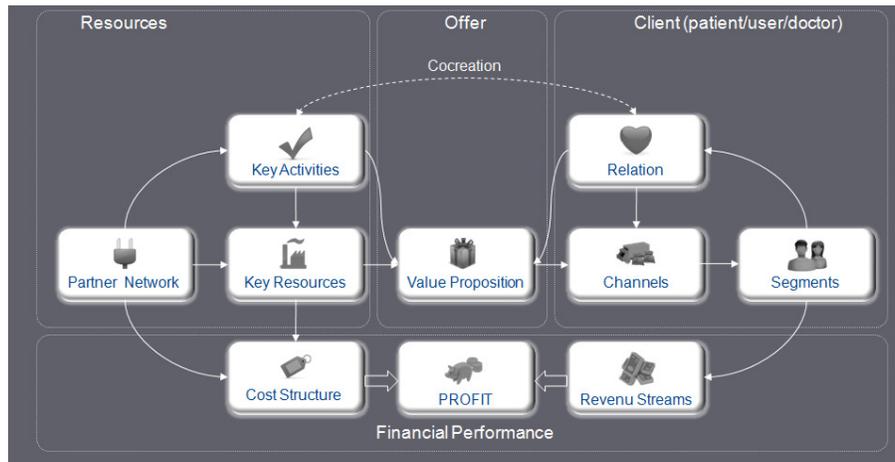
⁴¹ Osterwalder, A. (2004). *The Business Model Ontology: A proposition in a design science approach*. PhD Thesis University of Lausanne.

⁴² Adapted from Alexander Osterwalder, Business Model Generation available at <http://www.businessmodelgeneration.com/> (visited 30 June 2009)

Resources	Key activities
	Key resources
	Partner network
Financial performance	Cost structure
	Revenue streams

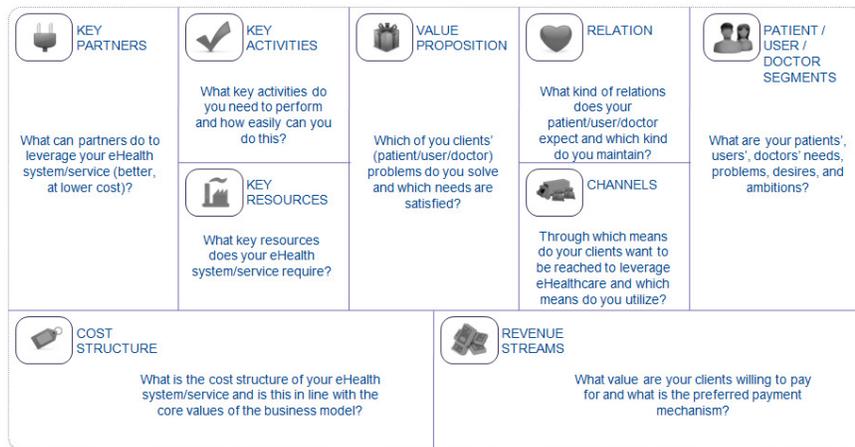
However, as strongly argued by Osterwalder, each building block does not operate in isolation but interacts with the others. This means that analysis of a business model should aim at understanding these inter-relations as summarised in the next picture.

Figure 2 Business model interactions (adapted from Osterwalder, 2009)



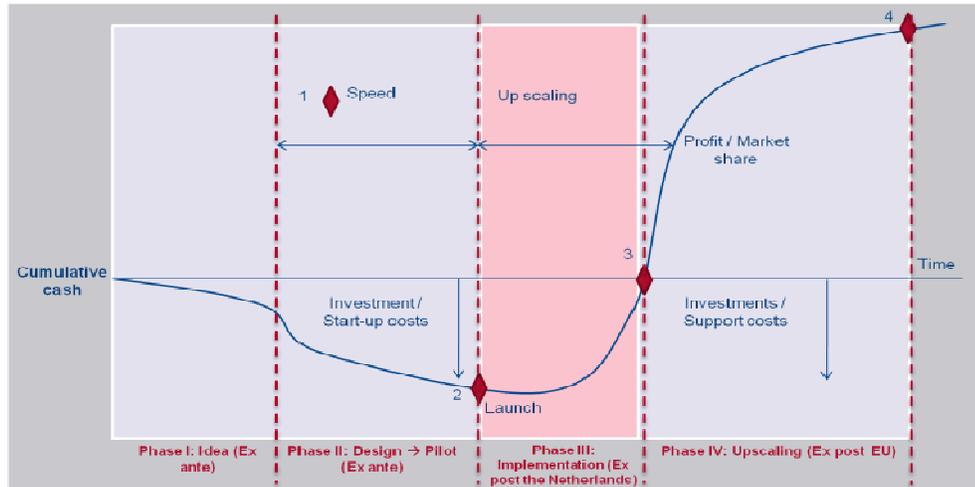
The analysis of these interactions, in any case, needs to be tailored to the eHealth domain, as described in the next picture.

Figure 3 Building blocks of the business model



Having identified the underlining business models of each case study, attention was directed to performing an impact analysis as to understand the operational consequences associated with the introduction of the specific eHealth service. A specific focus has been directed to understanding specific internal and external benefits brought forward by the

eHealth system examined in the case study. For internal benefits, the analysis considers specific effects within healthcare delivery organisations such as the reduction in clinical mistakes, decline in hospitalisation time, enhancement of executive reporting or the improvement of the “brand” of a healthcare delivery organisation. External benefits refer to socio-economic implications such as decline in transportation costs and time due to the electronic delivery of test results or less anxiety and stress for patients.⁴³



The analysis has been assessing distinctions in relation to each of the four building blocks of a business model: resources, offer, client, and financial performance. Benefits in the areas of resources and financial performance are usually internal, which means within the healthcare delivery organisation owning the eHealth system; still, it must also be noted that certain financial implications of eHealth implementations may affect interested third-parties who are part of the overall value chain such as insurance companies or national public health authorities in terms of lower claims due to efficiency gains. At the same time, benefits in the Offer and the Client domains are primarily external, such as patients’ stress.⁴⁴

In the Resources domain, IT applications can affect the way healthcare activities are performed and consequently, which partners are needed. Therefore, the analysis of the case studies should aim at responding to the question: “*What attributes in the healthcare service changed by adding electronic systems/services?*” At the same time, a change in resources, caused by, for example, a partner who could deliver a successful eHealth application resulting in more efficient processes can also lead to changes in the financial performance in terms of cost reduction. Should this be the case, the analysis should be able to answer the question: “*What attributes in the cost structure changed in order to achieve cost effectiveness? And, which new revenue streams have been identified in order to create new*

⁴³ An interesting approach in this context is Buccoliero, L. “A Methodological and Operative Framework for the Evaluation of an eHealth project”, *International Journal of Health Planning and Management*, vol.23, 2008, pp.3-20 published online on 4t May 2007

⁴⁴ Bahol Rahimi, “Methods to Evaluate Health Information Systems in Healthcare Settings: A Literature Review” *Journal of Medical Systems*, vol.31, 2007, pp.397-432.

financial value for making the eHealth service financially sustainable?” The elements are usually described in an s-curve model per healthcare service giving an overview of the investments/costs, revenues, profit, and maturity during the entire development and implementation phases of an individual eHealth system.⁴⁵

The structuring of an s-curve is not always possible especially when a system is not aimed at providing direct positive financial returns but rather to provide socio-economic benefits. As previously argued, the sustainability of eHealth systems cannot be measured exclusively via a financial perspective. The measurement must also include “soft” elements such as the development of new organisational capabilities to correctly manage the changes brought by the introduction of the eHealth system.

When examining external benefits, the most important ones are primarily social and apply to relevant stakeholders such as, patients, relatives, voluntary aid givers or general practitioners. These benefits are usually measured in terms of ownership, trust and commitment by all end-users to exploit the functionalities of an eHealth system.⁴⁶ Stakeholders’ needs and requirements can be viewed as measurable parameters for the identification of external benefits. This can be measured via consumer relevancy model based on Maslow’s hierarchy of needs⁴⁷. This model indicates that all client-centric transactions can be reduced to five essential elements – price, product, service, access, and experience⁴⁸ as described in the following table. It is evident that a value-creating and sustainable eHealth system has to provide benefits in all five factors.

Table 6 Impact analysis factors

Attribute	Overview
Access	Ease in accessing and exploiting the functionalities for performing specific activities.
Product	Level of performance and innovation brought by the eHealth system in the delivery of a specific healthcare service
Price	Value for money
Service	Level of flexibility and scalability of the eHealth system to accommodate new functionalities

⁴⁵ Adapted from Giesen, D.J.E., Van de Vrande, V., and Klokgieters, K.K. (forthcoming). *Business model innovation: the role of co-creation in the realisation of business model change*

⁴⁶ See also Paul, D. L. et alia “Assessing technological barriers to telemedicine: Technology-management implications” *IEEE Transactions for Engineering Management*, vol.46, n. 3, 279–288, 1999, Nir M. “Factors affecting the adoption of telemedicine: A multiple adopter perspective” in *Journal of Medical Systems*, vol.28, n.6. December 2004, pp.671-632: Leonard, K. “The Role of Patients in Designing Health Information Systems: The Case of Applying Simulation Techniques to Design an Electronic Patient Record (EPR) Interface” *Health Care Management Science* vol. 7, pp. 275–284, 2004 Edward C. Conley et alia “Simultaneous trend analysis for evaluating outcomes in patient-centred health monitoring services” *Healthcare Management Science* vol.11, (2008), pp.152-166

⁴⁷ Maslow, A. H., *The Farther Reaches of Human Nature*, 1968

⁴⁸ Crawford, F. & Matthews, R. (2001). *The Myth of Excellence: why great companies never try to be the best at everything*. Crown Business, UK, June, 2001.

Experience/ Intimacy	Level of emotional connection with the healthcare service
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3.2 Case studies

Having introduced the analytical framework, the following paragraphs apply it to each of the cases studies. As anticipated, the analysis involves five illustrative case studies, each one of them covering the eHealth sectors described in the context of the EU Lead Market Initiative. These are:

Case study	Lead Market Initiative classification
Telemedescape	Clinical Information System (CIS)
CUP	Secondary Usage Non Clinical Systems (SUNCS)
Tactive	Telemedicine
UCLH	Telemedicine
Naviva	Integrated Health Network (IHN)

3.2.1 Telemedescape

Situation overview

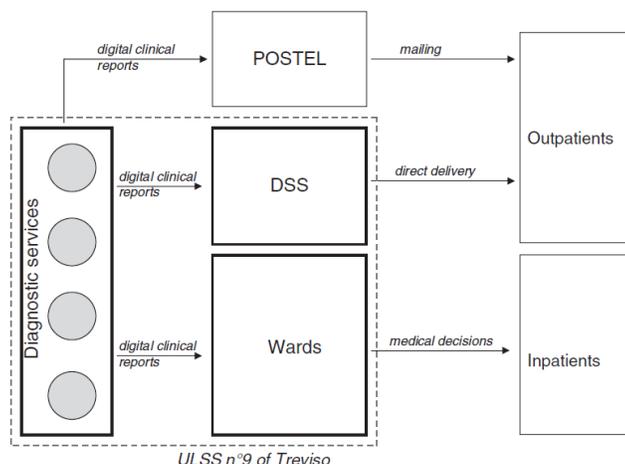
Telemedescape is an electronic managing system for digitally signed test results. The system has been developed by the local health authority n.9 of Treviso, one of the prominent cities of Italy’s Veneto region. This authority provides healthcare services to 407,000 citizens distributed over 37 municipalities. It employs 4300 individuals and involves 500 specialists and GPs. The main hospital is based in the city of Treviso with a small unit in Oderzo. The two structures have 1272 hospital beds and 70 wards that manage over 55,000 admittances per year.

Telemedescape provides the following functionalities. First, it allows for the digitalisation of clinical documents produced by the diagnostic services of the laboratories and radiology departments of the Treviso main hospital for forwarding to units and wards. The same process is applied to clinical documents produced by the hospital diagnostic centres and sent to the six local health districts which forward them to patients. Currently, the system allows for an average of 7000 digitally signed test results daily.⁴⁹ In 2003, these functionalities have been extended with the possibility of sending clinical documents directly to patients using Postel, the printing and delivery service of Poste Italiane, Italy’s postal service operator. With this system, the hospital diagnostic services send the digital document to Postel, which prints them and mails them to patients who have given their consent to this form of document delivery. The following picture provides an overview of the system.⁵⁰

⁴⁹ Elio Soldano, “Verso un ospedale senza carta” Presentation at Security Summit 2009, 9 June 2009, Rome

⁵⁰ Picture taken Buccoliero, L. “A Methodological and Operative Framework for the Evaluation of an eHealth project”, *International Journal of Health Planning and Management*, vol.23, 2008, pp.3-20 published online on 4t May 2007

Figure 4 Telemedescape architecture



In 2009, the functionalities of the system have been further extended through the electronic delivery of clinical documents directly to patients. This new functionality uses the IT infrastructure of Postesalute, the eHealth unit of Poste Italiane. Clinical documents are digitally signed by diagnostic services of the hospital who then forward them to patients who can securely access them from their PC. Since its launch, over 1600 test results have been accessed and downloaded daily and there are projections of reaching a total of 600,000 by the end of the year.⁵¹ This service is presently offered for free although the local health authority is considering applying a small charge. Moreover, it is important to emphasise that these digital documents have full legal validity since they are digitally signed in line with all applicable Italian legislation. The next step in progress is to consolidate an electronic patient record using the current IT infrastructure so that patients can store their medical records for a pre-defined time.

Figure 5 Postesalute Screenshot



⁵¹ Soldano, ibid.

The system cost EUR 400,000 for system integration and software development by external partners. Internal costs have been calculated to be 24 man-months, out of which:

- 2 man-months were for hospital staff;
- 18 man-months for administrative staff;
- 4 man-months for IT staff.

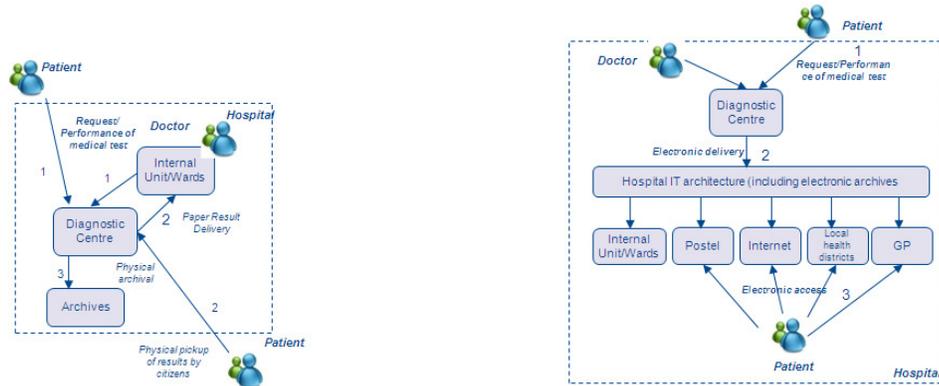
Regular maintenance costs range at around EUR 20,000 to cover external consultancy support while internal efforts have been quantified as 2 man-months.

Teledescape is currently being integrated with local pharmacies and is becoming the underlying infrastructure for the development of a regional health patient record system. Finally, the system has entered the Reuse programme, an initiative of the Italian government that facilitates the re-use of successful IT services by other local authorities. In the case of Teledescape, the solution is in the process of being implemented by the Lazio region.⁵²

Value chain

The network and partners in both the healthcare value chain as well as the eHealth value chain associated with this service are visualised in the following two pictures.

Figure 6 Teledescape value chain evolution (pre and post)



The picture on the left describes the state of affairs prior to the implementation of the Teledescape system. Within the hospital, the entire process was based on paper and therefore labour intensive and prone to errors and delays. If tests were provided to outpatients, citizens were required to physically come to the hospital in order to collect them. Meanwhile, the Treviso hospitals and its diagnostic centres were forced to keep paper copies in compliance with applicable national legislation. The introduction of the system has completely changed the situation. Diagnostic centres can provide test results electronically to hospital units and wards. At the same time, outpatients can access them online from the comfort of their home or receive them by mail. The patient can still go to local authorities for picking up the clinical documents should this be required. At the same time, the Treviso hospital is able to cut on storage by saving the documents electronically

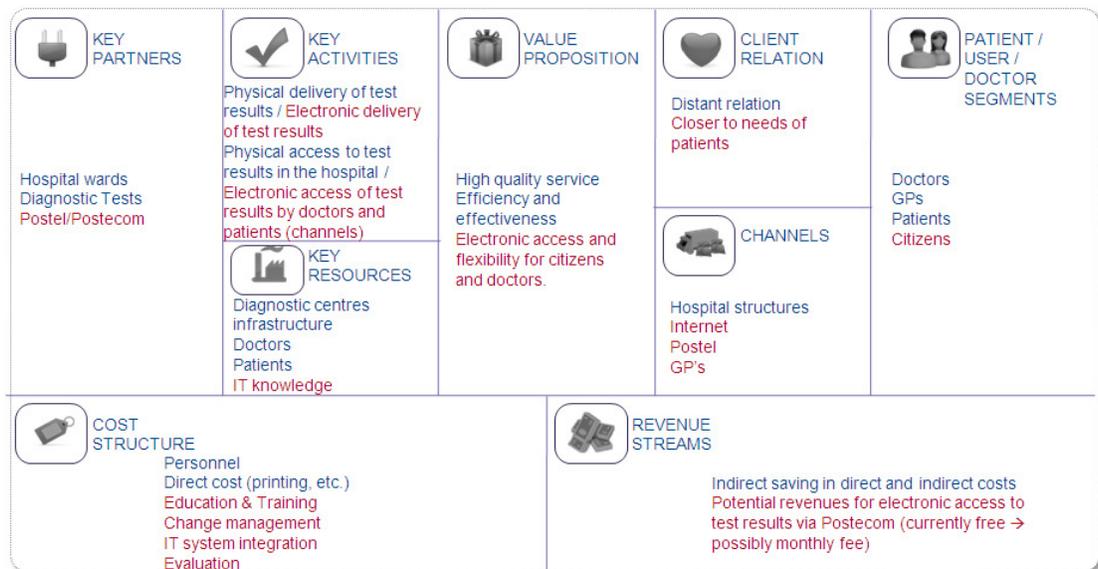
⁵² Soldano, *ibid.*

by applying all the required technical controls so as to maintain compliance with national legislation.

Business model analysis

Telemedescape has substantially changed the underlying business model of delivering and managing test results. First, it has extended it by allowing both electronic and physical delivery of clinical documentation. Moreover, as soon as all the technical and organisational issues are addressed, GPs and pharmacies are also expected to be provided access to these electronic documents via the electronic patient record functionalities devised by Postesalute.

Figure 7 Telemedescape: business model changes



N.B: Red text indicates changes brought by the introduction of the eHealth system

Telemedescape has also increased the value proposition of the delivery and management of clinical documents. It has provided patients flexibility of access and the possibility of choosing how to receive the results of their clinical test. Therefore, the Treviso hospital has decided to come closer to the needs of patients by providing a set of new channels for the delivery of clinical test results. The development of Telemedescape has led to additional costs, including expenses for education and training of the medical staff and change management. Overall, the local health authority has organised a total of 300 days of training of which over 100 were for medical staff and the rest for administrative and IT personnel.⁵³ However, as argued later, these costs have been offset by the efficiencies gained both internally at the hospital and externally with the citizens.

Particular attention has also been directed to evaluate the performance of the system to identify possible corrective actions should these be needed. Nevertheless, these costs have

⁵³ Data from CNIPA, Programma di Riuso available at <http://riuso.cnipa.gov.it/soluzioni/anteprema.bfr?id=252> (visited 10 September 2009)

been offset by gains in internal efficiency and the consolidation of an “innovation brand” of the Treviso hospital. Finally, it is possible to foresee a raise in revenues should the Treviso Hospital and its IT partner Postesalute decide to levy a charge for those patients who want to access their clinical documents electronically. Currently, the system is still provided for free.

Impact analysis

The section highlights the internal and external benefits related to the Telemedescape system.

Internal benefits

The introduction of the digitalisation of the production and distribution of clinical documents produced by diagnostic laboratories has led to operational efficiencies. First, the process of production and delivery of clinical tests has been cut by 50% since hospital staff is not expected to prepare documents to be collected by patients. Now, as soon as the clinical document is prepared electronically, it is digitally signed by the responsible doctors and sent to the patients electronically or via the Postel service. The hospital has quantified that this has allowed the reallocation of staff leading to EUR 480,000 in direct savings. In terms of direct costs, the system allows for savings of EUR 42,000 in consumables (printing, cartridge, etc.) and EUR 15,000 in storage space on a yearly basis.⁵⁴ The system has also allowed for the reduction of mistakes associated with the physical management of the clinical documents. It has also simplified the overall verification and correction process should mistakes be found. The evaluation of the initiative has concluded that the introduction of the system has led to a 10% decline in clinical mistakes and therefore to better patient care.

An additional internal benefit is associated with the significant reduction (from 23 to 11 hours) in the average waiting time related to the delivery of clinical documents to patients for diagnostic and therapeutic purposes. This aspect is extremely important from a clinical perspective since it implies greater timeliness of diagnosis and the possibility of starting targeted care in shorter timeframes.⁵⁵

External benefits

Access by patients is the main benefit associated with Telemedescape. Access can be quantified in reduction of transportation cost and time devoted to picking up reports. An independent evaluation of the system has quantified these benefits at EUR 4,072,826 associated with the delivery of clinical documents via Postel service.⁵⁶

This has been calculated estimating patients’ transportation costs to physically collect a report via private means (car) and via public transport. The cost of time spent in picking up the report was added via an estimation of the utility loss based on the opportunity cost method. These external benefits are not just limited to the Treviso hospital. A near-by local

⁵⁴ Data from Silvia Giovannetti, “AziendaULSS9–Treviso: Da ESCAPE al Libretto Sanitario Elettronico” Presentation at LUISS eHealth Executive Master, Rome, 18 May 2009

⁵⁵ See Buccoliero, L. *ibid.*

⁵⁶ See Buccoliero, L. *ibid.*

health authority has also implemented a similar system in 2006. After two years, over 40% of laboratory test results were accessed and reviewed on the Web.⁵⁷

Best practice identification

The analysis of the case study allows for the identification of the following best practices.

- It is important to emphasise continuous strong senior management support. The Director General of the ULSS 9 Treviso hospital has conceived the strategic nature of the project and has pushed for it during all of its phases. Together with his staff he had a clear strategic vision of Telemedescape as a core IT infrastructure through which it would be possible to move the local authority towards the full implementation of an electronic patient record and the networking of other interested actors such as pharmacies and specialist doctors. Essentially, there was a strong willingness to preserve the reputation of innovative of the healthcare delivery organisation.
- Senior management was also committed to support change management. It was evident that the introduction of this system was going to have a direct impact on the daily activities of medical and administrative staff. This called for training and support for change management to ensure that staff was not going to be “scared” by the introduction of Telemedescape. Instead, they could appreciate the efficiency that this tool was going to bring to their daily activities.
- Throughout the entire development of the system, the staff was given time to participate in the design and implementation of the system as to avoid the situation where staff was going to go back to carrying out their activities as they did prior to the arrival of Telemedescape.
- Strong senior management was also confirmed by the commitment to the decision of independently evaluating the system performance. This evaluation involved both qualitative and quantitative elements and was aimed at understanding not only the internal benefits but also the benefits for patients and citizens as a whole.

3.2.2 Centro Unico di Prenotazione (CUP) Umbria-Farmacup (SUNCS)

Situation overview

The Centro Unico di Prenotazione (CUP) is an electronic solution allowing patients to book, re-schedule, cancel and pay for specialist visits or laboratory tests requested by their GPs. The system support the following functionalities: after a visit to a GP or a hospital stay, a patient is prescribed laboratory tests or a visit with a specialist. He/she goes to a CUP contact point where the operator suggests possible appointment slots. At the time of the booking, the patients can pay the required ticket, unless special conditions apply. They may also visit the CUP contact point for cancelling the visit or a test or for rescheduling to a new date.

The system is targeted to serving patients who are resident in Umbria, a region in central Italy. Currently, the region has a population of over 872,967 inhabitants, about 400,000 of them residing in rural areas. In fact, the population density is just over 100 citizens per

⁵⁷ Arsenal.it, 2007 Observatory and Projects on Telemedicine Applications, Notebook 1/2008 pg.86

square km. Its population is rapidly aging and at the present time, over 55% of the population is over 50 years old, of which more than 70% resides in rural areas.⁵⁸

From an IT perspective, the system has a relatively simple client-server architecture supported by a centralised database hosted by Webred, the in-house IT company of the Regional Government of Umbria. It is based on an intranet composed of six interlinked communication infrastructures, one for each regional local authority. Webred also provides first and second level helpdesk support and assistance during the negotiated standard office

IT

hours. Due to the sensitivity of the data handled by the system, strong authentication has been implemented.

⁵⁹



CUP development started in 1999 with the initial integration of the individual system for each local authority. The first version of the system was released in the year 2000 and jointly involved all six local authorities as points of contact. Afterwards, it was decided to also directly link to all 266 pharmacies operating in the region, 144 of them operating in rural areas. The system also links 487 specialist doctors and laboratories that have signed a reimbursement agreement with Umbrian regional healthcare authorities. While the specialist doctors act as service providers, the pharmacies are CUP contact points.

Future plans involve the integration of the CUP

system with local GPs to create a comprehensive regional e-prescription service following the current test involving 15 GPs. The regional CUP system is directly linked to Italy's Ministry of Economics and Finance and the Ministry of Health as part of the regular information exchanges regulating the reimbursement between the central government and Umbrian regional health authority. According to official statistics, in 2009 the CUP system has handled 4.6 million transactions, equally distributed between requests for tests and specialist visits. Of these transactions, 25% have been via pharmacies, which represent a 3% increase compared to 2008. The remaining has been done directly from the main regional hospitals in Perugia and Terni and the four other local health centres.⁶⁰

Value chain

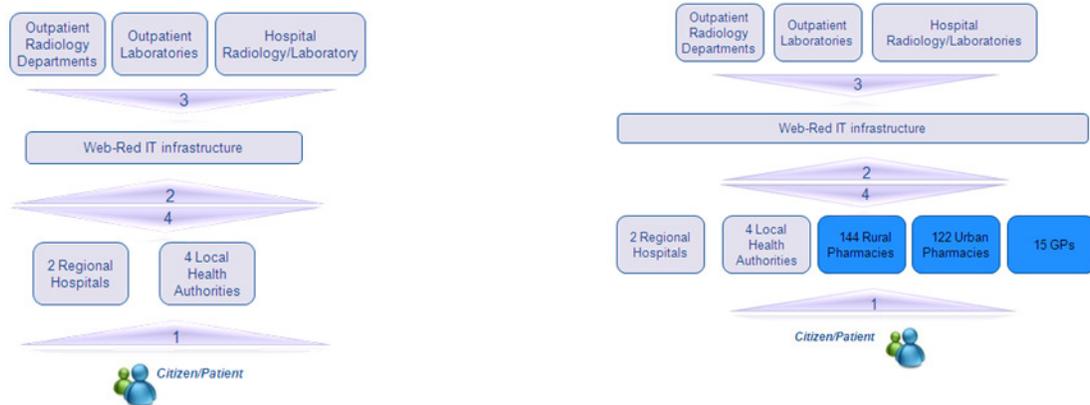
The network and partners in both the healthcare value chain as well as the eHealth value chain associated with this service are visualised in following picture.

⁵⁸ Data extracted from Istituto Nazionale di Statistica, Conoscere l'Umbria vol.12-2008 (Perugia: Istituto Nazionale di Statistica, 2008)

⁵⁹ Interview with Francesco Solinas, Healthcare Manager, Webred, Perugia, 10 May 2009

⁶⁰ Ibid.

Figure 9 CUP value chain (pre and post)

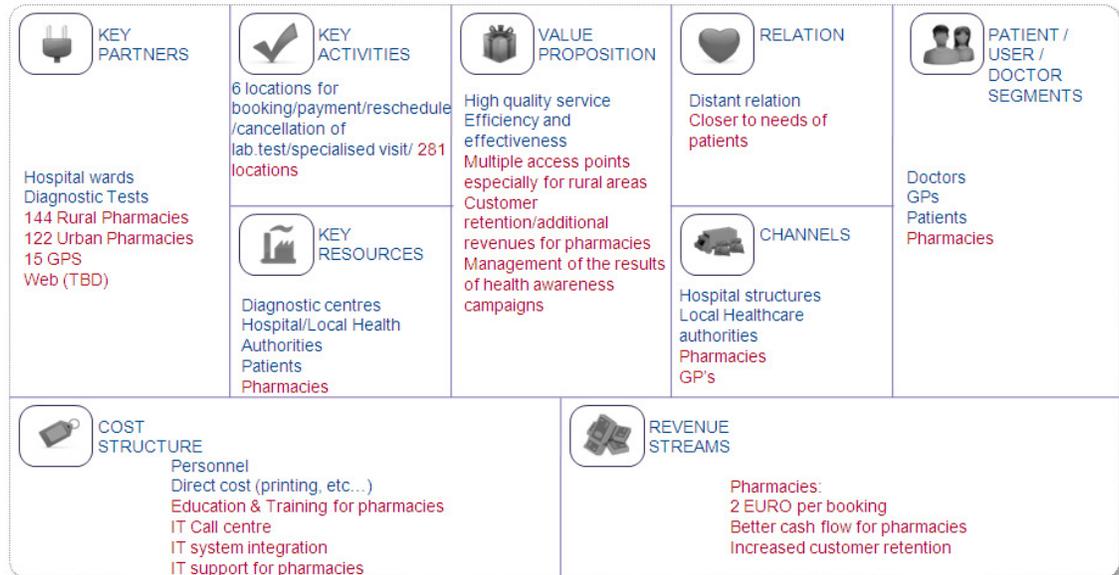


The picture on the left presents the situation prior to the introduction of the CUP system. Patients could only book, cancel, reschedule and pay for tests and specialist visits at 6 points - the two regional hospitals and the 4 local health centres. This meant that inhabitants in rural areas had to travel relatively long distances just for these simple tasks. The involvement of all pharmacies of the region in the system has significantly extended the reach of the service. In fact, the 266 pharmacies have a strong territorial presence, in particular the rural ones. Patients in these areas are not required to travel to other locations for these activities. Their travel is restricted to taking the tests or undertaking specialist visits. Nevertheless, this travel effort will be very limited due to the presence of over 589 specialist doctors and diagnostic centres in the region. The future extension of the system to GPs is expected to extend this coverage even further providing a more direct service to patients.

Business model analysis

The introduction of the CUP system has significantly changed the underpinning business model related to the management, booking, cancelling, rescheduling and payment of specialised tests and visits requested for patients by their GPs and subsidised by the Italian National Health Service. It is evident that the extension of the service to 266 pharmacies and to 15 GPs has augmented the number of CUP key partners, activities and resources leading to an increase in the overall value proposition of the system.

Figure 10 CUP Business model evolution



N.B: Red text indicates changes brought by the introduction of the eHealth system

It has created new channels and improved relations in terms of a regional healthcare system closer to the specific needs of patients. The development of the system has required some additional operational costs for the regional health authority and, partially, also for pharmacies. The former category of costs has been overcome by the indirect financial gains achieved by pharmacies in terms of increased customer retention and better cash flow. These will be detailed in the next section.

Impact analysis

The section highlights the internal and external benefits related to the CUP system.

Internal benefits

The development and implementation of the CUP has actually led to significant internal benefits, in particular for pharmacies and the regional health authorities. Initially, pharmacies were not interested in becoming part of the CUP systems. They saw the introduction of this service as an additional administrative burden over their activities, which are primarily aimed at selling medicines and related goods.⁶¹ Therefore, the regional health authorities decided to provide a set of operational incentives for pharmacies. The first of incentive was that the regional authorities would pay EUR 2 for each booking, cancellation or rescheduling of a visit or tests done via the CUP system, while the service remained free for patients.. It also provided pharmacies with free hardware and an ADSL line and, should broadband not be available, a reimbursement was provided for accessing the service via modem. Support was also directed to assist the cash flow of pharmacies. In fact, it was decided that the sums of money collected from patients as prepayment for a test or a specialist visits would not be transferred immediately to the regional health authorities. Instead, pharmacies would be provided a 30 day grace period so that they could use these

⁶¹ Interview with Francesca Duranti, owner of Farmacia Tarpani, Perugia, 11 May 2009

funds to compensate the reimbursement of prescriptions subsidised by the regional health authorities.⁶²

Following the introduction of the CUP, pharmacies have noticed an increase in their sales since it provided an additional reason for entering a pharmacy. As indicated by a local pharmacist, the introduction of the CUP has led to a 20% increase in general sales.⁶³

Regional authorities have also benefited significantly from the service. They have been able to put forward a service that pushes patients to take a specific test or undergo a visit, while managing waiting lists better. In fact, the system allows for automatic suspension of bookings for laboratories or specialist clinics with extensive waiting time and redirection towards other venues.⁶⁴ It has also reduced the percentage of no-shows since individuals can easily cancel their reservation should they not be able to undergo the test or attend the visit. It has allowed for the implementation of a system for confirming appointments. Especially for tests and specialist visits with a chronic long waiting time, health authorities use patients' contact details to remind them of their visit. Finally, regional authorities can also use the CUP for monitoring the effectiveness of their awareness campaigns. For example, regional authorities invite all women over 30 years old to undertake a free breast cancer tests by booking via the CUP system. It is evident that regional authorities have the required information for measuring the effectiveness of the campaign by monitoring how many women actually undertake tests.

External benefits

Access is the dominant benefit associated with the introduction and development of the CUP. Irrespective of their location, citizens are provided with a capillary presence over the regional territory for booking, scheduling, cancelling and paying for a specialised test or visit. This benefit is extremely important for senior citizens living in rural areas with difficulties in going to local health authorities for mundane activities, such as booking a visit or a test. They can easily go to their local pharmacy where they are known and supported. Access as a benefit is also expected to be increased with the future evolution over the web. In fact, Webred and the regional health authorities are examining ways to allow individuals to complete and manage their booking online. The national legal framework already allows this process. The real difficulty lies in managing the risk of patients not being able to make correct bookings for certain complex tests or visits. Therefore, Webred is thinking of concentrating on devising web-based CUP functionalities mainly for managing bookings concerning relatively simple and routine visits or tests such as a blood test or an ultrasound scan.⁶⁵

⁶² Information extracted from Atto Aggiuntivo all'Accordo Contrattuale per la Disciplina dei Rapporti con le Farmacie Pubbliche e Private concernente il servizio Farmacup sottoscritto da Federfarma, Assofarm e Azienda USL 3, firmato in Foligno il 27/02/2009 (Annex to Service Agreement concerning the CUP service between the regional associations of public and private pharmacies-Federfarma and Assofarm, and Local Health Authority n.3 of Umbria signed in Foligno Feb. 2, 2009)

⁶³ Interview with Francesca Duranti

⁶⁴ Interview with Francesco Solinas, Webred

⁶⁵ Interview with Francesco Solinas, Webred

Best practice identification

The analysis of the case study allows the identification of the following best practices.

- The senior management of the regional healthcare authority understood that it was necessary to offer incentives to pharmacies in order for them to join the system in light of the historical reluctance of the category to go beyond its core activities. After having overcome the initial reluctance, Umbrian pharmacies are now fully committed since they have noticed the benefits in terms of sales. Another identified best practice has been very operational. Regional health authorities clearly understood that the CUP could improve the way healthcare service in general is delivered irrespective of the geographical morphology of the region. Pharmacies were the point of entrance and delivery of a service.
- The development and implementation of the system also present interesting food for thought. The decision was to develop a very reliable client-server application supported by a centralised database based on open standards and technology. The easy interface and the associated first and second level helpdesk also make sure that pharmacies are comfortable with the system even if they have limited technical expertise.

3.2.3 Tactive (Telemedicine)

Situation overview

Developed by Tactive, Tactus delivers online care and treatment to Dutch citizens affected by alcoholism. Overall, it performs over 5,500 units of care per year with an operational budget of EUR 1,605,000.⁶⁶ Its activities are targeted at alcohol addicts residing in the eastern part of The Netherlands.

Alcoholism is a prominent problem in The Netherlands leading to direct financial damage to Dutch society of about EUR 2.58 billion⁶⁷. According to official statistics, only 10% of Dutch alcohol addicted citizens receive appropriate support.⁶⁸ Therefore, the main driver for this system has been the need to increase this low percentage by providing an anonymous professional support system,⁶⁹ since Tactus-sponsored research concluded that preventive action in treatments can improve behavioural changes in individuals affected by alcoholism.⁷⁰

⁶⁶Tactive annual report 2008 available at <http://www/tactive.nl>

⁶⁷Keizer, H., Postel, M. Westendorp, H., and Brenninkmeijer, M. (2007). *Ontwikkeling Alcoholdebaas.nl, Internetbehandeling*, Resultaten Scoren, April 2007, GGZ Nederland, Amersfoort and interviews with M. Postel, M. Westendorp and Hans Keizer, employees of Tactive, June 2009

⁶⁸ Interview H. Keizer, Director of Tactive, June 2009

⁶⁹Keizer, H., Postel, M. Westendorp, H., and Brenninkmeijer, M. (2007). *Ontwikkeling Alcoholdebaas.nl, Internetbehandeling*, Resultaten Scoren, April 2007, GGZ Nederland, Amersfoort.

⁷⁰Postel, M.G., de Jong, C.A.J., & de Haan, H.A. (2005). *Internetbehandeling www.alcoholdebaas.nl. Een zoektocht naar literatuur*. Amersfoort: GGZ Nederland, Resultaten Scoren.

Tactive developed an online tool in conjunction with IT supplier TheFactor.e, which allowed structured asynchronous interaction between counsellor and patient. The goal was to replicate cognitive behavioural therapy centred on one-to-one counselling by a professional assistant in an online environment. This internet-enabled treatment programme consists of:

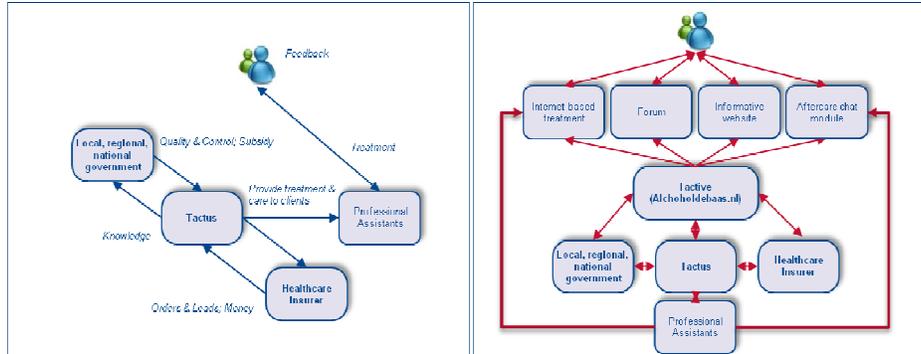
- Two-sided treatment (diagnostics and behavioural change);
- Informative website;
- Forum for online contact with fellow sufferers;
- Internet-based treatment (on a secured platform);
- Aftercare chat module;

This electronic service involves 4 organisations: Tactus (franchiser), Tactive (franchisee) Mondriaan (franchisee), and Symphora Group (franchisee). These franchiser and franchisees provide tele-consultations and see the internet as a way to consolidate their offering beyond the current geographical presence in the eastern part of The Netherlands as well. Moreover, since the IT platform is made of easily customisable applications, it is believed that it could also be scaled to address other treatments for ailments such as drug abuse, medication abuse, gambling and eating disorders.⁷¹

Value chain

The network and partners in both the healthcare value chain as well as the eHealth value chain associated with this service are visualised in the following picture.

Figure 11 Tactive value chain (pre and post)



The two figures provide an overview of the changes in the value chain associated with the treatment of alcohol addiction following the introduction of the new IT system. As emphasised on the picture on the left, it is evident that the entire treatment process was centred on face-to-face meetings between the patient and the professional. In addition, interactions with local and national authorities and health insurers were paper-based. The introduction of the online platform has completely changed this situation. Alcohol addicts can access their nominated assistants anonymously via the online platform while Tactus can manage interactions with individual healthcare insurers and the relevant national, regional and national public health authorities more efficiently. Interactions with the latter

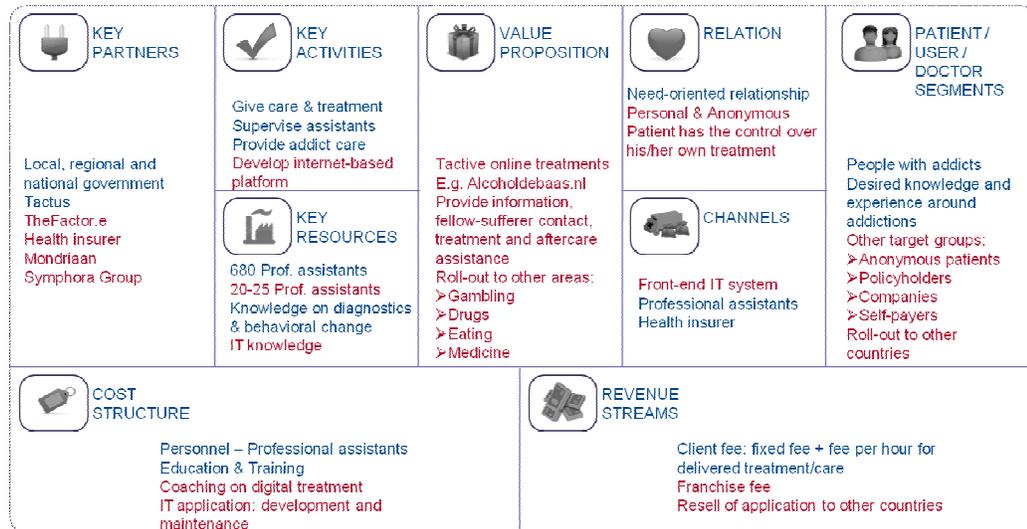
⁷¹ Interviews with M. Postel, M. Westendorp and Hans Keizer, employees of Tactive, June 2009

actors are extremely important since it simplifies the overall reimbursement process even if the service *per se* is provided anonymously.

Business model analysis

The next picture provides an overview of the changes in the business model of the delivery of treatment to alcohol addicts following the introduction of the online platform.

Figure 12: Tactive’s business model



N.B: Red text indicates changes brought by the introduction of the eHealth system

As previously anticipated, the core changes in the business models are the possibility of providing online treatment in complete anonymity (Relation), potentially addressing other forms of addictions (Value Proposition). Moreover, by providing asynchronous online support, it has also led to a reduction in the number of professional staff required (Key Resources).

Due to the scalability of the IT platform, its revenue streams have also evolved potentially. Prior to the introduction of the online platform, revenues were obtained only from fees paid by individual alcohol addicts. However, the organisation is to develop a reseller fee that allows for treatment organisations in other countries to consider the use of the available online platform to offer similar treatments locally. The organisation is currently considering the possibility of consolidating a “franchise” model so that other organisations can license its services for a fee.

Impact analysis

The section highlights the internal and external benefits related to this online platform that make this eHealth service sustainable.

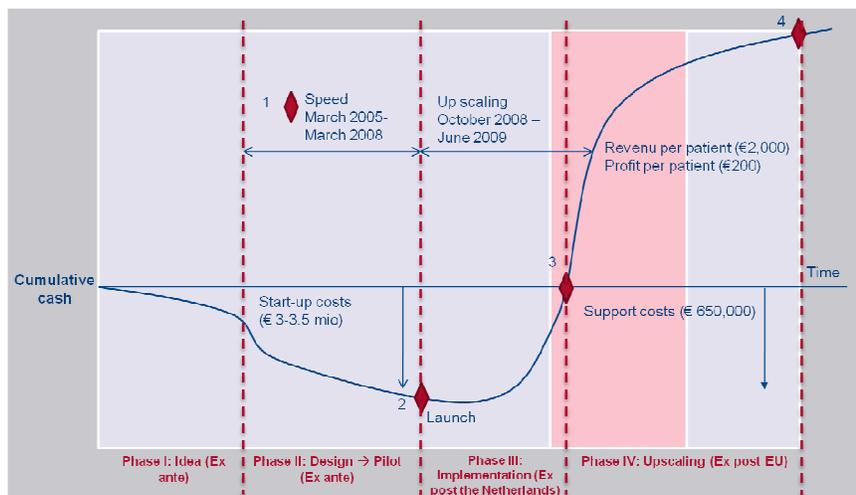
Internal benefits

When considering the development of this online system, Tactive decided to change its operational focus by moving away from exclusively being a treatment operator to turning into a platform provider. But this did not mean that it was abandoning treatment activities. It continued to involve a restricted number of professional assistants for face-to-face treatments, if required. These activities are now supported by a front-end application.

The organisation was also able to measure other direct effects following the introduction of the IT solution. It has noticed a significant decline in internal costs caused by less administrative burden and use of on-site consultation rooms. There was also a significant digitisation process since a large part of the diagnostic list was managed electronically. Finally, the organisation witnessed a 30% decline in “no-shows” which means patients failing participate for face-to-face meetings.

Financial benefits were also visible. Tactus invested EUR 3-3.5 m of private equity funding in Tactive to develop this solution. Moreover, Tactive has gained additional funding (EUR 650,000) for their online treatment from M&ICT (an action program of the Dutch government to contribute to societal problems) because of the innovative nature of their solution also in terms of value for patients. This additional funding was reinvested for improving the scale of its online activities.⁷² Using the provided data, it has been possible to extract S-curve to assess these benefits.

Figure 13 S-curve of the Tactive case⁷³



Presently, the service generates revenues for EUR 2,000 per patient with an estimated profit of EUR 200 also per patient. The profit is used to take this service internationally and for countering other addictions.

External benefits

Tactive dominates on access as it enables easy interaction between professional staff and addicts. In particular, the anonymity herein is the key to its success. Tactive has found that 96% of its users prefer this feature in the service.⁷⁴ Moreover, it has registered 5000 unique visitors per month and 700 regular forum members between January and June 2009⁷⁵. The

⁷² Interviews with M. Postel, M. Westendorp and Hans Keizer, employees of Tactive, June 2009

⁷³ Adapted from Giesen, D.J.E., Van de Vrande, V., and Klokgieters, K.K. (forthcoming). *Business model innovation: the role of co-creation in the realisation of business model change*

⁷⁴Postel, M. G., de Haan, H. A., & de Jong, C. A. J. (in press). *E-therapy for mental health problems: A systematic review*. Telemedicine and e-Health.

⁷⁵Postel, M. G., de Jong, C. A. J., & de Haan, H. A. (2005). *Does e-therapy for problem drinking reach hidden populations?* The American Journal of Psychiatry, 162(12), 2393.

online platform has also allowed Tactive to differentiate their offering by moving beyond face-to-face treatments. More importantly, company statistics confirm that online treatments are perceived better by patients. Of all patients who start treatment online, 61.2% move to the second part of the treatment while 36% complete it.

This data does not indicate that 64% of them fail to continue treatments. Some of them indicate that they have had enough support to stop the treatment after the first phase. It is important to indicate that this online treatment is to be considered as an additional option for traditional face-to-face treatment. Addicts can always return to face-to-face treatment provided by the organisation.

Another benefit is the empowerment of alcohol addicts in their treatment. Since the treatment is usually done in two different phases (diagnostics and behaviour) to be delivered online, power is vested in the hands of the client. They are the captain of their own destiny. This element is expected to increase the effectiveness of the method and the final results.

Best practices

The analysis of this case study allows for the identification of the following best practices.

- Senior management had a clear vision on how to operate an online treatment service and infuse strong commitment in making the transformation a success. The strategic objective was to implement an online platform that provided a valuable tool for personal counselling to alcohol addicts.
- This strong commitment was underpinned by a detailed, prior identification of the functionalities that the new online platform was expected to deliver. Still, even after the delivery of the online platform, senior management monitored the situation regularly and carried out regular feedback sessions and enhancement cycles.
- It is important to emphasise that the design and delivery of the online system saw the continuous engagement of professional assistants, who also received the required training and support. Finally, the sustainability of the online service was achieved by setting up a franchise model, wherein Tactive gains revenues from these franchisees. This provided the stepping stone for future roll out of a similar online system to address other forms of addiction in The Netherlands and in other countries.

3.2.4 University College London Hospital (Telemedicine)

Situational overview

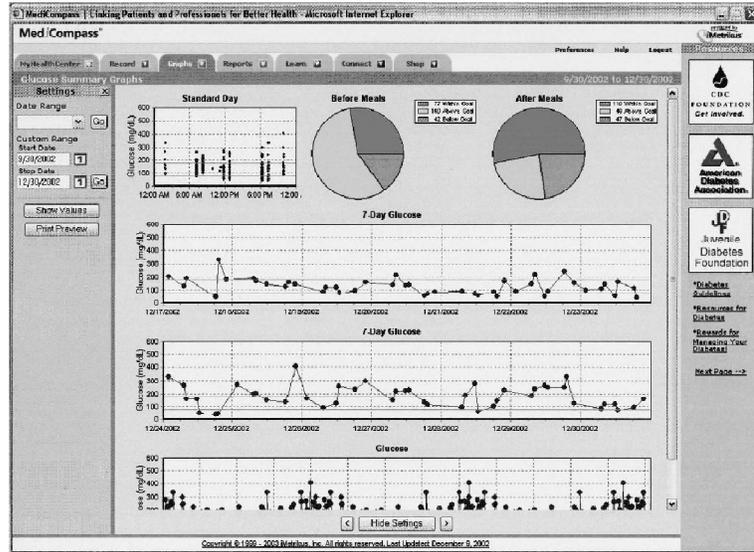
The department of Paediatric Endocrinology at the University College London Hospital (UCLH) serves a population of about 2500 children and young people affected by diabetes. One of the main drivers to implement IT applications is that 85% of the children and young people in the UK with diabetes type-1 do not have it under control.⁷⁶ It is vital that these patients understand how much insulin is required to have a normal healthy life.

Therefore, UCLH partnered with the NHS (National Health Services), the Great Ormond Street Hospital (GOSH), iMetrikus and Capgemini Consulting to implement an eHealth

⁷⁶ Interview Andrew Jaminson, Head of Health and Social Care Capgemini UK, June 2009.

technology supporting young patients and their parents. The solution allows for the electronic upload of blood glucose results from home. The solution allows plugging into blood sugar meters and automatically uploads results from them. These results are available to clinicians and nurses who can then proactively intervene when and if needed or call patients to give advice or guidance.

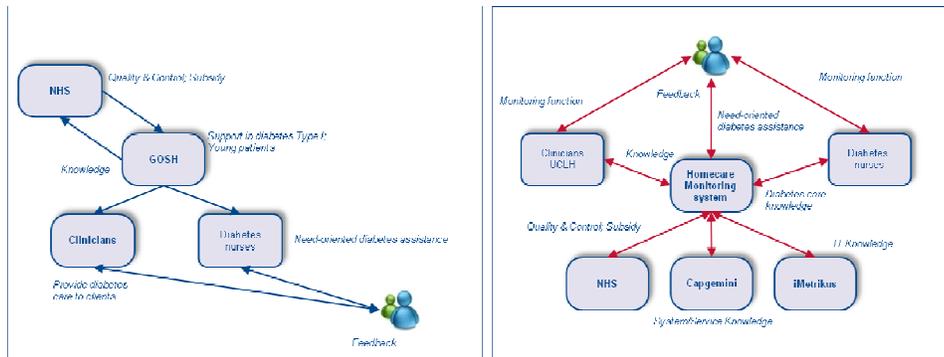
Figure 14 Medicompass Pro Health management system charts point-of-care data⁷⁷



Value chain

The network and partners in both the healthcare value chain as well as the eHealth value chain are visualised in the following picture.

Figure 15 UCLH diabetes telemedicine (pre and post)



All system partners have been gathered into the paediatric diabetes “federation”, which is a clinical network covering the area encompassing the five boroughs of North Central London⁷⁸. The program leaders were Jane Pringle and Dr Peter Hindmarsh with support

⁷⁷Bailey, T.S. (2003). Use of an Electronic Diabetes Registry Augmented with Low-Cost Device Connectivity. *Point of Care*, Vol. 2, Nr. 3, September 2003.

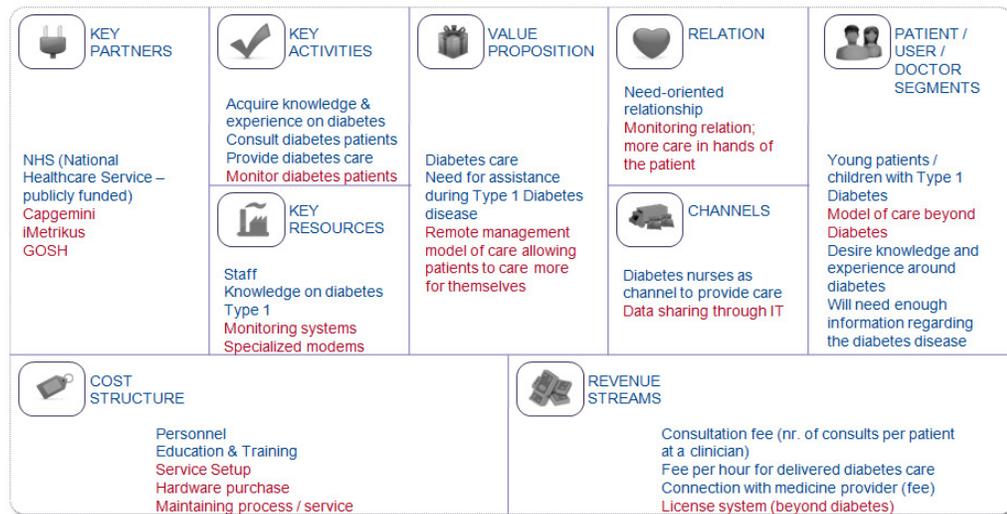
⁷⁸http://www.ich.ucl.ac.uk/cypph/clinical_learning.html#diabetes

of relevant actors from across north and central London. The two images clearly demonstrate the changes in the value chain following the introduction of this eHealth system. Previously, the young patients had to provide regular feedback of their status via physical meetings or other delayed methods. By introducing the IT application, a homecare remote monitoring system came into place by facilitating the overall monitoring of diabetes among young children treated from a distance. The whole area of London is participating, which means that all UCLH hospitals and PCT's cooperate. The goal is to deliver a total solution for young diabetes patients in order to monitor and act on their disease.

Business model analysis

The cooperation between the organisations UCLH, GOSH, iMetrikus, and Capgemini was set up to form a pact and influence the value chain, as indicated above. The following image provides an overview of the changes in the business model, following the introduction of the specific IT system.

Figure 16 UCLH's business model



N.B: Red text indicates changes brought by the introduction of the eHealth system

The introduction of this IT system has extended the value proposition of the diabetes monitoring service managed by UCL hospitals. It allowed for the development of a remote management model through which young patients and their parents could monitor their conditions in cooperation with designated medical staff. The extension of the value proposition has required the use of additional key resources such as centralised monitoring systems and specialised modems for the patients. These led to an increase in cost structure. The costs of the service are divided into 2 parts – capital and revenue. There is some capital expenditure in setting up the service and purchasing hardware. Then there is the expense of maintaining the service and the process of dealing with patients proactively.

However, the service has become sustainable through cost reduction on the payer-side, and service improvement and diversification on the provider-side.⁷⁹

Impact analysis

The objective of this section is to identify the benefits associated with the changes in the business models underlying the delivery of this diabetes monitoring system targeted at children.

Internal benefits

One of the major benefits for UCLH is the increased granularity on data. Usually clinicians have to rely on a measure known as the HbA1c (Glycated Haemoglobin). This is an average measure over 4-6 weeks; it does not give the highs and the lows that are so important in monitoring this health condition. The data gathered via this eHealth system is more accurate since it also measures important hypo and hyper-glycaemic episodes on a regular basis.

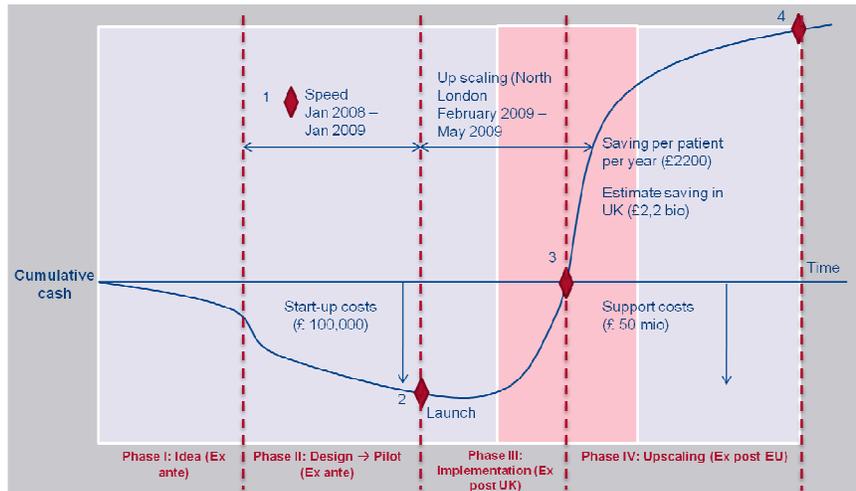
The system also promotes the improvement in the quality of patient data received by healthcare professionals. Earlier, they had to rely on paper charts that children or their parents had to maintain. Where results existed, they were often not clear and did not provide an easy way to extract trends or series to understand the evolution of the condition over a period of time. The introduction of the system has changed this state of affairs by improving data availability and immediacy. The specialised nurse or clinician can see a patient's results as soon as they are uploaded, often on a weekly basis. This also enables the identification of possible interventions.

The case of UCLH has some interesting benefits for the treatment of young diabetics. In general, it has been possible to witness an increased patient pro-activity in managing their chronic condition with less time devoted to consultation with healthcare professionals. This is leading to a decrease of GBP 1.75 m per year in cost for PCT's (Primary Care Trust). Should this system be scaled to rest of the United Kingdom, it is expected that it will generate savings of about GBP 20 m in total.⁸⁰ Based on the available data, it has been possible to produce the following s-curve of the benefits.

⁷⁹ Interview Dr. Peter Hindmarsh, Professor at Great Ormond Street Hospital, June 2009; see also: <http://www.capgemini.com/industries/healthcare>

⁸⁰Capgemini UK Analysis

Figure 17 S-curve of the UCLH case⁸¹



At this moment, the front-end monitoring system costs about GBP UK 100,000. This includes iMetrikus hardware and software, and Capgemini’s system integration support. The variable costs per patient were indicated at GBP 5-10 per month.⁸²

External benefits

This system dominates in terms of service innovation and associated quality of care, especially in terms of immediacy. Normally, the interventions in the treatment of diabetes took 6-7 weeks (because the nurse or clinician got insight in the blood glucose levels at these durations), whereas they can now actually monitor day-to-day health status of the patient. This increased amount of information means better and more focused care. This in turn means less hypo and hyper-glycaemia patients, and lower average blood glucose in patients. In turn, this causes less acute escalations and complications in patients, and therefore less money spent on their care. Patients are able to care for themselves more actively, and need less hospitalisation and have better long-term health outcomes since they have fewer complications. The research on approximately 2,500 young diabetics that UCLH executed in order to measure the effects of the new provided service indicated that patients are increasingly able to care for themselves, need less hospitalisation, and have better long-term health outcomes.

Best Practices

It is possible to identify the following best practices from this case study.

- The first fundamental element of this system starts with the establishment of a consortium of partners sharing the same commitment to the success of the project and at the same time, respected each other’s professional and operational role.
- The project benefited from strong senior management leadership by Prof. Peter Hindmarsh throughout the entire development and implementation phase. He

⁸¹ Adapted from Giesen, D.J.E., Van de Vrande, V., and Klokgieters, K.K. (forthcoming). *Business model innovation: the role of co-creation in the realisation of business model change*

⁸² Interview Anneke Dantuma, Manager Quality & Organisation Naviva, May, 2009

had a clear understanding of the specific needs of his patients and was committed to devising an IT application that could assist them in their care. This resulted in clear technical and organisational guidance to the technical members of the consortium - Capgemini and iMetrikus.

- The development of the systems saw the continuous involvement of all clinicians, who were clearly informed on the way the new tool would change their operational activities.
- This engagement required the implementation of tight feedback sessions and enhancement cycles. Finally, all involved clinicians were provided with comprehensive training on the specific technical functionalities of the system and its data visualisation tools.
- It is also important to emphasise that the development and implementation of the system is underpinned by repetitive quantitative and qualitative evaluation cycles. This facilitates regular performance evaluation of the system and the identification of potential organisation and technical corrective actions.
- The sustainability was achieved primarily through large savings achieved in treating individual patients. At this point, the objective is to roll-out the system to cover the entire UK, which would eventually lead to even higher savings.

3.2.5 Naviva

Situational overview

The Dutch healthcare sector is extremely competitive in light of its “free market approach”. Therefore, healthcare delivery organisations compete in providing the best quality of care at declining costs. Health insurance companies are one of the main beneficiaries of this approach, together with patients who can experience better quality of care, information, and more process transparency.⁸³ This is the environment within which Naviva operates. This is a maternity care organisation in the eastern region of The Netherlands aimed at delivering high-quality maternity care to pregnant women. It performs 10,000 units of care per year. This leads to a “market share” of 70% in this area. Naviva’s core competencies are its quality of care, its regional presence, and operational partnerships.

The evolving nature of the Dutch healthcare system has had an impact on the operational focus and financial revenues of the organisation. Naviva has noticed a decline in number of patients using its services causing a related decline in revenues. As it was looking for new ways to offer its services, Naviva looked at IT as a way to facilitate direct contact with its patients by going beyond mere exchanges with maternity assistants. Together with De Waarden, a Dutch maternity care organisation, Naviva has developed an online platform to support its patients electronically and to facilitate data exchange with individual actors involved in the value chain, such as health insurance, obstetricians and maternity assistants. In particular, the system entails the following elements:

- A web portal for clients;
- Connection with ISK (national organisation for maternity care);

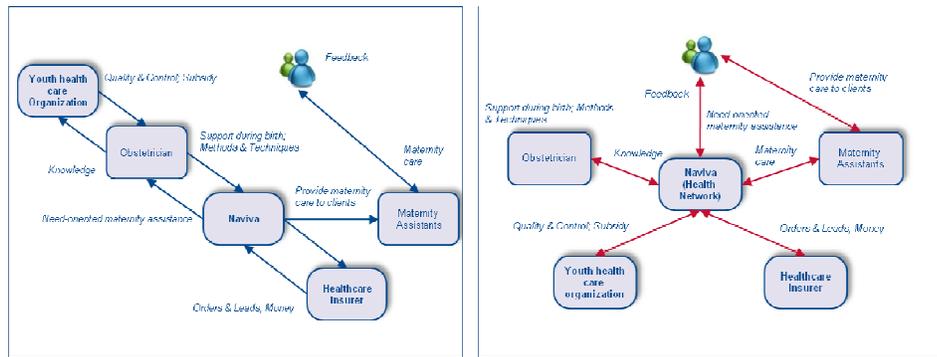
⁸³Interview Anneke Dantuma, Manager Quality & Organisation Naviva, May, 2009

- Data sharing through IT applications between Naviva, De Waarden, obstetricians, and maternity assistants.

Value chain

The network and partners in both - the healthcare value chain as well as the eHealth value chain - are visualised in Figure 18.

Figure 18 Naviva value chain (pre and post)

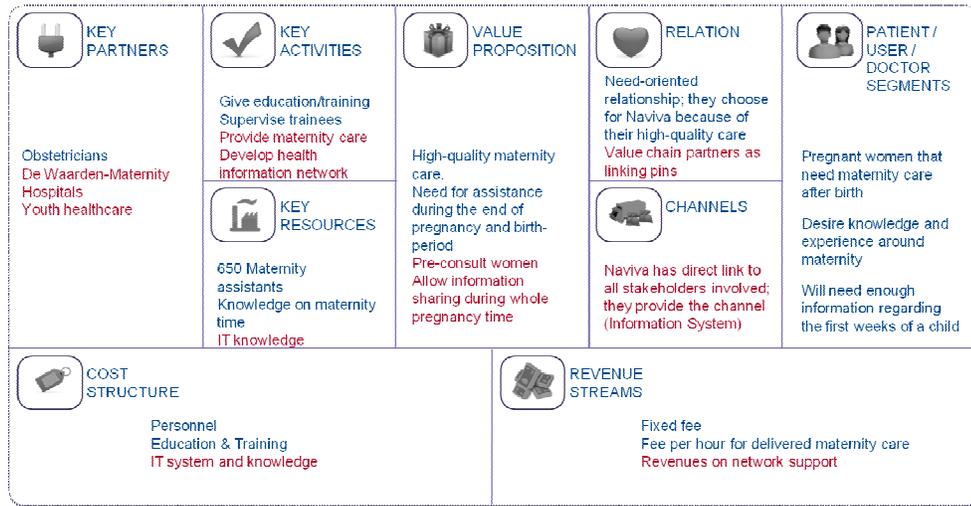


These figures describe how the introduction of Naviva has changed the delivery of its services. Prior to its introduction, Naviva was only interacting with maternity assistants who were collecting specific needs from patients and passing them on to the health insurers, local and national authorities and, where applicable, to obstetricians. The new online platform has changed this state of affairs. While patients can still interact with maternity assistants in face-to-face meetings, they can also ask for electronic consultation and support via the new online platform for a different fee. It also integrates all the other actors and shares information among them, cutting down on processing costs and related inefficiencies.

Business Model analysis

The following image provides an overview of the changes in Naviva’s business model following the introduction of the online platform.

Figure 19 Naviva’s business model



N.B: Red text indicates changes brought by the introduction of the eHealth system

The new electronic platform has extended the number of key partners coordinated by Naviva thanks to the direct involvement of De Waarden as a service provider, hospital obstetricians and youth organisations with their policy development around maternity assistance. Its key activities were also extended since they provide assistance in maternity care both online and offline and general background information and data. The value proposition was also extended since Naviva is now able to provide assistance to women during all phases of pregnancy, especially in the initial period. In fact, prior to the introduction of the online platform, Naviva was primarily providing support during the last 1-2 weeks prior to and after the birth of the child.

The online platform has also allowed an increase in clients since non-pregnant woman can access pregnancy-related information and data about pregnancy. It is expected that these women will then resort to Naviva should they get pregnant and therefore bring additional revenues to offset the additional costs in IT and network support

Impact analysis

The following two sections provide an overview of the internal and external benefits associated with the introduction of the new online platform.

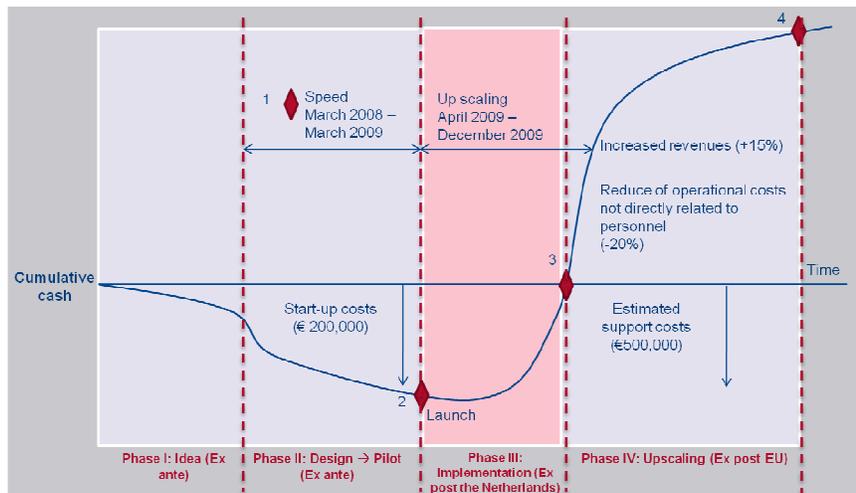
Internal benefits

Following the delivery of the online platform, Naviva has chosen a different focus for its services. It moved away from being an exclusive maternity care provider and transformed itself into a complete maternity care network provider. This does not mean that it has abandoned the provision of treatments. Its maternity care assistants still play an important role in assisting women who are pregnant or have just delivered a baby. Face-to-face interactions are still needed. The platform has added an extra dimension to maternity care by trying to assist women during the entire pregnancy period. Moreover, in light of its direct links with health authorities and insurers, it has digitised the exchange of the relevant documentation leading to gains in process efficiency. Internal company data has valued these gains at a 25% decrease in administrative costs. Based on Naviva’s in-house

research of a group of 2,500 patients, further indications were given that there is a decrease of 10% related to a reduction in costs for maternity assistants, and also a decrease of 25% in terms of training and educating personnel because this is adequately provided by the web-based service.

In order to achieve these benefits, Naviva has invested EUR 200,000 and a similar amount has been contributed by De Waarden. Currently Naviva is examining the possibility of extending its services to other target groups as well. Based on this information, it has been possible to extract the relevant s-curve.

Figure 20 S-curve of the Naviva case⁸⁴



The development of the IT service required an investment of EUR 500,000. This is a large effort for Naviva, but – as the figure indicates – the service has already generated an increase of 15% in Naviva’s revenues, and a decrease of 20% in operational costs. With the profit gained, they are able to pay the estimated support costs. Thus, Naviva has been able to upscale its service, increase the number of patients they serve, increase services to patients and gain valuable information regarding its stakeholders in the value chain, by adding IT services into their maternity care.

External benefits

The new value propositions resulted in pregnant women receiving better accessibility to support, better preparation for their situation, and most importantly, improvements in the well-being of both women as well as children. Naviva dominates on experience since they provide pregnant women with a more comprehensive set of services. Naviva is already in the higher segment of maternity care, and it has been able to achieve satisfaction from more patients through the portal.⁸⁵ Of the people that use the web portal besides the traditional maternity care, 98% of the pregnant women are satisfied. Moreover, Naviva has embarked on a new way of informing pregnant women and also women who are searching

⁸⁴ Adapted from Giesen, D.J.E., Van de Vrande, V., and Klokgieters, K.K. (forthcoming). *Business model innovation: the role of co-creation in the realisation of business model change*

⁸⁵ Interview Anneke Dantuma, Manager Quality & Organisation Naviva, May, 2009

for information regarding pregnancy. Naviva could therefore reach people who were never usual patients at that time.

Naviva has also identified another benefit: more transparency in the maternity care value chain. Normally, the value chain is fuzzy and has no direct specific lines to the different actors involved. However, since other parties are connected, it creates more awareness for the different actors involved about what is actually happening within this value chain. This eventually leads to a higher awareness about what is primarily done by each actor and in what way they can cooperate in order to increase the value of care.

Best Practice identification

From this case study it is possible to extract a set of best practices for the development of eHealth systems.

- One of the best practices of the eHealth service of Naviva is the focus on using an online platform to create a network of partners committed to devising new ways to support women during their entire pregnancy.
- Naviva guided the technological implementation to achieve this objective and provided De Waarden with clear specifications concerning the required technical and operational functionalities. This allowed Naviva to focus on engaging all the involved stakeholders, including back-office staff, in monthly training and feedback sessions.
- Naviva monitored the operational results of the project through the development and implementation phase, by evaluating the performance of the new service. Its results were monitored frequently, and were followed up with tight feedback sessions and enhancement cycles.

Naviva believes that its system is now sustainable since it has led to internal operational efficiencies while providing new services to pregnant women. They have seen an increase in the number of women using the new services. Naviva also believes that their model can be used in other European countries when enabled with the provision of linguistic customisation.

3.3 Concluding remarks

In its previous paragraphs, this chapter has introduced five illustrative case studies of eHealth systems that are currently delivering value to its users and are sustainable. A specific set of lessons and guidelines have been identified for each case study. The results of this examination, combined with the evidence presented in the previous two chapters, provides the basis for the next chapter that will provide operational best practices supporting the development of value creating business models in the area of eHealth and public policy interventions for supporting this objective.

CHAPTER 4 **Defining a vision for value creating eHealth systems**

In the previous chapters this report has argued that value-creating and sustainable eHealth systems involve the development and implementation of business models where processes and stakeholders' interactions are mapped and identified. It has also argued that, unlike other commercial environments, the identification of value creation and sustainability in eHealth requires taking into consideration financial and non financial factors. These arguments have been also tested via five illustrative case studies from which some specific operational guidelines have been extracted. In this chapter, the report brings together the analysis of the previous chapters by providing a set of strategic guidelines for the development of business models supporting value creating eHealth systems in Europe and then, to indicate a set of European public policy actions to support their implementation.

4.1 **Value creating business models for eHealth: a set of strategic guidelines**

The following paragraphs provide an overview of a set of strategic guidelines to support the development and implementation of a value creating eHealth system. The first main conclusion from the analysis of the collected evidence is the pivotal importance of senior management commitment to devise an eHealth system that does not substitute a pre-existing healthcare service but improves it and allows extracting additional value. The starting point for this is the mapping of the business model supporting a specific healthcare case and the way the introduction of ICT can improve it. This is particularly evident in two specific case studies, Naviva and Tactus systems, where senior management looked specifically at IT for improving the quality of their services and exploiting other potential commercial and operational venues. This mapping process, nevertheless, is not always explicit. In the case of CUP, senior management aimed at facilitating the overall booking of specialist tests and visits to all Umbrian citizens. A similar situation applies to Telemedescape and UCLH telemedicine system. Irrespective of the explicit or implicit approach, the examined literature and the case studies suggest that the introduction of IT systems has led senior management to ponder the possibility of using ICT to go beyond the delivery of the specific healthcare service that they were targeting initially. They started to consider new services or functionalities via integration with other systems. This was evident in the case of Tactive and Naviva where senior management identified additional

financial revenues by extending their service offering. In the case of Telemedescape, the system was considered the first step towards a local/regional electronic patient record system involving diagnostic centres, hospitals, GPs and pharmacies. In case of the CUP, senior management saw IT as a way to engage all stakeholders while providing additional revenues to pharmacies. However, in all five cases, it was evident that senior management had to redesign the business model so as to accommodate these new potentialities.

This confirms what literature has clearly indicated: business models supporting a value creating and sustainable eHealth system are not a static entity. They need to be dynamic as to exploit the potential new benefits brought by an eHealth system and its future developments. In this context, the commitment of the senior management is particularly important when several network partners are involved or affected by the introduction of an eHealth system. Their engagement has to be examined and jointly assessed and, where possible tested, since an eHealth system requires strong commitment from all the involved actors. Therefore, a business model needs to be flexible and adaptable to new situations while avoiding a “big-bang” approach. It needs to apply a phased step-by-step approach so that all involved actors have the time to adjust and adapt.

The sustainability and value creation of an eHealth system also requires stable financial support for its implementation. As argued in the previous chapters, this specific element is essential since the implementation of eHealth systems involves a long time before they return the expected operational and financial results. This specific element was evident in the case of Telemedescape whose functionalities have evolved over the years. Senior management was instrumental in making sure that the activity received constant funding that helped avoid development gaps. In the other case studies, the systems involved less time for implementation, but regular funding was made available. However, as already argued in the examined literature, the quest for funding commitment should not be exclusively for covering costs associated with IT development and implementation. It is also important to allocate funding to cover staff time for their involvement in change management processes associated with the introduction of a specific eHealth system.

The business model of a sustainable eHealth system needs to refer to the clear understanding of the needs of patients and involved healthcare professionals. All the case studies, in fact, had a clear and precise understanding of the specific needs of their patients. Their goal was to add value and not create additional burdens, hence the need to directly or indirectly involve them in designing the functionalities. However, this is not an easy task since specific needs evolve over time. This calls for the development of an operational process for capturing these evolving needs while finding the appropriate responses and solutions.

As emphasised in the literature and the five illustrative case studies, it is clear that the technical infrastructure of value-creating eHealth systems needs to be based upon open standards and applications, which does not mean “open source” software. Instead, it is necessary to use technical hardware and software solutions that allow easy integration with current and future systems. This approach is particularly evident in the specific case of Telemedescape where integration was achieved with the use of HLS version 7 communication protocols. Similarly, in the case of CUP, the system was developed in such a way so as to ensure usability by pharmacies.

Claiming that an eHealth system and its underlying business model are value creating is not the same as being able to prove it. As already indicated in the opening pages of this report, the available literature provides unclear tested guidance in actually quantifying or qualifying the benefits achieved with the introduction of an eHealth system. Still, the case studies shared the common element of implementing regular operational assessments while the system was developed or delivered. In all five cases, in particular, there were regular in-house sessions to review the performance of their services. In the case of CUP, this performance was regularly monitored by tracking transaction numbers. However, the most visible example of performance assessment is exemplified by Telemedescape. Here, senior management decided to go outside their organisation by procuring an independent evaluation. More importantly, the assessment was not only targeted at measuring and evaluating internal benefits of the system. Effort was also directed to quantifying, the external benefits, an operational approach that is in line with the overall argument of this report, that a business model of a value creating and sustainable eHealth system should not be measured only in financial terms but also in socio-economic ones.

In the previous paragraphs, this chapter has provided a set of strategic guidelines that healthcare delivery organisations should tailor and operationalize via detailed checklists in their specific settings. Nevertheless, their operationalization should also be supported by appropriate public policy initiatives and actions performed at the national and European level.

4.2 **Policy recommendations for fostering “positive” eHealth business models**

EHealth systems can provide responses to Europe’s changing demographics, disease patterns and overarching healthcare capabilities. Provided that its potential is fully exploited, it can also help to deliver better care for less money while fostering technological innovation. At the same time, European industry as a whole can provide responses and solutions especially since it can leverage the experience and knowledge of other fields like pharmaceuticals and medical devices. Still, these benefits can only be achieved if eHealth systems deliver upon their expected value and sustainability. In addition to the application of specific operational guidelines, there is also the need for public policy initiatives supporting the development of value-creating business models for eHealth. These require the involvement of all stakeholders such as national healthcare authorities, health professional associations, healthcare delivery organisations, industry and the research community as well as European perspectives so as to foster the sharing of applicable best practices and experiences.

A first potential initiative should be to launch pilot actions of eHealth-related projects where different business models are tested or simulated using appropriate modelling approaches. This may require operational data to be collected from current or planned systems and examined in detail. EU FP7 and similar programmes can provide a good environment for implementing this initiative. Currently, under the aegis of the Competitiveness and Innovation Programme’ ICT Policy Support Programme, the

European Commission is working towards the deployment of eHealth records between 12 EU member states. At the same time, it is bringing together the large majority of national health authorities to actually foster a roadmap to foster pan-European exchanges of patients' information. These activities, as well as those expected to be supported via future calls, can provide a solid basis where different organisations can share detailed information about the business models supporting their national and, where applicable, pan-European eHealth systems. The sharing of business modelling experience per se only provides limited responses. It is important that specific benchmarking parameters are identified so as to make sure that individual organisations are able to monitor and compare the way they develop and implement business models for eHealth. As with the previous initiative, this initiative requires a more targeted pan-European approach that goes beyond the current European Commission's attention to identify indicators for assessing the specific level of eHealth implementation in Europe.

Irrespective of the "tactical" initiatives indicated in the previous paragraphs, the development of business models for value-creating eHealth systems involves the exchange of specific best practices and practical experiences from organisations that have actually gone that way. In this context particular attention should be directed to knowledge about funding mechanisms and responses to national legal challenges. Although it is clear that EU member states embody different healthcare financial models, organisations may face similar challenges in dealing with start up and operational funding. Therefore, it might be very beneficial for healthcare delivery organisations and national public health authorities to see how their colleagues have managed interactions with national and international financial institutions for securing the required funding. As for the previous suggested initiatives, it might be useful that this activity is managed and coordinated by the European Commission in the context of its current activities associated with structural funds but with the support of specialised agencies such as, for example, the European Investment Bank and its activities related to the managing of structural funds.

Similar information sharing and best practice identification should also involve specific topics like security, privacy, data protection and safety. The elements are usually solved with appropriate regulations and protocols. However, it is also important to remember that these requirements are often neglected when designing and developing a business model for an eHealth system. At the same time, some of the issues associated with privacy and security may be overemphasised. Therefore, an exchange of knowledge about how different organisations have addressed these specific elements when starting to design and map the supporting business model of an eHealth system is essential. Unlike what has been indicated previously, there is already quite a significant amount of data and information available on where to start. What is required is a coordinated central point where this specific knowledge and experience is collected, organised and made available to all interested stakeholders. As with the previous suggested initiatives, this activity should be lead by the European Commission and involve stakeholders including legal counsellors and chief technology officers of healthcare delivery organisations.

The proposed initiatives primarily have a national focus, in the sense that they are aimed at fostering the pan-European exchanges of domestic activities. The situation, nevertheless, becomes more complex when the analysis is extended to consider multi-national eHealth

systems. In these cases the guidelines previously identified are valid and their implementation should lead to the identification and structuring of appropriate and detailed business models. Nonetheless, these business models may not provide the necessary positive responses in light of the current technological, financial and legal divergences among member states. This should not stop national authorities and healthcare delivery organisations from different countries from working together on finding common solutions and appropriate business models using the current R&D funding mechanisms provided by the European Commission and reporting back in terms of best practices and knowledge sharing with their peers from other EU states.

This chapter and the report overall do not pretend to be comprehensive in their analysis and conclusions as they deal with a constantly evolving field as new technological solutions constantly arise. Its ambition, nevertheless, is that it foster a stream of successive research activities aimed at consolidating its findings and providing new “business model” responses to healthcare organisations that want to continue to venture in this field exploiting the potentials of the Internet and new ICT technologies.

Annex 1: List of References

- Ahituv, N. "A systematic approach towards assessing the value of an information system". MIS Quarterly, vol.4,n.4, 1980, pp.61-75,
- Aho Group Report "Creating an Innovative Europe available at http://ec.europa.eu/invest-in-research/action/2006_ahogroup_en.htm
- Amit, R Value creation in eBusiness. Strategic Management Journal vol. 22 n.6-7, 2001, pp. 493-520.
- Appelgate, LM et alia Emerging networked business models: lessons from the field. Harvard Business School No. 9-801-172, 2001 Harvard Business School, Boston.
- Artman, J. *et alia* "State of the Art of New ICT-Enabled Models of Healthcare-First Interim Summary" Report prepared in the context of project Scenarios for ICT-Enabled New Models of Healthcare, on behalf of the JRC-Institute for Prospective Studies, June 2007
- Auer, C "Using action research for gaining competitive advantage out of the internet's impact on existing business models". In Proceedings of 15th Bled Electronic Commerce Conference – eReality: Constructing the eEconomy. Bled: June 17-19 2005
- Bahol, R. "Methods to Evaluate Health Information Systems in Healthcare Settings: A Literature Review" Journal of Medical Systems,vol.31, 2007, pp.397-432;
- Boddy, D. et alia "The Influence of Context and Process when Implementing e-health", BMC Medical Informatics and Decision Making, vol.9, n.9. January 2009 available at <http://www.biomedcentral.com/1472-6947/9/9/pdf>
- Brynjoolfsson, E. "Paradox Lost: Firm-level evidence on the returns to information systems spending" in Willcocks, LP, Beyond the IT Productivity Paradox, (John Wiley and Sons, 1999),
- Buccoliero, L. et alia "A Methodological and Operative Framework for the Evaluation of an eHealth project", International Journal of Health Planning and Management, vol.23, 2008, pp.3-20 published online on 4t May 2007
- Caldwell, C. "Managing Change in Healthcare" E Hospital,the Official Magazine European Association of Hospital Managers, October-December 2008, pp.3-5.
- Centre for Information Technology Leadership (CITL) The Value of Healthcare Information Exchange and Interoperability, 2005 available at <http://www.ctil.org>.

Chesbrough H et alia The Role of the Business Model in Capturing Value from Innovation: Evidence from XEROX Corporation's Technology Spinoff Companies, Working Paper, 2002 Available online at: <http://www.hbs.edu/dor/papers2/0001/01-002.pdf>

Dansky, K. et alia "A Framework for Evaluating eHealth Research", Evaluation and Program Planning, vol.29, (2006), p.397-404

Dixon BE et alia Inpatient Computerized Provider Order Entry (CPOE): Findings from the AHRQ Portfolio AHRQ Publication No. 09-0031-EF. January 2009. The publications are available for download at <http://healthit.ahrq.gov> (visited 10 April 2009)

Dixon BE et alia Using Telehealth to Improve Quality and Safety: Findings from the AHRQ Portfolio AHRQ Publication No. 09-0012-EF. December 2008;

Dobrev, A. et alia, Sources of Financing and Policy Recommendations to Member States and the European Commission on Boosting eHealth Investment, Final Report, December 2008.

Dumortier, J. Study on Legal Framework of Interoperable eHealth in Europe-Country Reports Study Prepared for ICT for Health Unit, DG Information Society and Media, European Commission, January 2009 (draft report)

Edward C. Conley et alia "Simultaneous trend analysis for evaluating outcomes in patient-centred health monitoring services" Healthcare Management Science vol.11, (2008), pp.152-166

Empirica, eHealth ERA Report Towards the Establishment of a European eHealth Research Area, Report prepared by DG Information Society and Health, European Commission, September 2007

Empirica, ICT Standards in the Health Sector: Current Situation and Prospects A Sectoral e-Business Watch study by Empirica n. 108, July 2008 available at http://www.ebusiness-watch.org/studies/special_topics/2007/documents/Special-study_01-2008 ICT_health_standards.pdf (visited on 15 March 2009)

European Commission eHealth Portfolio of Projects, Prepared by the European Commission, DG Information Society and Media, September 2007: for FP7 projects, a detailed summary is available at http://ec.europa.eu/information_society/activities/health/research/index_en.htm (visited 15 march, 2009)

Garrido, T. "Effect of Electronic Health Records in Ambulatory Care: Retrospective, Serial, Cross Sectional Study." British Medical Journal, vol. 330, no. 7491 (March 12, 2005), pp. 581–585.

Giroi, F. et alia Extrapolating Evidence of Health Information Technology Savings and Costs, Report MG-410, 2005, available on www.rand.org/health

Goldzweig, C.L., et alia "Costs and Benefits of Health Information Technology", Health Affairs, vol. 28, n.2, (2009) pp.282-293 published online on 27 January 2009

Gordijn, J et alia "Business modelling is not process modelling", In: Conceptual modeling for e-business and the web (ECOMO-2000), (Berlin: Springer-Verlag 2000)

Gordijn, J."A Design Methodology for Trust and Value Exchanges in Business Models" Paper presented at 16th Bled eCommerce Conference "eGlobal" Conference, June 9-11, 2003 available at [http://domino.fov.uni-mb.si/proceedings.nsf/Proceedings/B79DB31A6F902FA4C1256EA1002D8C1E/\\$File/31Gordij.pdf](http://domino.fov.uni-mb.si/proceedings.nsf/Proceedings/B79DB31A6F902FA4C1256EA1002D8C1E/$File/31Gordij.pdf) (visited 15 march 2009)

Gordijn,J. "What's in an Electronic Business Model? Paper presented at Knowledge Engineering and Knowledge Management - Methods, Models, and Tools, 12th International Conference, 2000 available at <http://www.cs.vu.nl/~hans/publications/EKAW2000.pdf> (visited 15 March 2009)

Gordijn,J., "Design and Evaluating eBusiness models", IEEE Intelligent Systems, vol.16, n.4, (2001), pp.11-17

Grasl, O. "Business Model Analysis: A Multimethod Approach" in Dumas, M. and Reichter, M. Proceedings of Business Process Management, 6th International Conference, BPM 2008, Milan, Italy, September 2-4, 2008. Published in Lecture Notes in Computer Science,vol.5240, 2008

Harknes, J. "The future of healthcare is patient-centred" in 2050 A Health Odyssey: Thought Provoking Ideas for Policy Making, Report prepared by Health First Europe

Health Financial Management Association (HFMA), Overcoming Barriers to Electronic Health Record Adoption, Results of Survey and Roundtable Discussions Conducted by the Healthcare Financial Management Association, February 2006

Health Information Technology Evaluation Toolkit, Report prepared by Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 2006

Hedman J The business model concept: theoretical underpinnings and empirical illustrations. European Journal of Information Systems vol. 12, n. 1, 2003, pp. 49–59.

Hedman, J and Kalling, T. "The Business Model Concept: Theoretical Underpinnings and Empirical Illustrations", European Journal of Information Systems, vol. 12, n.1, 2003, pp.49-59;

Hillestad, R. et alia "Can Electronic Medical Record Systems Transform Health Care? Potential Health Benefits, Savings, and Costs." Health Affairs, vol. 24, no. 5 (September–October 2005),pp. 1103–1117.

Hook J, et alia Using Barcode Medication Administration to Improve Quality and Safety: Findings from the AHRQ Health IT Portfolio AHRQ Publication No. 09-0023-EF, December 2008.;

Jakubobowski, E. et alia "Healthcare Systems in the EU: A Comparative study" Working Paper prepared for the Directorate General For Research, European Parliament, October 1998;

Klueber R (2000) Business Model Design and Implementation for services. In Proceedings of Americas Conference on Information Systems,Long Beach, CA, 2000

- Kruger C et alia, Business Model formation within the online news market: the core + complement business model framework. In Proceedings of 16th Bled eCommerce Conference eTransformation, Bled: June 9–11, 2003
- Lederer A et alia, “Process and reality in information system benefit analysis” Information System Journal, vol.8, 1998, pp.145-162,
- Leonard, K. “The Role of Patients in Designing Health Information Systems: The Case of Applying Simulation Techniques to Design an Electronic Patient Record (EPR) Interface” Health Care Management Science vol. 7, pp. 275–284, 2004
- Linder, C et alia Changing Business Models: Surveying the landscape, Research Report, Accenture Institute for Strategic Change, 24 May 2000, available at http://www.accenture.com/NR/rdonlyres/0DE8F2BE-5522-414C-8E1B-E19CF86D6CBC/0/Surveying_the_Landscape_WP.pdf (visited 15 March 2009)
- Magretta, J. “Why Business Models Matter” Harvard Business Review, May 2002, pp.86-92
- Mahadevan B (2000) Business models for Internet-based eCommerce: anatomy. California Management Review vol. 42, n.4, 2000, pp. 55–69.
- Malone, T, et alia “Do Some Business Models Perform Better Than Others” MIT Sloan Working Paper, Ma6 2006 p.2-4
- McGann S Capturing the dynamics of eBusiness models: the ebusiness analysis framework and the electronic trading infrastructure. In Proceedings of 15th Bled Electronic Commerce Conference - eReality: Constructing the eEconomy, Bled, Slovenia, June 17 – 19, 2002
- Pomerleau, J. et alia “The burden of chronic disease in Europe” in Nolte, E. e McKee, M. Caring for People with Chronic Diseases: an Health System Perspective, (Maidenhead, Open University Press, 2008) pp.15-43
- Nilsson AG, Perspectives on Business Modelling – Understanding and Changing Organisations.(Berlin, Springer, 1999)
- Nir M. “Factors affecting the adoption of telemedicine: A multiple adopter perspective” in Journal of Medical Systems, vol.28, n.6. December 2004, pp.671-632
- Noel Nader, “Interstate Access to Healthcare Care in Europe: How to make it easier for citizens?” Presentation at EU Ministerial Conference “eHealth for Individuals, Society and Economy@ Prague, 18-20 February 2009.
- Osterwalder A An ebusiness model ontology for modeling eBusiness. In Proceedings of 15th Bled Electronic Commerce Conference – eReality: Constructing the eEconomy, Bled, Slovenia, June 17 19, 2002
- Papakiriakopoulos D, et alia Building eBusiness models: an analytical framework and development guidelines.In Proceedings of 14th Bled Electronic Commerce Conference, Bled,June 25-26, 2001
- Pateli, A. “A Framework for Understanding and Analysing eBusiness Models Paper presented at 16th Bled eCommerce Conference "eGlobal" Conference, June 9-11, 2003

available at [http://domino.fov.uni-mb.si/proceedings.nsf/Proceedings/4C84233423603AD0C1256EA1002D1A29/\\$File/25Pateli.pdf](http://domino.fov.uni-mb.si/proceedings.nsf/Proceedings/4C84233423603AD0C1256EA1002D1A29/$File/25Pateli.pdf) (visited 15 March 2009)

Pateli, A. and Giaglis, G. “A research framework for analysing eBusiness models”, European Journal of Information Systems, vol.13, November 2004 (online version), p.302

Paul, D. L. et alia “Assessing technological barriers to telemedicine: Technology-management implications. IEEE Transactions for Enginnering Management, vol.46, n. 3, 279–288, 1999,

Pouloudi, A. “A societal perspective on E-Business adoption”. Journal of Information, Communication and Ethics in Society vol. vol. 1, n.3 (2003) pp.149–165.

Richardson, J. The Business Model: An Integrative Framework for Strategy Execution(September 1, 2005) Paper available at SSRN: <http://ssrn.com/abstract=932998> (visited 15 March 2009)

Seppanen, M. Business Model Concept: Building on Resource Components, Doctoral Thesis, Tampere University of Technology, 22 August 2008, p.3

Smith M “Towards a global definition of patient centred care” British Medical Journal, n.322 (7284) 2001, pp.444-445.

Southern California Evidence-Based Practice Centre, Cost and Benefits of Health Information Technology, Report prepared for Agency of Healthcare Research and Quality, US Department of Health, AHRQ n.06/E006 April 2006

Stephen T. Parente , “Beyond The Hype: A Taxonomy Of E-Health BusinessModels”, Health Affairs, Vol, 21, November/December 2000,pp.90-101

Stroetman, V. eHealth for Safety: Impact of ICT on Patient Safety and Risk Management, Report prepared for ICT for Health Unit, DG Information Society and Media, European Commission, October 2007

Stroetmann, K. et alia eHealth is Worth it: The economic benefits of implemented eHealth solutions at ten European sites, Final report prepared for the European Commission, 2006

Economist Intelligence Unit, The future of Healthcare: Putting the Patient at the Centre of Care Report prepared on behalf of Philips, 2007.

The Impact of eHealth on the Quality & Safety of Healthcare: A Systemic Overview & Synthesis of the Literature, Report prepared for Report for the NHS Connecting for Health Evaluation Programme, 2008

US Congressional Budget Office, Evidence of the Costs and Benefits of Health Information Technology, Publication n.2976, May 2008

Van Der Zeijden, A. Chair International Alliances of Patients’ Organisations, “Patient Empowerment through Effective eHealth Strategies” Presentation at Clinical Information Systems and Electronic Records and eHealth, London, September 2004

Van Doosselaere, C. et alia Legally eHealth: Putting eHealth in its European Legal Context Study Report on behalf of DG Information Society and Media, European Commission, March 2008

Walker, J. "The Value of Health Care Information Exchange and Interoperability." Health Affairs, vol. 25, no. 6, 2005 Web Exclusive (January 19), pp. w5–10–18

Wang, S. "A Cost-Benefit Analysis of Electronic Medical Records in Primary Care" The American Journal of Medicine, vol.114, April 1, 2003, pp.397-403, see in particular pp.401-402

Weill, P. and Vitale, M.R. Place to Space: Migrating to eBusiness Models (Boston, Harvard Business School Press, 2001)

Yuji Akematsu et alia An empirical analysis of the reduction in medical expenditure by e-health users, Journal of Telemedicine and Telecare, Vol. 15, N 3, 2009, pp. 109-111

Zimmerman, H.D et alia, "Introduction to Special Section: Business Models" Electronic Markets, vol. 11, n.1, 2001, pp.3-9

Annex 2: Expert interviews

As part of the evidence collection, the project team has undertaken a set of semi-structured interviews with leading European experts on eHealth. Each interview has been undertaken in strict Chatham House. The interviewee participated in a strictly personal capacity.

Country	Service/Company name	Position	Title	First name	Surname	Date of interview
UK	eHealth Interdisciplinary Group	Senior Lecturer, Leader of the eHealth Interdisciplinary Group	Dr.	Claudia	Pagliari	23-4-2009
UK	Judge School of Management	Professor	Prof.	Stefan	Scholtes	7-5-2009
IT	Bocconi University	Professor, Head of eHealth	Prof.	Luca	Buccoliero	11-5-2009
BE	European Venture Capital Organisation		Mr.	Georges	Noël	14-5-2009
FR	AGFA-Healthcare	Director, Strategy	Mr.	Eric	Maurincomme	15-5-2009
UK	BT	Director Health, EMEA and LATIN	Mr.	Keith	Rivers	15-5-2009
NL	Plexus		Dr.	Jaap	Maljers	18-5-2009
CY	DITIS	Associate Professor at University of Cyprus (Department of computer science)	Prof.	Andreas	Pitsillides	18-5-2009
NL	Pfizer	eHealth manager	Mr.	Gerard	Davelaar	19-5-2009
NL	Menzis	Manager Innovation & Healthcare	Drs.	Harry	Nienhuis	20-5-2009
BU	Ministry of Health Bulgaria	Deputy minister, Ministry of Health	dr.	Lubomir	Pramatarov	22-5-2009
Benelux	Microsoft Amalga and Health Vault	Manager Health Care Microsoft	Mrs.	José	Strijbos	26-5-2009

		Benelux				
NL	KPN	Healthcare Manager	Ing.	Ruud	Slemmer	26-5-2009
BE	Intel	Digital Health Policy Manager	Dr.	Mario	Romao	27-5-2009
BU	Consortium (ICW-Cisco-Kontrax)	ICW representative/MoH representative	Dr.	Dimitri	Trifonov	27-5-2009
CZ	General Electric	General Manager Home Health	Mrs.	Agnes	Berzsenyi	28-5-2009
UK	NHS Scotland - eHealth / SCI (Scottish Care Information Gateway)	Chair SCI Gateway Steering Group / Scottish Executive eHealth Directorate	Mrs.	Jackie	Caldwell	28-5-2009
NO	Norwegian Center for Telemedicine	Head of the Center	Mr.	Steiner	Pedersen	29-5-2009
NL	Martini Hospital	Drs. Cardiologist	Drs.	René	van Dijk	2-6-2009
NL	Catharina Hospital	Prof. Dr. Anaesthetist	Prof. Dr.	Erik	Korsten	2-6-2009
NL	NPCF	Senior Policy Employee		Marcel	Heldoorn	3-6-2009
NL	University of Amsterdam	Professor Medical IT	Prof. Dr.	Arie	Hasman	5-6-2009
NL	Rivas Zorggroep	Information Manager	Mr.	Peter	Smithjes	8-6-2009
NL/GE	Siemens	Manager Health IT	Mr.	Eva	Remerie	25-6-2009

Annex 3: Case study on selection methodology

This annex details the methodology for the selection of the 5 illustrative case studies described in the report.

Research methodology scholar Robert Yin encourages the use of case studies for public policy projects when they discuss situations and environments that the researcher cannot manipulate or those in which the researcher does not have intrinsic and direct involvement.⁸⁶ The overall objective of this project satisfies these two requirements since it aims to identify case studies of value creating and sustainable eHealth systems in Europe from which it is possible to extract relevant best practices and guidelines. Favoured this specific research methodology, the first research challenge has been to choose between an approach involving the analysis of a single case study or one centred on multiple ones.

Robert Yin argues that research strategies based on one case study are suitable in three situations. First, they should be undertaken when the selected case study represents events or situations that may test a well-established theory by confirming its strengths or introducing alternative explanations. This research strategy may also be used when the case study is unique, rare and, more importantly, revelatory. Still, this last condition exists when "the investigator has the opportunity to observe and analyse a phenomenon previously inaccessible to scientific investigation". Even if these three conditions are satisfied, this strategy presents the risk that the selected case study is not explanatory enough. Consequently, Robert Yin suggests avoiding single case study strategies "until all major concerns have been covered" and, in particular, total access to all the required quantitative and qualitative data for conducting the analysis.

This project team has not been able to identify a single case study that fulfilled the necessary criteria and provided indispensable data and information from which applicable operational best practices applicable to all European eHealth contexts could be extracted. Instead, it has been possible to identify several case study candidates that would have suited a multiple case study project. In fact, multiple case study projects are considered more "robust" since they are able to present more compelling evidence. The selection of this research strategy opens a set of specific research challenges, primarily accessing the required evidence and the need to select case studies allowing for "logic replication". This is the

⁸⁶ Robert Yin *Case Study Research: Design & Methods*. Sage Publications, California, USA (third edition, 2003)

situation where each case study "either (a) predicts similar results (a literal replication) or (b) produces contrary results but for predictable reasons (a theoretical replication)". In order to satisfy the requirement for logical replication, each case study needs to refer back to the proposed operational framework and unit of analysis. Their precise identification is extremely delicate since it may affect the possibility of extracting relevant and comparable information and data. Units of analysis guide the research project and the data collection. If the questions and objectives of the project do not reflect the units of analysis, the collected data will not provide the necessary evidence from where to extract meaningful and solid conclusions.

Taking into consideration the strategic objectives of this project, it was decided to espouse a multiple case study approach. Therefore, efforts have been directed towards the identification and selection of cases that allow for logical literal replication. These were expected to be sustainable eHealth systems (units of analysis) that were fully operational and integrated in overall delivery of a specific healthcare-related service (e.g. medical advice or test results delivery). They were also expected to be supported by a revenue model that makes them chargeable in line with the *modus operandi* of the national health system where they operate. The satisfaction of these conditions was extremely important since the literature makes extensive reference to eHealth systems that seem fully operational but, after a closer look, are still in their pilot phase. In addition to the condition of sustainability, particular attention was directed towards the identification of case studies that allowed access to the necessary qualitative and quantitative evidence. The third selection criteria referred to the fact that the combination of case studies was suitable to provide for the coverage of each of the four eHealth sectors identified by the European Commission in its Lead Market Initiative. Finally, the selected case studies should not have been examined by previous EU-supported projects. The satisfaction of all of these criteria has led to the selection of the five case studies described in the report.

Annex 3: Validation workshop

The initial results of the project were presented during a half day restricted workshop held in Brussels on 7 July 2010. During the workshop, the project team presented the first results of the project and collected suggestions for future directions for the project. As in the case of the expert interviews, participation in this workshop was under strict Chatham House rules and in a personal capacity. Workshop participants are listed below. .

- Drs Hans Ossebaard, University of Twente
- Keith J. Rivers, Head of Healthcare, EMEA and Latinamerica, British Telecommunications
- Hans Keizer, Tactive
- Chloé MANIFICAT, Consultant Alcmend
- Ms. Anne-Charlotte Pupin, Project Manager Alcmend
- Roberto Landi, Assistant Professor, Libera Università' delle Scienze Sociali Italy and Coordinator of the eHealth Executive Master, Luiss Business School (Academia)
- Liuska Sanna Programme Officer European Patients' Forum
- Fabio Miraglia, Professor of Healthcare Management, Università' Mediterranea di Reggio Calabria, Head of the Italian Association of Private Hospitals and Official Delegate of Union Européenne de l'Hospitalisation Privée
- Paul Garassus, President Scientific Council, French Private Hospitals Association, and Vice President Health Economy Society-France and Official Delegate, Union Européenne de l'Hospitalisation Privée
- Mario Romao, Digital Health Policy Manager, Intel Corporation, SA
- Harry Nienhuis, innovation Manager, Menzis, Innovation Manager (Industry, healthcare insurance).

Annex 5: Final workshop

This annex provides a description of the methodological approach for the final workshop structured around the active scenario methodology held in Brussels on 8 November 2010. The following paragraphs provide an overview of the overall workshop approach and the list of participants. The results of the workshop have been one of the core inputs for the identification of future EU public policy interventions for fostering value-creating and sustainable eHealth systems and applications in Europe.

Workshop methodological approach

The objective of this workshop was to discuss the preliminary version of the final findings of the project and identify future policy interventions for fostering the development of business models for sustainable and value creating business models for eHealth. The core element of the workshop was the application of the active scenario methodology. This approach, which has been approved by the European Commission, builds upon the fact that scenarios concerning future developments of specific services or systems should be devised with the direct involvement of the involved stakeholders. The stakeholders should be in a position to freely express their ideas based on their specific personal and professional experience. The results of these expressions are to be collected and jointly presented during a scenario-based workshop and used as a starting point for moderated discussions among invited workshop participants.

With the support and approval of the European Commission, RAND Europe and Capgemini Consulting have implemented this methodology in the final workshop of this project. This has required them to conduct two minute interviews with healthcare professionals from different EU countries. In selecting the interviewees, RAND Europe and Capgemini Consulting focused upon healthcare professionals who are actively using (or expect to) eHealth applications. However, the project team also wanted to identify interview targets who are not regularly involved in the overall European eHealth public policy debates. The reason for this restriction is that RAND Europe and Capgemini Consulting were interested in getting information and perception about the ways eHealth is currently changing their professional activities and future directions without contamination of the current EU public policy intricacies.

RAND Europe and Capgemini were able to obtain agreement for a video interview from 8 European healthcare practitioners and patients. Each interview lasted between 2-3 minutes. Participants were allowed to freely respond to the following two questions: a) What kind of eHealth system would you like to see on the market? B) How would you benefit from it? Interviewees were asked to be frank and independent in their assessment. In order to

preserve a sense of spontaneity, interviews were taped live and left unedited. Some interviewees prepared brief background notes to facilitate their communication in English, which was not their mother tongue.

Having completed the interviews, the project team merged them into a single digital video file to be presented at the workshop. Since workshop participants have different linguistic backgrounds, it was also decided to transcribe these interviews to facilitate comprehension.

The workshop itself lasted one day. It was held in Brussels on November 9, 2009. It was hosted by the European Commission. The meeting opened with introductory remarks from the project team and the European Commission, including an overview of the results of the project up to that stage. Afterwards, participants were presented with the digital video file of the interviews and, then were asked some immediate first reactions.

Participants were then subdivided in two groups and engaged in the first breakout session, where participants were asked to discuss the following question: “Why are eHealth systems not successfully responding to the needs or expectations of the interviewee?” Participants were asked to identify these reasons using sticky hexagons to be attached on the wall of the room. These sessions were moderated in order to facilitate participants’ engagement and support the clustering of issues along common themes and/or trends. Following lunch, each breakout group was asked to report back to all participants in the plenary sessions where all participants were asked to comment and debate.

Starting from the results of the morning discussions, participants were asked to break for the second session as to discuss and identify actions to overcome the barriers or impending factors affecting the development of appropriate business models. As in the morning session, this identification process involved a facilitated debate on the generation of recommendations across stakeholders. Each participant was asked to identify public policy options involving the European Commission, national member states and other stakeholders. These ideas were posted on a ‘hexy’.

The same approach of the morning session was followed subsequently: a moderator was asked to consider each suggestion and then steer the discussion to determine what policy actions are necessary to support or encourage the required actions by each class of stakeholders. For example, participants may identify that “business needs to adhere to common interoperability standards regarding message exchange for the sharing of electronic patient records”. The recommendation (and the ultimate aim of what is to be achieved) could be an understanding of what the policy-maker (and which sort –European Commission or Member State) needs to do to encourage, support or facilitate this. In the above example it might be: “policy makers should require IT common standards for managing the sharing of personal healthcare records in Europe”. As in the morning session, a clustering process was implemented.

The results of the discussions were then reported back to the plenary by the nominated rapportuer. The floor was then available for a moderated discussion.

Workshop participants

- Björn KABISCH- Jena University Hospital
- Bruce GREENSTEIN – Health Microsoft
- Hans OSSENBARD - National Institute for Public Health and the Environment, Netherlands
- Helen WESTENDORP - Tactive (ehealth free of alcohol)
- Ivana SILVA – Pharmaceutical Group of the European Union (PGEU)
- Keith RIVERS – BT Global Services
- Mike PALMER - ICT for Health unit (H1), DG Information Society and Media (DG INFSO)
- Philippe SWENNEN – International Association of Mutual Benefit Societies (AIM)
- Veronique LESSENS - Agfa HealthCare & COCIR HC IT
- Virginia BRAUNSTEIN – Economic and Statistical Analysis unit (INFSO C4)
- Christoph THUEMMLER - School of Computing Edinburgh, Napier University
- Harry NIENHUIS - Menzis Health insurance
- Kristin SMITH – BT Global Services
- Lisette VAN GEMERT-PIJNEN - ehealth Research Center, University of Twente
- Liuska SANNA - European Patient Forum
- Mario ROMAO - Intel
- Nigel STRANG - INFSO H1
- Octavian PURCAREA – Health Microsoft
- Saad MEZZOUR - Medtronic

Active scenario interviews transcripts

The following paragraphs provide the transcripts of the stakeholder interviews described before. As previously indicated, these interviews have not been edited to preserve the original sentiment and feelings of the participant.

Francesca, pharmacist, Italy

“Hi, my name is Francesca Duranti. I am currently following the tradition of my family who has owned a pharmacy in the centre of Perugia over the last hundred years. I have actually been a pharmacist since 1995, but I have been here since I was a child. I like my job since I can talk to my people and help them. So, I feel I am an active member of my community. I am not a great user of IT systems. In Italy we have an IT system called Centro Unico di Prenotazione. Patients come to the pharmacy to make an electronic appointment for a visit or test. I enter the electronic database and book the visit according to the availability and then I collect the ticket as requested by the visit and test. It is very useful for me since patients can buy other medicines while making the appointment of the visit. I also know about RFID. These are specific sensors that make sure that medicines we sell to the people are not fake because over the last six and more months fake medicines are available at the pharmacies. So with RFID I can see where it is bought and that it is not a fake medicine and can give it to the patient with no problem. IT can be useful for my work but at the moment it is not really changing my life. “

Diederik, chronic diabetes patient, the Netherlands

[What kind of ehealth system would you like to see on the market?]:

“My name is Diederik and I am an urban development designer in the Netherlands. Since 6 months, I have diabetes. This means that I have to check my blood glucose 5 times a day, and have to inject lots of insulin. I write down these values into a booklet. Every 6 weeks I go to the hospital to discuss the values with my doctor and nurse. They look into the booklet and adjust the amounts of insulin based on the values of the last 6 weeks. Unfortunately, they can only check my values once during these 6 weeks. IT systems could help me with my disease. When I have a system at home, linked to my computer, I can easily write down my values and send them on a regular basis to the hospital. It can be a system which also indicates the amount of insulin I have to inject when I have high blood glucose levels. “

[How would you benefit from it?]:

“These systems can be very useful in getting control over my diabetes. When I have the ability to put values into a system, these can be analysed easily by my doctor. She can tell me more often what adjustments I need to make in injecting insulin. Therefore, the fluctuation in my blood glucose will decrease. I will have less chance on complications resulting from diabetes. For example, I need to go fewer times to the hospital, and have less hypo's (<4) and hyper's (>20). The result is that I will feel myself much better during the day. “

Gabriele, insurance broker, Italy

“Hello, I'm Gabriele Lasci, I'm an insurance broker in Umbria. Following recent changes in Italy's legislation, I am actually able to sell many products from different providers. The client comes to me primarily for life insurance and professional indemnity. Over the last years there has been an increase of requests for private health insurance. You know, in Italy we have got a health system, a national health system, but (this is because this) national system is not... so good. You know it is not that bad, but you know... they can't wait for that. You ask me about the ehealth system we would like to see in the market... you know, even if the prices are not good for my clients, they are good for a lot of effort, so in general it's not helping me and the insurance I work for. You know, because for example, when an individual comes to me for an insurance, it would be useful for me to have some information about his healthcare in general, so they would be much faster, and there will be less mistakes. So that would be better for me as insurance broker and for the insurance as well. You know I am not very knowledgeable about ehealth, but, in general, but, I saw something in the past. I saw something in the hospital as well, because they had some database, they check on a database the records of the patients, that would be very useful for me. Even if I'm not expert in ehealth. What about... you ask me about the benefit from ehealth? I think this new IT tools in healthcare, to select can be very useful for organisation represented for me as well. [Meaning: I think the use of new IT tools in healthcare can be very useful for organisations like the one I represent] For example, you can have the information as to what would be your previous condition, whether you smoke or not, you already have this information, you can check it on your computer, it will be very very very easier to work. And also if, if I be a... a patient I'll be much more quite, because I know that the people are checking my health on a database, so they know already my situation. The positive also, when we need to process a claim, because, you know, now I have to

check everything in paperwork. Everything in the future will be, I hope, will be done by internet, so will be very much, you know, faster and easier.”

Helle, chronic patient, Denmark

“I just think that the idea sounds nice. I am not a doctor and I don’t know anything about eHealth systems. So, if I was comfortable with it and was sure about it – like I am now shopping on the internet. It would take some years. Then it would be perfect, if I could take my blood sample at home and just knowing it would be just as save and just as quick and they could share information between different doctors. I think it would be most nicely, if every hospital doctor would communicate with each other. I don’t think we are so far in that area. Because, ...I live in Demark. And they [doctors] do sometimes communicate. It is going better and inside the hospital they do communicate, but they try to communicate better with your own doctor. So that’s good and I think it is very necessary and I can’t see how it can be so complicated. It would be nice if they developed even more across countries. If I am injured in a foreign country and that’s probably more....well, I guess I will have more problems. Eventually, if I feel safe about I would like to take my own blood test and then just send it. Because I have epilepsy and I know exactly how to do it and there is no need for my doctor to use his very expensive time to do that for me. But I wouldn’t like to miss the personal contact in total but if it is something I really know how to do and it would only be a waste of time for me and the doctor, I don’t the necessity of just going there. And of course, I think it’s gonna take several years because I have to be very comfortable and thinking that the result be just as good as if I went there in person. And, so I wouldn’t like my doctor to be just an online doctor. He has to see me and he has to yeah, I don’t know if I am injured see what the knee looks like. Even so with a webcam, if don’t think it’s the same. I would feel much more comfortable if he was there, but not in the common coincidence that I am used then this is totally ok. And it might be even quicker. I have one more thing, and I don’t know if I am allowed to say it. But I don’t think it ever gonna work unless to loosen up the personal data policy in the EU. I am sorry.”

Massimo, general practitioner, Italy

“Hi my name is Massimo Alba. I am a GP here in Rome servicing patients that are resident in the northern part of the city. I have been a GP for the past 12 years. I have started outside Rome and then moved to the city after 5 years. I have a mix set of patients; most of them are professionals and come from middle class environments. Clearly, I also have people with low income. I am confronted with the usual health conditions, some of them chronic. I am not a great user of IT. Yes, I have Internet in my practice and interact with my patients with email sometimes. However, I still like to have a face-to-face interaction. One possible IT system I would like to see is some sort of shared patient record. Currently, I have the medical history of my patients. Actually, I do not need the computer as I know most of them. Experience and knowledge is always important. However, it would be great to have the possibility of accessing electronic patient records to facilitate all the processes. For example, when a patient undertakes a test, I should be able to receive the results electronically so that I can see and take the appropriate measures. I would not need to actually see the patient unless it is extremely urgent. I know that I can do this. However, I can also see a major issue. Does this count as a visit? Do I get paid if I do this remotely?

This is still not precise but if in the future this can be done, it will be great I suppose. As I said, I am not a great user of IT. However, with some of my colleagues I have been informed about so called telemedicine services. These are expected to allow me to monitor from a distance a patient. Well, I am a GP and, in theory, it is difficult for me to monitor all the patients. However, I can see telemedicine for people with chronic diseases such as diabetes. If they can send the data to somewhere and I can monitor sometimes how they are doing, I can see the benefit. As you know Rome has a terrible traffic...so telemedicine can allow you to avoid it. Still, I am also afraid of my patient expectations. What happens if I am not able to see something via telemedicine? Am I responsible? I use the Internet so I can see it in my work. But there are risks. Should I continue to use pen and paper?"

David, ER doctor, Germany

"I would like to have a PDA that allows me to access my patients' records, manage my entries in real time, and consult key medical references and encyclopaedias. Also, I would like it to be equipped with a camera so that I can take photos which I can send to and share with my colleagues for immediate feedback. It must be easy to use, comprehensive, networked, reliable and quick. However, I am afraid that more information will lead to an information overflow and make it more difficult to take fast decisions. Also, I am worried about the implications of using such a system – will it be used to make physicians more accountable and increase stress and burden? "

Sam, biomedical scientist, UK

"My name's Sam and I work for the NHS in Harlow, I'm a biomedical scientist, and I use the TG system to install patient information regarding histology. I find the systems quite helpful and easy to use. It's helpful because I can access any patient information that I need, from any computer around the lab, and that helps with my work, that makes my work a bit easier. Also means I don't need to keep paperwork everywhere because everything is being stored on the computer.

What ways do you think the lab could benefit from different sorts of IT, or better use of technology in your lab? As I said before, because you keep all the information in one place and everyone can access that, that happens with other systems within the hospital, like, if you have a blood test done, that it's available to the lab and also to the GPs, or to anyone that is authorized to have that information, so that means you don't need to send a letter to the GP, the GP can straight away access the patient's results, discuss with the patient, so that facilitates a lot. Also you can keep all the patient's details and paperwork within a file, in a computer, rather than have, you know, numerous files, and having to have a place for them and things. Do you think there are people in the lab that use IT in a... in a... use IT well, are they IT literate in terms of how the sort of, processes, and all the paperwork that they do?

No. It's very difficult, especially for the older members of staff, and doctors seem to have quite a lot of difficulty in dealing with it, but that's more to do with their computer literacy rather than the system itself. What sort of new technologies might benefit your job in terms of, the processes you go through with labelling of specimens, and things that you have to do on a day to day basis? Would there be, for instance, a sort of, RFID technologies perhaps; would they be useful in that respect, to create a little scanner of

things that go round? We do have scanners actually. We have, all the labels we to use to give a patient number, a lab number, you can always scan all the numbers, you can also scan our names and things, so that makes... useful for when you need to use the computer. So, it makes errors... less... less errors. Is that through barcode technology? Yes.Ok, thanks very much, thank you.”

Fons, pharmacist, the Netherlands

“My name is Fons, and I am a pharmacist since 1991 in Hengelo, the Netherlands. I have set up, and am the chairman of, ‘Care Network Twente’. This network connects general practitioners and pharmacists in several cities in Twente (Hengelo, Borne, Delden and Goor). This network provides information concerning patients to all connected stakeholders, and results in benefits such as quick mutual communication, and the transfer of medication assignments between general practitioner and pharmacist, and the other way around. The general practitioner puts an assignment into the system. That assignment, a prescription, is send to the pharmacist, he/she prepares it, and the patient can pick it up easily at the pharmacist. There is also a connection between general practitioners. GPs can at all time see the electronic record of a patient. However, I also have a negative aspect on the information sharing. I do not see the benefits of the EHR which the Dutch government tries to implement. According to this system, all providers of care should have communication between one and another. The first system is OZIS (Open Care Information System). I and lots of other stakeholders also, think that this system appears to be certain but it is not. This system has a translation option, where medication coming from different countries (e.g. England, France, and Germany) is translated to Dutch. This means that patients can read in Dutch what specific medication they should take at a day. However, since pharmacists use different codes to indicate how many times you should take your pills, it sometimes goes wrong in setting out the right medication. In my opinion, it appears to be safe, but it is not! Therefore, these systems cannot be used yet into the healthcare environment.”

Iris, dentist, the Netherlands

“What kind of eHealth system would you like to see on the market?”

My name is Iris, and I am a dentist in Hengelo and Markelo, the Netherlands. I have indeed a good view on eHealth systems. For us as dentists, this could be of major importance, because we do not have information regarding patients coming on regular basis, patients coming from other dentists, but also patients that come in case of emergency. We do not have data of these patients, and ideally want information regarding patients’ medication. Patients do not always know what type of medication they use. Especially for dentists, it is very important that we know when patients use for example blood-diluting medication, or need antibiotics during a treatment. From my perspective, a network between pharmacists, general practitioners and us is critical.

Do you see more advantages?

Yes, patients come sometimes on times to the dentist for emergencies, for example during the weekend. At that moment, you cannot reach a general practitioner. So you do not know which medication a patient uses. When we have a connection to that system, we can

easily check if a patient uses critical medication (e.g. blood-diluent, and which type), and proceed to treat the patient as soon as possible.

Are there also disadvantages?

Yes, because there are also patients that are in physical healthcare (e.g. using overdoses of medication). Of course, they do not want that other people know this. Perhaps a part of the patient history must be protected. ”