

**Report on:**

**Sources of financing and policy  
recommendations to Member States  
and the European Commission on  
boosting eHealth investment**

**Final study report**

Version 1.0

**December 2008**



### About *Financing eHealth*

The Financing eHealth study was commissioned by DG INFSO and Media, unit ICT for Health, with the aim to assess different financing opportunities against the financing needs of eHealth investment. The overriding goal is to assist Member States and the European Commission in their efforts to meet the eHealth Action Plan objective of "supporting and boosting investment in eHealth".

### Full project title

Assessment of financing opportunities available to Member States to support and boost investment in eHealth

### Contract details

Contract number: 30-CE-0121896/0042

Starting date: September 01, 2007

Ending date: August 31, 2008

### Number and title of deliverable

This report is deliverable D5.3 of the Financing eHealth study, the final report on sources of financing eHealth investments and policy recommendations for Member States and the European Commission

### Authors

Alexander Dobrev, empirica, Germany, Tom Jones, TanJent, UK

Veli N. Stroetmann, Karl A. Stroetmann, Jörg Artmann, Anne Kersting, Narges Kasiri, Dainis Zegners, Stefan Lilischkis, empirica, Germany

### Contact

For further information about the *Financing eHealth* study, please contact:

	
<p><b>empirica</b> Communication and Technology Research Oxfordstr. 2, 53111 Bonn, Germany  Fax: (49-228) 98530-12 <a href="http://www.empirica.com">www.empirica.com</a> <a href="mailto:financing_ehealth@empirica.com">financing_ehealth@empirica.com</a></p>	<p><b>TanJent</b>  Hereford UK  Tel: +44 7802 336 229 <a href="http://www.tanjent.co.uk">www.tanjent.co.uk</a> <a href="mailto:tomjones@tanjent.co.uk">tomjones@tanjent.co.uk</a></p>

## Table of Contents

Executive Summary .....	6
1 Introduction .....	12
2 Conceptual framework of eHealth investments .....	15
<b>2.1 Defining eHealth and eHealth investment</b> .....	<b>15</b>
<b>2.2 The healthcare value system and its actors</b> .....	<b>16</b>
<b>2.3 Supply of finance for eHealth investment</b> .....	<b>20</b>
<b>2.4 eHealth spending decisions</b> .....	<b>21</b>
<b>2.5 Demand for finance for eHealth investment</b> .....	<b>24</b>
2.5.1 <i>eHealth investment decisions</i> .....	24
2.5.2 <i>Factors affecting financing options – a typology of eHealth investments</i> .....	28
2.5.3 <i>Financial needs of eHealth investments</i> .....	30
3 Financing arrangements for eHealth .....	33
<b>3.1 Venture capital</b> .....	<b>36</b>
<b>3.2 Capital markets</b> .....	<b>37</b>
<b>3.3 Commercial financing</b> .....	<b>39</b>
<b>3.4 Public financing sources</b> .....	<b>40</b>
<b>3.5 Charitable financing</b> .....	<b>42</b>
<b>3.6 Citizen contributions</b> .....	<b>42</b>
<b>3.7 Third party payer contribution</b> .....	<b>43</b>
<b>3.8 Reallocation of internal resources</b> .....	<b>45</b>
<b>3.9 Joint financing</b> .....	<b>45</b>
<b>3.10 Public-private partnerships (PPP)</b> .....	<b>46</b>
<b>3.11 Other arrangements relevant in the context of eHealth investment</b> .....	<b>50</b>
3.11.1 <i>Procurement and pre-procurement</i> .....	50
3.11.2 <i>Collaboration and purchasing power in procurement</i> .....	51
3.11.3 <i>eHealth investments in services, not products</i> .....	53
3.11.4 <i>Industry-health authority relationships and networking</i> .....	54
4 Issues determining sustainability of eHealth investments .....	55
<b>4.1 Costs and benefits – common misunderstandings</b> .....	<b>55</b>
<b>4.2 Timescales for eHealth</b> .....	<b>58</b>
<b>4.3 Risks of eHealth</b> .....	<b>60</b>
<b>4.4 General strategic fit</b> .....	<b>62</b>

<b>4.5</b>	<b>eHealth procurement</b> .....	<b>64</b>
<b>4.6</b>	<b>Reimbursement and business models</b> .....	<b>66</b>
5	Skills & knowledge needed to boost investment in eHealth.....	68
<b>5.1</b>	<b>What is eHealth?</b> .....	<b>68</b>
<b>5.2</b>	<b>Managing the variables in eHealth</b> .....	<b>69</b>
5.2.1	<i>Taking investment decisions</i> .....	70
5.2.2	<i>Supporting investment management after decisions</i> .....	72
<b>5.3</b>	<b>Developing health ICT staff</b> .....	<b>74</b>
<b>5.4</b>	<b>Managing risk</b> .....	<b>75</b>
<b>5.5</b>	<b>Creating an information culture</b> .....	<b>76</b>
<b>5.6</b>	<b>Procurement expertise</b> .....	<b>77</b>
<b>5.7</b>	<b>The new jobs of executives</b> .....	<b>78</b>
6	Policy recommendations .....	80
<b>6.1</b>	<b>Promote eHealth as a resource in healthcare and services, not as an end in itself</b> 80	
<b>6.2</b>	<b>Focus on improving several aspects of health services, not on cash savings</b> .....	<b>80</b>
<b>6.3</b>	<b>Facilitate effective, comprehensive financing packages covering the whole investment lifecycle</b> .....	<b>81</b>
<b>6.4</b>	<b>Invest in more evidence on investment risks</b> .....	<b>82</b>
<b>6.5</b>	<b>Promote and facilitate stakeholder engagement, not just consultation</b> .....	<b>82</b>
<b>6.6</b>	<b>Provide resources to develop skills and knowledge</b> .....	<b>83</b>
7	Acknowledgements .....	84
8	Disclaimer .....	85
	List of abbreviations .....	86
	References .....	88

## List of Exhibits

Exhibit 1: The healthcare value chain in the healthcare value system ..... 17

Exhibit 2: Mapping processes to organisations ..... 19

Exhibit 3: NHS England - ICT expenditure as a share of total finance available ..... 23

Exhibit 4: NHS England - eHealth investment as share of total revenue expenditure ..... 23

Exhibit 5: The process of economic and financing decisions ..... 25

Exhibit 6: Sub-optimal position - eHealth pushing into healthcare from the outside ..... 26

Exhibit 7: Constructive strategic fit - eHealth as an integrated factor of production ..... 27

Exhibit 8: Typology structure for eHealth investment profiles ..... 28

Exhibit 9: Joint development of complex eHealth solutions ..... 29

Exhibit 10: Supplier developed eHealth solutions ..... 30

Exhibit 11: Example of economic expenditure curve of an eHealth investment ..... 30

Exhibit 12: Timing of sustainable benefit realisation ..... 32

Exhibit 13: Matching financial needs and sources ..... 35

Exhibit 14: Examples of activities financed by extra and reallocated finance ..... 56

Exhibit 15: Illustrative financing needs curve of eHealth investments ..... 58

Exhibit 16: TanJent nine-level eHealth development and culture wall ..... 77

## Executive Summary

The Financing eHealth study was commissioned by DG INFSO and Media's ICT for Health Unit. The aim is to assess different financing opportunities against the financing needs of eHealth investment. The overriding goal of the study, and of this final report, is to assist Member States and the European Commission (EC) in their efforts to meet the eHealth Action Plan objective of "supporting and boosting investment in eHealth".

A sobering conclusion of the study is that just increasing finance for eHealth will not necessarily boost investment. How much to spend is the wrong question and conveys an inappropriate perspective. What to spend the money on is a better question. The most important part of eHealth investment that needs expanding is the eHealth skills and knowledge of healthcare staff and ICT suppliers' staff. An expanded capability is essential to achieve more success and so help to boost eHealth investment.

Increased capability helps to secure the potential and confidence that eHealth will add enough value. If an investment is worth it, providing the required finance becomes a supporting priority. Denying finance for eHealth is the right decision where the planned investment does not show a better net benefit than other types of competing investment.

Choosing the best financing arrangement is a challenge for eHealth investors. A common theme seems to be the difficulty in integrating eHealth financing into the factors that ensure success. Over-emphasising finance for ICT to the detriment of engagement, change, and benefits realisation may be prevalent, and needs correcting.

No single source of financing is enough to initiate an eHealth investment and see it through to its completion. Mixed financing arrangements are a solution to handle such investments at all stages of their lifecycle. This applies to both recurring and non-recurring costs. Joint financing for recurring costs is a model in which all beneficiaries have to be involved in the financing stage. Current financing opportunities support a limited, and often insufficient, time-period of the investment lifecycle. Therefore a combination of sources is suitable to support an investment, and its characteristics determine the finance mix. Often, different models of eHealth financing need combining to procure such investments.

Models such as public-private partnerships (PPP) can help to share the burden of financing eHealth investments between private ICT vendors and public health service provider organisations (HPOs). PPP lowers the burden of hump expenditures for HPOs significantly, while HPOs have to secure their recurring costs that are higher than the annual costs in conventional models.

When considering the financing sources available across Member States and at the European and international levels, the emphasis is mainly on non-recurring financing. Recurring finance, for instance through reimbursement for healthcare with eHealth, is still the exception rather than the rule. This has a negative impact on eHealth investment. Investors have to deal with long-run recurring costs and often need additional annual income to finance these. Another hindering reality is that finance to develop and expand capacity and capability at HPOs is very limited.

There is plenty of activity on research and eHealth implementation, with numerous financing models, but they are a bit haphazard, and could benefit from rationalisation and streamlining. More importantly, few of the eHealth financing sources seem to support the need to develop and expand the skills base needed to boost eHealth investment.

Improvements of these financing models include enhanced facilities to navigate the diversity of financing sources, integrating the policies and use of funds, and improving the co-ordination of EC funds. HPOs and third party payers in each country should develop and expand recurring finance through reimbursement for healthcare with eHealth to reflect new care models, better quality and different costs. HPOs and third party payers should also increase finance to develop and expand the capacity and capability for leadership of ICT-enabled change, eHealth investment decisions, benefits realisation, health informatics, and creating sustainable eHealth strategies that are part of general healthcare development.

The issues determining sustainability of eHealth investments are:

- Economic and financial costs and benefits
- Timescales
- Risks
- General strategic fit
- eHealth procurement
- Reimbursement and business models.

The first issue relates to the uncomfortable truth that eHealth is usually a net investment, with a negative financial return. While large proportions of costs are extra financial burdens to investors, benefits are often bundled into pockets of liberated resources and intangible categories. These benefits have a considerable value, but seldom translate into extra cash. Sustainable eHealth investment requires decision takers and financial stakeholders to be clear and explicit about the distinction between economic benefits, economic returns and financial savings.

Timescales for sustainable eHealth investment extend well beyond the business and financial planning cycles of most national health agencies and HPOs, and can thus present financing challenges for eHealth. Nevertheless, eHealth investment lifecycles should be set by the time needed to realise the required net benefits and so achieve economic returns. In this context, an important observation is that step-by-step, slow burn eHealth investments build continuously from relatively small scale successes. For national and regional eHealth investments, it is essential that lifecycles and timescales used by Member States' health entities and HPOs are consistent.

Neglecting risk is common. Successful eHealth investors tend to apologise for their extended timescales, understating the significant reduction in risk they have achieved by taking the time needed for effective collaboration and engagement, especially with healthcare professionals. Risk in eHealth contains a paradox. Generally, longer time scales increase risk, but in this context and if used effectively, they enable risk mitigation. In addition, large-scale big bang eHealth carries increased risks of isolation and disconnection from benefits and net benefits. Without this perspective, eHealth investors

seldom evaluate risk realistically, so risk is not recognised as a cost, and there is no mitigation and no respective financial provision. This in turn leads to understated costs and overstated benefits, not a good foundation to boost eHealth investment. Knowledge and research on risk exposure and probabilities in eHealth is extremely limited, exacerbating the challenges to potential eHealth investors.

The strategic fit of eHealth investments also needs improving. The challenge is to ensure that eHealth investment has, and sustains, a direct link with mainstream strategic goals for health and healthcare. Achieving a strategic fit for eHealth depends on the type and scale of eHealth and the number and type of actors, especially national bodies, HPOs, ICT suppliers and stakeholders.

After the decision to invest and once all the finance has been secured, procurement comes high on the priority list. In this context, an argument is that financial benefits from appropriate joint and aggregated procurement can be considerable. However, the topic reveals another uncomfortable reality: there are repeated occasions when ICT suppliers are not in the position to supply the solutions needed for benefit realisation. At the same time, procurers do not always set their requirements effectively, making life more difficult for ICT vendors. This again underlines the importance to invest in specific eHealth skills and knowledge among the wider healthcare and ICT communities.

Procurement staff need inherent knowledge of the specifications that enable the systems and services of eHealth to meet the procuring organisation's needs. They also need direct knowledge of risk transfer and sharing, as illusions often prevail. Procurement contracts should be set into small manageable steps, with performance linked to payments. Alongside this, realistic arrangements for payment deduction for penalties need to be in place, providing incentives to fix problems and avoiding continuous penalty payments without the fixes.

A simultaneous task for investors, starting with or even before procurement, is to secure the recurring financing of the eHealth services, systems and tools. This involves sound business planning and in some cases augmentations in healthcare reimbursement models. Reimbursement arrangements must be responsive to continuous change, which is much more than just an eHealth matter.

The Financing eHealth study set out to discover how to support and boost sustainable investment in eHealth. It identified a skills gap in managerial knowledge needed to deal with eHealth investment and the specifics of the eHealth domain in general. This gap seems to be the most significant factor that impedes progress. Identified shortfalls in the real resources for eHealth are:

- Significant lack of skills and capabilities in the workforce to deal with all eHealth requirements
- Limited view of the potential of eHealth by many healthcare professionals, executives and managers, leading to narrowly defined eHealth investment plans.

While there are sources of financing individual eHealth projects, only limited financing opportunities are available to fix these shortfalls.

The knowledge gap includes some confusion about the concept of eHealth. It has become an overused term with many meanings. An eHealth definition that includes both



ICT and organisational change is essential for managers. Focusing on ICT alone is the wrong starting point. The next step for healthcare and eHealth managers is to learn how to take the best investment decisions and how to see eHealth investments through to success. The most important requirement for leaders, executives and eHealth stakeholders is to be able to deal with eHealth investment as an integrated part of all healthcare investment. Two methodologies are required: one to support decision taking, the other to support investment management after decisions.

On the decision side, managers need the capability to produce comparable economic assessments of each possible project. Executives need the capabilities to challenge these constructively and either change the proposals or agree them. The best investments often include a combination of conventional resources and eHealth, with realistic eHealth investment plans usually having longer timescales than other types of healthcare investment.

Planning eHealth on shorter-term horizons of less than five years leads managers to focus on the investment in costs, which then become detached from the investment needed to realise benefits. Optimism bias is a common feature of all investment plans, and eHealth is no exception. Unrealistically short timescales result in increased risk and optimism, weak business cases, and so weak decisions.

Finance managers need to understand the value and impact of eHealth, so they can extend and develop financial planning to deal with eHealth investment timescales. It is also essential that eHealth investment plans offer value for money and are affordable. A critical point is to ensure that meeting affordability requirements does not diminish a positive value for money.

After the investment decision, managers must put in place the arrangements needed to facilitate long-term sustainability. Achieving successful engagement and change are essential skills for managers. A subtle distinction to draw attention to that engagement, unlike consultation, deals with positions, propositions, concerns and requirements of stakeholders. Engagement facilitates success; consultation does not increase chances considerably. A note of caution regarding change is about the timing of different changes. Often, two sets of changes are required: ICT use and new practices. If implemented simultaneously, there is a risk that it becomes too much to cope with successfully.

Further skills gaps are the ability of healthcare professionals to exploit the full functionality of eHealth systems. This calls for an additional role for ICT staff, a combined role of change manager and trainer, as part of successful eHealth investments.

Along with the already highlighted insufficiencies related to research on the types of risks, their values and their probabilities in eHealth, managers at different levels tend to be risk averse due to a lack of knowledge about eHealth in general. This aversion to risk is understandable given that the financial costs of risk can exceed the extra finance generated from an eHealth investment. Executives and managers can use a range of 0.4% to 2.6% of total annual turnover to test the risk-adjusted cost of large-scale eHealth investments.

Creating an information culture is characterised by healthcare professionals and managers wanting more information from more eHealth investment. This culture is essential in mitigating risk and increasing the chances of success. The wrong cultural

conditions with botched eHealth; lack of, or inappropriate engagement; silo organisations with weak teamwork; people with inappropriate skills in eHealth roles; inability to recruit, train and retain the skilled people needed; and the wrong kind of leadership, all need changing before allocating finance to eHealth investment.

Public eHealth finance needs developing along three lines:

- Develop and retain the eHealth skills and knowledge of healthcare professionals, executives and managers, so they can engage effectively
- Develop and retain eHealth skills and capabilities of ICT specialists, so they can address users' needs better
- Direct eHealth investment in projects, so that more succeed and feed back into the pool of skills, knowledge, and experience.

The most important requirement for leaders, executives and eHealth stakeholders is to be able to integrate eHealth investment as part of all healthcare investment. When the investment is complete, executives have a different organisation to lead and manage. It is feasible for eHealth to change clinical and working practices, and so the performance of the organisation, and for executives to continue to manage using the previous model. A result is executives out of touch, so executives need to use the new information that is available to improve their leadership and management of their organisations.

Finance executives and managers need to understand the value and impact of eHealth so they can extend and develop financial planning to deal with eHealth investment timescales. Second, they need to extend their financial management skills to be able to develop ways to invest in better value alongside the current emphasis on continuous cost containment.

Executives need to expand the principle of organisational change from healthcare professionals who use the eHealth investment directly, to the whole organisation. Change is just as uncomfortable for executives as it is for healthcare professionals. As healthcare professionals use new information to improve quality, access and efficiency, executives have a different organisation to run. They must do more than keep up. They must be ahead, looking for new opportunities, leading on to their second new job: using the knowledge and experience of the eHealth investment to construct and plan the next one. With these two changes in place, executives can be sure that the finance allocated has proved beneficial, and continues to add value. This will facilitate the required boost to eHealth investment.

At the core of the policy recommendations is the most important finding from the study, that better, more widespread skills and knowledge in taking and delivering eHealth investment decisions is more important than more finance. Skills and knowledge in eHealth are in short supply across the European Union, so their rapid enhancement and expansion needs new policies and action. Investment is needed, so enhancing skills and knowledge is the top priority for finance for eHealth.

Boosting skills and knowledge to boost investment in eHealth needs action by policy makers in Member States and at the EC. Policy makers need to manage the core, high-value features of eHealth investment within the available resource mix and the healthcare strategy. Specific actions in this respect include:

- Promote eHealth as a resource in healthcare and services, not as an end in itself
- Focus on improving several aspects of health services, not on cash savings
- Facilitate effective, comprehensive financing packages covering the whole investment lifecycle, including long-term, recurring expenditure
- Invest in more evidence on investment risks
- Promote and facilitate stakeholder engagement, not just consultation
- Provide resources to develop skills and knowledge.

Only when these are in place and effective can access to finance increase and boost successful eHealth investment.

# 1 Introduction

The Financing eHealth study was commissioned by DG INFSO and Media, unit ICT for Health, with the aim to assess different financing opportunities against the financing needs of eHealth investment. The overriding goal of the study, and of this final report, is to assist Member States and the European Commission in their efforts to meet the eHealth Action Plan objective of "supporting and boosting investment in eHealth"<sup>1</sup>.

This report draws from the reports of previous stages of the project. It identifies concisely and comprehensively the possible approaches by the European Commissions to assist Member States in boosting eHealth investment. The report provides materials for Member States in response to challenges and opportunities regarding investment in eHealth. It includes a policy brief identifying individual challenges in supporting and boosting investment in eHealth and ways to address them.

## Information sources

Information sources for the report are primarily face-to-face interviews, telephone interviews, desk research on literature and documents in the public domain and other EC studies, including:

- eHealth IMPACT: Study on economic and productivity impact of eHealth - developing a context-adaptive method of evaluation for eHealth, including validation at 10 sites - covering the whole spectrum of eHealth applications and services<sup>2</sup>
- EHR IMPACT: Study on the socio-economic impact of interoperable electronic health record and ePrescribing systems<sup>3</sup>
- Good eHealth: Study of best practice across Europe in providing innovative eHealth-related services<sup>4</sup>
- eHealth ERA: Towards the establishment of a European eHealth research area - coordination of Member State innovation-oriented eHealth RTD as the basis for a common roadmap and joint RTD activities, thereby establishing an effective ERA<sup>5</sup>
- Other reports and the two international workshops associated with the Financing eHealth study<sup>6</sup>.

---

<sup>1</sup> Commission of the European Communities - COM (2004) 356: 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 health care better for European citizens: An action plan for a European e-Health Area, Brussels, 2004-04-30.

<sup>2</sup> [www.ehealth-impact.org](http://www.ehealth-impact.org)

<sup>3</sup> [www.ehr-impact.eu](http://www.ehr-impact.eu)

<sup>4</sup> [www.good-ehealth.org](http://www.good-ehealth.org)

<sup>5</sup> [www.ehealth-era.org](http://www.ehealth-era.org)

<sup>6</sup> Financing eHealth, D2.2: Report on financing opportunities available to Member States to support and boost investment in eHealth; D1.3: Report on conceptual framework, healthcare and eHealth investment context and challenges; D3.1: Report on options and methods for

The first workshop was an expert workshop on “Innovative approaches to financing eHealth solutions” held at the World of Health IT conference, 25 October 2007, Vienna, Austria, provided initial input to the study. The second expert workshop, on “Procuring for health benefits: critical factors for beneficial deployment of innovative eHealth and telemedicine services” held at the World of Health IT conference, 06 November 2008, Bella Center, Copenhagen, Denmark, reinforced the conclusions from and added some new insights to other field work.

## Report structure

This report is the final report to the study, and provides a concise yet comprehensive overview of the study findings. It addresses directly the overriding study goal of providing assistance to Member States and the European Commission in their efforts to meet the eHealth Action Plan objective of “supporting and boosting investment in eHealth”. A critical aspect in efforts to boost investment in eHealth is to have a rigorous conceptual framework. This involves some understanding of what eHealth is and how it fits into the health delivery system, addressed in the first half of chapter 2. An eHealth investment is defined as expenditure on an eHealth solution and associated change management to achieve an improvement in healthcare quality, access, or efficiency. This study focuses on the financial aspects of eHealth investment, including the potential of financing as a tool to boost investments. Thus, section 2.3 defines the supply side of financing as the sources of funds for eHealth investments. Section 2.4 reveals a key finding of the study, which is a confirmation of the theoretical hypothesis that the amount of financing available alone is not the key challenge to boosting eHealth investment. Section 2.5 addresses the most crucial aspect of the conceptual framework: demand for finance for eHealth investment. The conceptual setting includes an analysis and structures of decision-making processes for eHealth investments, the role of eHealth in overall healthcare strategies and investment decisions, factors affecting the financial needs for different types of eHealth and general healthcare investment, and a generic illustration of these requirements.

Chapter 3 deals with various financing arrangements for securing the financial resources for healthcare investment in general and eHealth projects in particular. It provides a comprehensive treatment of ways to match the supply of and demand for eHealth investment financing from an investors’ perspective. The tools available to Member States to influence investment levels, in particular the conditions of subsidy and funding schemes, must be geared to and supported by these arrangements, accounting for the actual volume and type of demand for financing investments. An overview of such tools, in the form of a detailed list of different organisations and initiatives that provide financial support on regional, national, European, and international level is available in report D2.2<sup>7</sup> of the study.

---

obtaining value added among Member States in the context of eHealth investments; D4.1: Report on effective and efficient healthcare management support for eHealth investment; D4.2: Guide on effective and efficient management of eHealth investments, [www.financing-ehealth.eu](http://www.financing-ehealth.eu)

<sup>7</sup> Financing eHealth, D2.2 Report on financing opportunities available to Member States to support and boost investment in eHealth; [www.financing-ehealth.eu](http://www.financing-ehealth.eu)

Following the overview of arrangements facilitating the financing side of eHealth investment, organisational, managerial, and resourcing issues determining sustainability of eHealth investments are in chapter 4. The issues, critical to the goal of boosting eHealth investment, are addressing the perspective of all eHealth investment planners, including politicians and managers. The focus of the argument is on why eHealth does not take off. It is a fruitful way to identify actions that will boost investment in the future. Chapter 5 is devoted to a more hands-on support for healthcare managers, highlighting the skills and knowledge identified as critical, but often scarce. The scarcity of widespread skills and knowledge, as outlined in chapter 5, is identified as being the main barrier to boosting eHealth investment across Europe.

Finally, chapter 6 presents a policy brief with recommendations for Member States and the EC on steps towards effective support of eHealth investment initiatives.

## 2 Conceptual framework of eHealth investments

### 2.1 Defining eHealth and eHealth investment

This study aims to assess financing opportunities to boost, protect and manage investment in eHealth. Achieving these needs a reasonable return on that investment, usually as some form of net benefit, and can only be achieved by investment in a combination of ICT and changes in healthcare. Together, ICT and changes in working practices can lead to potential benefits, and ideally, net benefits. In this context, **an eHealth investment is defined as expenditure on an eHealth solution and associated change management to achieve an improvement in healthcare quality, access, or efficiency.** eHealth investment includes ICT and the resources needed to achieve the changes and improvements in health and healthcare that lead to net benefits. This definition enables the consideration of financing opportunities for eHealth investment alongside competing claims for finance for other beneficial investments in healthcare, such as new assets and new drugs. Consequently, eHealth is more than just the implementation and use of ICT in healthcare.

There is no consensus yet on any particular definition of the term eHealth. Even between documents issued from organs of the EU, the definition of eHealth varies. The "Action Plan for a European eHealth Area" defines and describes eHealth as "the application of information and communications technologies across the whole range of functions that affect the health sector. eHealth tools or solutions include products, systems and services that go beyond simply Internet-based applications. They include tools for health authorities, healthcare provider organisations (HPO) and healthcare professionals at all levels, as well as personalised health systems for patients and citizens. Examples include health information networks, electronic health records, telemedicine services, personal wearable and portable communicable systems, health portals, and many other information and communication technology-based tools assisting prevention, diagnosis, treatment, health monitoring, and lifestyle management"<sup>8</sup>. Similarly, but not identically, the Ministerial Declaration at the EU Ministerial eHealth 2003 conference in May 2003 in Brussels pronounced that "eHealth refers to the use of modern information and communication technologies to meet needs of citizens, patients, healthcare professionals, healthcare providers, as well as policy makers"<sup>9</sup>.

If we allow "ICT-based tools assisting..." to mean much the same as "use of modern ICT to meet needs of...", then the main difference in structure between these examples is the

---

<sup>8</sup> Commission of the European Communities - COM (2004) 356: 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 health care better for European citizens: An action plan for a European e-Health Area, Brussels, 2004-04-30.

<sup>9</sup>

[http://europa.eu.int/information\\_society/eeurope/ehealth/conference/2003/doc/min\\_dec\\_22\\_may\\_03.pdf](http://europa.eu.int/information_society/eeurope/ehealth/conference/2003/doc/min_dec_22_may_03.pdf)

way the definition refers to the domain of healthcare. This is a critical issue. In one case reference is made to healthcare processes as "... diagnosis, treatment, health monitoring...", probably with the intention of implying all healthcare processes; in the other case the reference is to individuals and organisations as "... patients, healthcare professionals, healthcare providers..." possibly with the intention of implying all healthcare stakeholders. The eHealth definition for this Financing eHealth study is consistent with these two references that refer ICT being used and ICT assisting. The core is that eHealth investment includes the resources needed to use and realise the benefits from ICT. General trends in eHealth enhance this wider perspective. It started in the 1980s with mainly administrative applications, such as patient administration systems, to the current century, where ICT, such as Picture Archiving and Communication System (PACS), that has a direct impact on improving quality and cost-effectiveness at the point of care, and telecardiology, that leads to a new healthcare model that can improve quality, access and cost-effectiveness of healthcare. Now, ICT can be an integral component of healthcare, hence eHealth.

Today, eHealth mostly assists processes as an external contributing element. This underlies the general position that modern eHealth is not yet widely recognised across the whole healthcare sector as a significant, integrated part of health policies, strategies, and delivery. This comprehensive investment context needs addressing, so the definition adopted for the Financing eHealth study is:

### **eHealth is ICT-enabled change in health services**

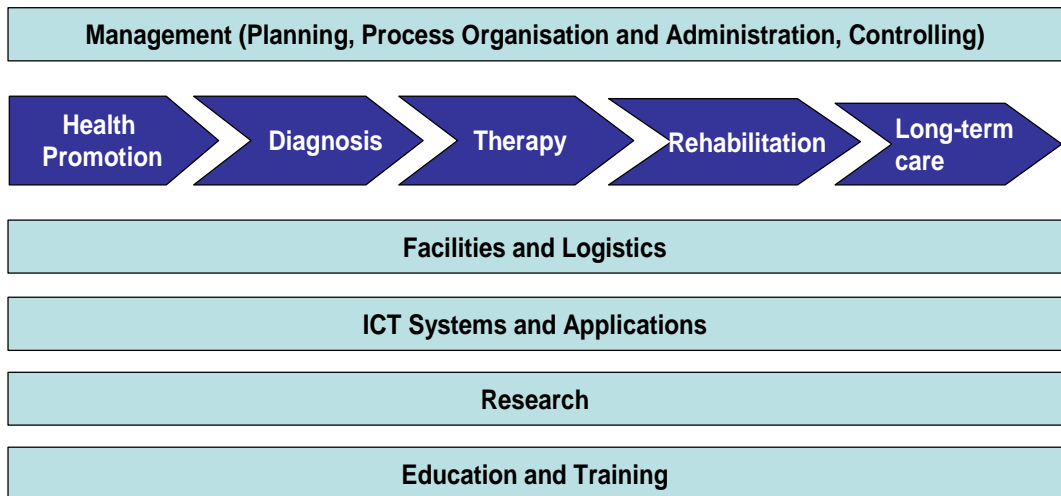
## **2.2 The healthcare value system and its actors**

Healthcare policy makers and strategists will have to devise ways to deliver increasingly complex services to meet increasing demand and expectations for the promotion and maintenance of health, and an expanding range of direct treatments and healthcare. Healthcare delivery processes need radical transformation<sup>10</sup>, supported by and making use of the latest ICT and recognising the reality of increasing consumer influence, probably leading to increasing demand for more personalised healthcare. Healthcare systems constantly evolve to provide a wider range of services, emphasising improvements in health and healthcare, and regarding citizens as independent consumers who can be both inside and outside healthcare services, rather than patients who are within the responsibility of healthcare professionals, especially doctors. Exhibit 1 shows a schematic model of health and healthcare processes depicted as a healthcare value system.<sup>11</sup>

<sup>10</sup> In line with Jean-Claude Healy's views; Cf. J-C Healy, Integration and Informatics and Communication Technologies (ICT) in the EU national health systems: status and trends, Swiss Medical Informatics (SMI 52), 2004

<sup>11</sup> On the concept of value system cf. Porter, M. Competitive Advantage. New York: The Free Press, 1985, p. 34: "Gaining and sustaining competitive advantage depends on understanding not only a firm's value chain but how the firm fits in the overall value system. ... Competitive advantage is increasingly a function of how well a company [here: a healthcare provider] can



**Exhibit 1: The healthcare value chain in the healthcare value system**

Source: © empirica 2006

The generic core consists of interrelated value chains of individual health service providers, in economic terms 'producing' health: promoting good health, providing healthcare and long-term care with the healthcare value chain. Supporting processes and tools connect to this value chain to create the total healthcare value system. Only as a system of integrated processes, can they lead effectively to healthier, or less ill, citizens.

An eHealth vision for this health value system is to invest in a way that the journey, and experience, of the citizen as they pass through the system is improved with increasing net benefits, and that healthcare professionals will have access to the data, information and knowledge they need to fulfil their role effectively and appropriately. So, eHealth investments, such as interoperable electronic patient records (EPRs), will be used to improve both the processes through the value chain, and the supporting care pathways, and enable citizens and healthcare professionals to take effective decisions between available choices.

*Health promotion*, as the first element in the core healthcare value chain, refers to the citizen provided with given reliable materials to enable them to exercise life-style choices in a way that improves, or maintains their health. Examples are information on appropriate action to avoid bird flue, the composition of a healthy diet and the importance of tetanus vaccination. Responsibility rests with the public health function, healthcare professionals and citizens themselves. Prevention of illness is included as a part of health promotion.

*Diagnosis* is the determination of the nature of a disease or injury. It can be clinical, and made from the study of the signs and symptoms of a disease; differential, by determining which of two or more diseases with similar signs and symptom is the one from which a patient is suffering; or laboratory, and made by chemical, microscopic, bacteriologic or biopsy study of secretions, discharges, blood or tissue; or derived from images, such as ultrasound and scans. Each type of diagnosis fits alongside details of patients' medical and health histories. It is an activity often shared between hospitals, general practitioners

---

manage this entire system. Linkages not only connect activities inside a company but also create interdependencies between a firm and its suppliers and channels."

(GPs), specialists, and laboratories. EPRs and personal health records (PHR) are key supporting and guiding tools in this process, particularly connected to, and integrated with, decision support systems, ePrescribing as part of wider computerised physician order entry (CPOE) systems, and evidence-based medicine tools.

Three different generic, but in reality often overlapping, forms of medical intervention may follow diagnosis if treatment are:

- *Therapy* is the medical or other healthcare, such as nursing and physiotherapy, treatment of illness, probably acute, usually relative short-term, often intensive treatment at this stage of the healthcare value chain
- *Rehabilitation* is part of the process of restoring a patient to good health or useful life, usually through medium-term treatment. In contrast to therapy, it is often more focused on regaining or re-learning specific functions through medium-term interventions and training, and can begin part way through a episode of therapy
- *Long-term care* is the treatment of and care for chronically ill, or disabled people who are not expected to regain totally their previous health status. It focuses on achieving an improved level of quality of life, or maintaining the status by preventing the worsening of the disease. Where neither of these is achievable, the goal can be to slow down the rate of deterioration.

The distinction between these three kinds of treatment can be fluid and relates to factors such as the intensity and duration of care and the age of the citizen. Electronic health record (EHR) and ePrescribing systems may play a more important, supportive role in these phases of the healthcare value system.

Alongside the citizens, health components of the healthcare value chain are important supporting processes:

- Management includes the strategy, planning, organisation, delivery, control and administration of all health and healthcare services
- Facilities and logistics refer to the procurement, supply, availability, scheduling and performance of all assets, consumables and goods, and ensuring that the right things are at the right place at the right time
- Research creates opportunities for new or improved ways of delivering health promotion, diagnosis, therapy, rehabilitation and long-term care. In this respect, it is an important instrument changing core health processes
- Education, training, continuing medical education (CME) and continuing professional development (CPD) connect to both healthcare provision and clinical and basic research, and creating opportunities to convert research into practice.

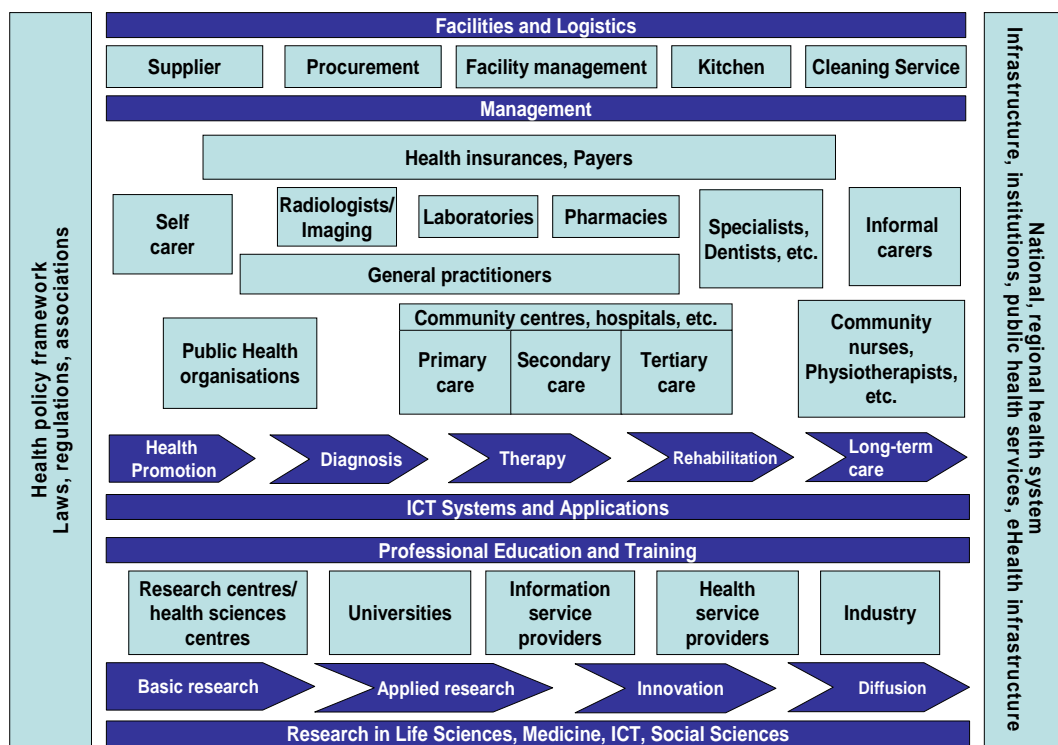
Complex eHealth investment can already, and will increasingly, play a central role in binding together and integrating these widely varying actors, functionalities and elements in providing optimal health services to all citizens. In this conceptual framework, eHealth combines the healthcare delivery chain and the supporting tiers. eHealth can impact at every stage of the healthcare value chain and across the whole healthcare value system. This is related to the requirements of sharing information across all tiers. In practice, eHealth investments have to be interoperable, integrated and interconnected, allowing

cross-system access to data, in order to share data information and knowledge. This stresses the importance of the interoperability of the various parts of the eHealth setting.

Modern healthcare should focus on making the best use of finite resources in order to balance the health outcomes produced with the needs of all stakeholders in the healthcare arena. Responsibilities and interests of different participants in healthcare are diverse: physicians have interests that differ from those of the citizens who receive treatment. Hospitals differ from a GPs' offices. Health insurances negotiate the payments for medical services with doctors and their associations. Medical care is dependent on data in order to create the basis and transparency for balancing all the different needs and interests of these stakeholders.

Exhibit 2 maps the processes of the healthcare value system, together with the main organisations involved, to identify the role of information availability and exchange in healthcare. The aim is to illustrate the complexity of information flows: each institution shown needs information from most other organisations, sometimes along several channels. Actual information and data flows within each of these organisations are much more voluminous and complex that conveyed by Exhibit 2.

**Exhibit 2: Mapping processes to organisations**



Source: © empirica 2006

It is not conceivable how all these communication channels can be efficient and effective without eHealth, particularly advanced EPR and EHR systems. For centuries, it has always been communication, the exchange of data, information, and knowledge, which has bound medical and healthcare processes and actors together. More recently, rapid developments in ICT, and solutions based on them, have led to paradigm shift, creating a new quality and scale of such exchanges and interactions.

## 2.3 Supply of finance for eHealth investment

Assessing finance opportunities to boost eHealth investment has to reflect the general financing context for healthcare in each Member State, as well as the collaborative potential facilitated by activities of the EC and other international institutions.

The **supply side** of eHealth financing comprises a variety of sources. A number of sources are presented in detail in deliverable D2.2 of the Financing eHealth Study<sup>12</sup>, including:

- Institutional funds, mainly internal priorities and current budgets of direct eHealth investors, such as HPOs
- Regional funds, including public and private sources on sub-national level
- Risks National funds, including support from public and private initiatives and organisations operating on a national scale
- European Commission<sup>13</sup> funds
  - Structural Funds
  - Directorate Generals and research programmes, including Framework Programme (FP) 7
- The European Investment Group: Bank (EIB)<sup>14</sup> and Fund (EIF)<sup>15</sup>
- International institutions, such as the World Health Organisation (WHO)<sup>16</sup>, the World Bank<sup>17</sup>, or the European Economic Area (EEA) Financial mechanism<sup>18</sup>.

Opportunities for eHealth financing can rely on expanding both capital and revenue finance. Capital links mainly to direct acquisition of hardware components of ICT investment. However, a revenue model can replace it by using leasing or Public Private Partnership (PPP). In addition, revenue finance facilitates organisational changes essential for realising the benefits from eHealth.

Additional injections of funds to support non-recurring expenditure, especially at the time of design, development, implementation, and initial roll-out can be drawn from different sources. At implementation and roll-out stages, change management will be a critical and resource intensive factor, leading to a temporary increase in expenditure that can extend over several years.

In this context, it is important to stress that the financing options are not mutually exclusive. eHealth investments can, and often must, be financed by a financing package

---

<sup>12</sup> Financing eHealth: D2.2 Report on financing opportunities available to Member States to support and boost investment in eHealth; [www.ehealth-financing.eu](http://www.ehealth-financing.eu)

<sup>13</sup> <http://ec.europa.eu>

<sup>14</sup> <http://www.eib.org>

<sup>15</sup> <http://www.eif.org>

<sup>16</sup> <http://www.who.int>

<sup>17</sup> <http://web.worldbank.org>

<sup>18</sup> <http://www.eeagrants.org>

that includes a mix of several sources, including some of those listed addressed in chapter 3 below. Each option could cover part of the financial requirements. The optimal mix of financing models for an eHealth investment, or project, over its whole lifecycle should be determined according to its investment profile including the net benefits realisation curve.

## 2.4 eHealth spending decisions

A holy grail of eHealth financing seems to be the answer to the question how much money should be set aside for eHealth investment? A frequent answer for some Member States seems to be about 4% over some five years of total annual expenditure on healthcare<sup>19</sup>; broadly double the current levels. Unfortunately, life is not this simple. **How much to spend is the wrong question and conveys an inappropriate perspective. What to spend the money on is a better question.** The answer depends on the benefits and net benefits that can be realised over time, relative to the opportunity cost of foregoing other healthcare investment, such as extra staff, new drugs and new facilities. In this context, boosting eHealth investment requires opportunities for effective eHealth that offers relative net benefits. **If the investment is worth it, providing the required finance becomes a supporting priority.** This theme emerged clearly from various sources used for the study as a pragmatic response, rather than a theoretical economic stance.

The question to establish the amount of money needed should be how much net benefit can eHealth deliver<sup>20</sup>? Then followed by: when will net benefits be realised<sup>21</sup>? This leads to the third question, what are the risks that the net benefit may not be realised? From an economic point of view, these risks need a price tag and incorporating into the net benefit over time estimates. The precondition for this, however, is a realistic assessment of the risks<sup>22</sup>.

Comparisons of the eHealth answers to those questions with the equivalent answers for other investment possibilities are then possible. Where these answers show that the potential net benefit from eHealth is better than other healthcare investments, eHealth wins the finance available. **Finance should not be available for eHealth where it does not show a better net benefit than other types of competing healthcare investment.**

This is consistent with Fisher's separation theorem<sup>23</sup> that the objective of a firm will be to maximise its present value. Applying this to healthcare means that HPOs will invest in initiatives that improve their performance in achieving their healthcare goals, such as improving quality, access and efficiency. Many different types of investment can help to achieve this, such as new drugs, new facilities and new equipment, as well as eHealth, or

<sup>19</sup> NHS Funding and Reform: the Wanless Report House of Commons Library UK Research Paper 02/30 3 May 2002

<sup>20</sup> Cf. Section 4.1

<sup>21</sup> Cf. Section 4.2

<sup>22</sup> Cf. Section 4.3

<sup>23</sup> Irving Fisher, 1930, *Theory of Interest*, Chapters 6 to 8

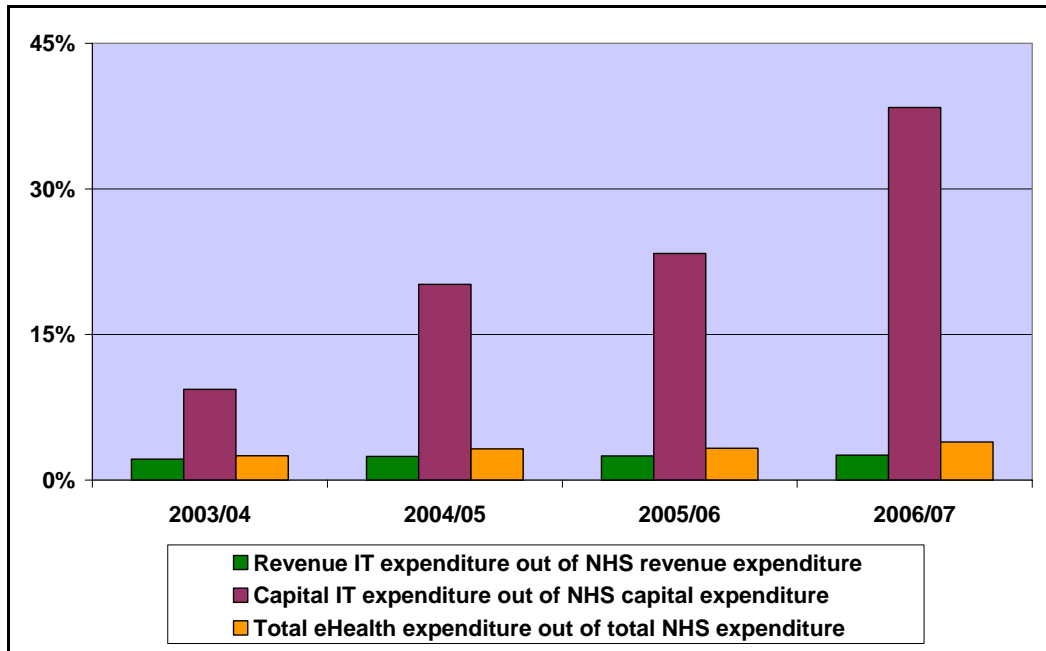
a combination of these. Some projects will offer better value than others in improving the performance of HPOs. These projects will attract finance, and the lower value projects rejected.

Fisher proposes two arrangements to achieve this resource optimisation level. One is keeping the firm's investment decision independent of the preferences of the owner. In healthcare, this can include state agencies. The other is ensuring that investment decisions are independent of the financing decision. The second theme is directly relevant for this study. It proposes that **increasing finance for eHealth will not necessarily boost investment. What will is the potential and confidence that eHealth will add enough value** to the investing organisation, and so be worth the increased spending and the loss of value from projects that are denied finance, referred to as opportunity cost. In essence, an economic case for eHealth should estimate the costs and benefits over time. Where these are sufficient compared to all proposed healthcare investments, then finance can be allocated to the eHealth project.

This multi-faceted approach may help to boost eHealth investment. It is consistent with a view from the fieldwork that **an inappropriate approach is to provide a big bag of money for eHealth, then decide how to spend it**. This is contrary to the separation theorem and is unlikely to lead to long-term sustainable deployment. Of course, baseline research and development (R&D) activities must be exempt from this generalisation, as their outcomes are by definition less well defined. The claim rather supports the emphasis on a sound strategic approach towards deployment of eHealth rather than on more or less arbitrary spending levels.

An example is from England, where large national budgets in excess of £6 billion were devoted to part of the NHS National Programme for IT (NPFIT). Spending numbers released in 2007 by England's Connecting for Health (CfH) for the NHS in England showed that the NPFIT budget of over £6 billion pounds over more than one year, the equivalent of about 7% of a recent total annual spending in the NHS, had not converted into the expected boost for eHealth investment. The percentage of annual ICT spending increased from about 2% in 2002/03 to about 2.6% of NHS revenue expenditure in 2006/07, a span of five years. The share of the NHS capital spending has increased over the same period from about 9% to about 38% of total capital expenditure; a position that seems unlikely to be sustainable as the total capital spending is broadly static, so spending on other types of capital investment was squeezed to provide the increased eHealth finance. Exhibits 3 and 4 show the position.

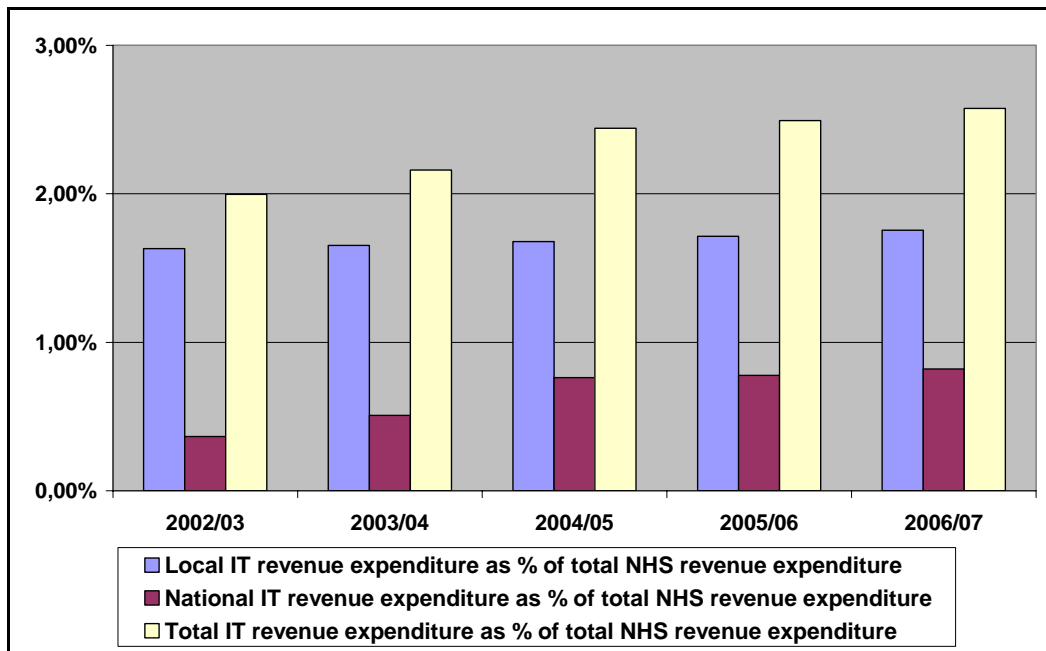
**Exhibit 3: NHS England - ICT expenditure as a share of total finance available**



Source: Based on NHS Connecting for Health (CfH) numbers, 2007

Exhibit 3 shows the large capital expenditure increases on eHealth in the NHS in England over four years. It has grown from about 9% of the total NHS capital expenditure to about 38%. However, this large expansion in capital finance has not reflected to the same degree in annual eHealth expenditure.

**Exhibit 4: NHS England - eHealth investment as share of total revenue expenditure**



Source: Based on NHS Connecting for Health (CfH) numbers, 2007

Exhibit 4 shows that local annual spending on eHealth by HPOs has been stable as a percentage of annual revenue expenditure. The percentage spent nationally has increased slightly, giving a combined total of annual eHealth spending that seems to be broadly stable at about 2.5% of total annual expenditure. A slow uptake scenario was that

ICT spending would double by 2007/08<sup>24</sup>, but this seems unlikely to happen, with a shortfall of some 30%. The trends indicate that at the 2006/07 growth rate, will take about ten years to double the 2% 2002/03 percentage. These expenditure numbers are consistent with interview comments that finance is not the constraint and a big bag of money is not a solution to boosting eHealth finance. There is; something else that drives the eHealth investment rate. One problem, experienced among others by NHS CfH, is that big bags of money for large-scale investments need all the fundamentals in places to succeed.

Whilst generalisations across EU Member States are not always reliable, the numbers illustrate the view of many interviewees that increasing the finance available for eHealth does not automatically, or necessarily, lead to a significant, sustained investment in eHealth. Something else is required. Interviewees have expressed these items as pre-requisites. They include the issues addressed in the rest of this report. The skills and knowledge needed to see eHealth investments through to success are the most critical factor in boosting eHealth investments.

## 2.5 Demand for finance for eHealth investment

Boosting investment in eHealth involves stimulating the demand for financing. Achieving the former requires an understanding of the factors that affect the demand for finance for eHealth investment: the investment decisions themselves. Classifying different types of investment profiles, with their specific financial needs, defines the **demand side** of financing eHealth investments.

### 2.5.1 eHealth investment decisions

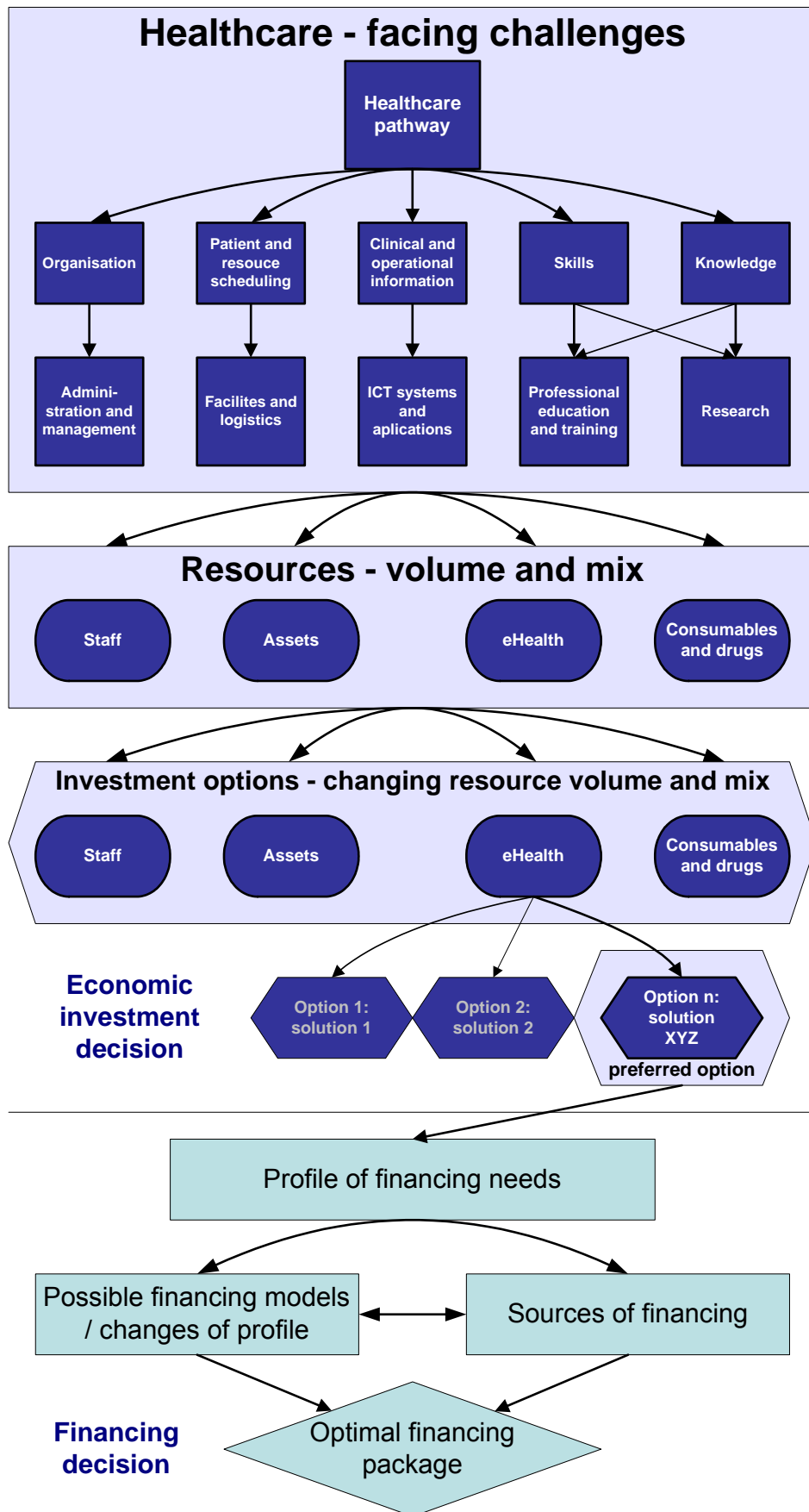
Developing financing capacity to boost eHealth investment should not be an isolated initiative. *Two types of decisions for investments in general, and healthcare and eHealth in particular are relevant for this study: economic and financial.* Economic decisions set relative priorities in the context of Exhibits 1 and 2 above. Only when these decisions are made, can the financial implications and needs be rigorously analysed and optimal financing decisions taken. Exhibit 5 summarises the process of identifying needs and setting priorities that lead from economic to financing decisions.

---

<sup>24</sup> NHS Funding and Reform: the Wanless Report House of Commons Library UK Research Paper 02/30 3 May 2002



Exhibit 5: The process of economic and financing decisions



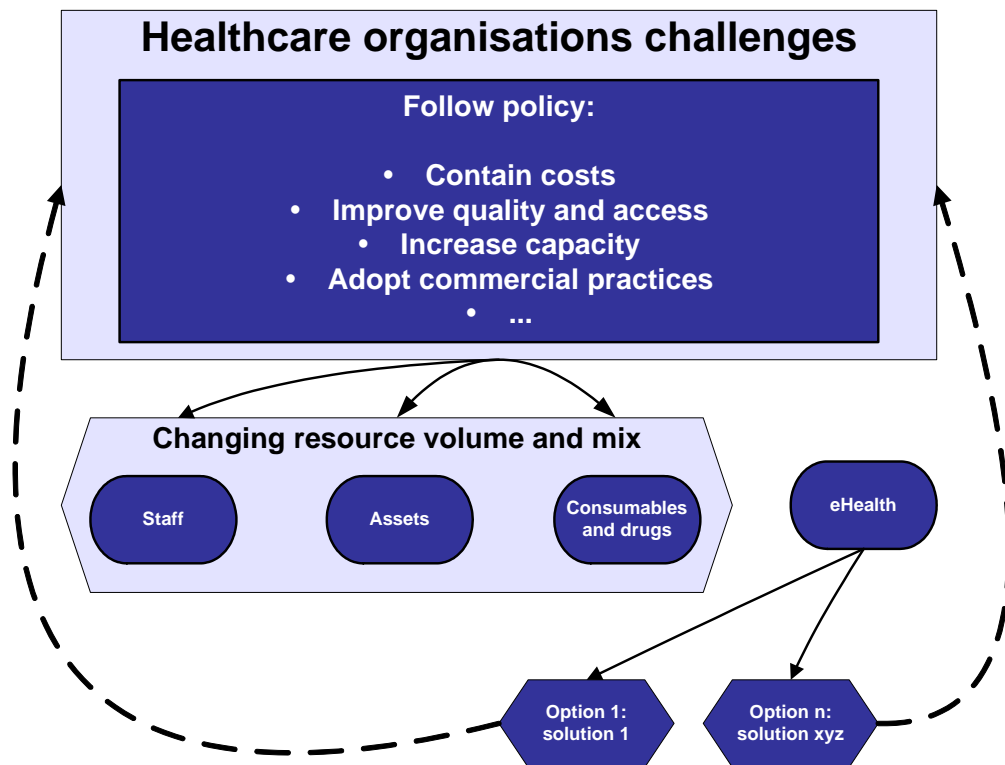
Source: © TanJent/empirica 2006

From economic and systems perspectives, eHealth is competing for resources with all other tiers of the healthcare value system. Decision makers have to set their priorities for the change of emphasis among the tiers and allocation of resources, given the objective of meeting the challenges of modern healthcare systems. From this first economic decision, a range of options for, in particular for eHealth, investments becomes clearer. The next step is to design and choose an optimal investment based on an assessment of the potential economic costs and benefits in the strategic context of the investing entity. For eHealth, this means choosing between various types of eHealth applications and solutions, such as EPR, EHR or telecare.

Successfully measuring benefits requires the appropriate benefits matrix to be in place at the outset of the investment. Completing this is part of the business case for the eHealth investment that is proposed to secure the eHealth finance<sup>25</sup>. In this context, a new relationship needs developing that builds from the economic model of cost benefit analysis (CBA) and adds a finance benefits analysis (FBA) that can be used to secure eHealth finance.

For effective eHealth investment, a strategic fit of eHealth and other investments across, and within, each organisation type is needed. Exhibit 6 shows a position of eHealth outside this strategic fit.

**Exhibit 6: Sub-optimal position - eHealth pushing into healthcare from the outside**



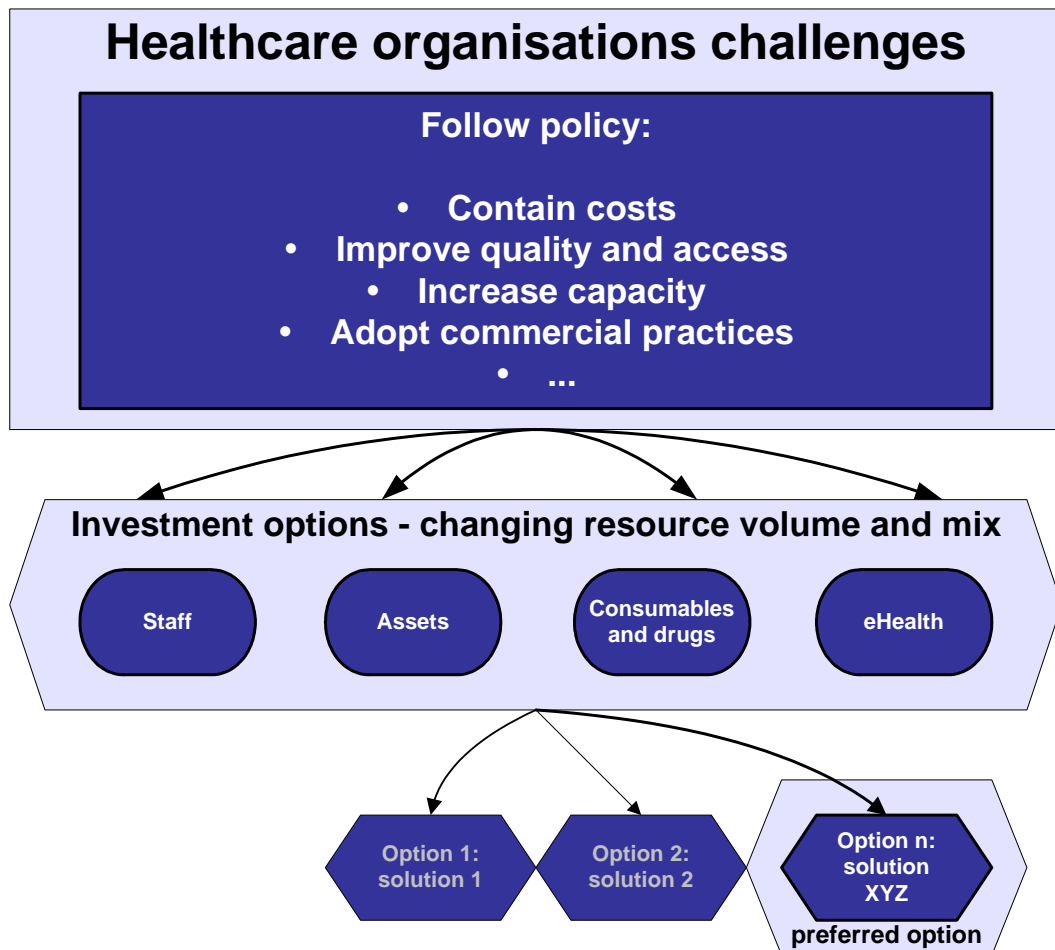
Source: © TanJent/empirica 2006

<sup>25</sup> for more details, cf. Financing eHealth, D4.2 Guide on effective and efficient management of eHealth investments, [www.financing-ehealth.eu](http://www.financing-ehealth.eu)

Organisations providing health services (HPOs) today are under constant pressure to contain costs, improve the quality of and access to their services, and adopt business-like practices in their management and other activities. In order to meet these challenges, HPOs can focus on refining their traditional resource mix, which includes staff, assets, and consumables. eHealth is considered as an parallel factor impacting on healthcare, but without an explicit, clear role or relative position in the HPO's working and management practices. Exhibit 6 shows an artificial eHealth demand, pushed by supply. In this setting, which seems to be prevalent in many HPOs, investment decisions on eHealth are taken in isolation from strategic investment decisions.

Natural demand for eHealth as part of the investment portfolio, and thus natural demand for eHealth financing, will only come about from a construct like the one illustrated in the Exhibit 7. Here, eHealth is drawn into the strategic fit of potential investors and becomes a factor of production. Thus, eHealth can substitute other resources in meeting growing demand. This does not necessarily boost investment in eHealth, but it ensures the appropriateness of eHealth investments.

**Exhibit 7: Constructive strategic fit - eHealth as an integrated factor of production**



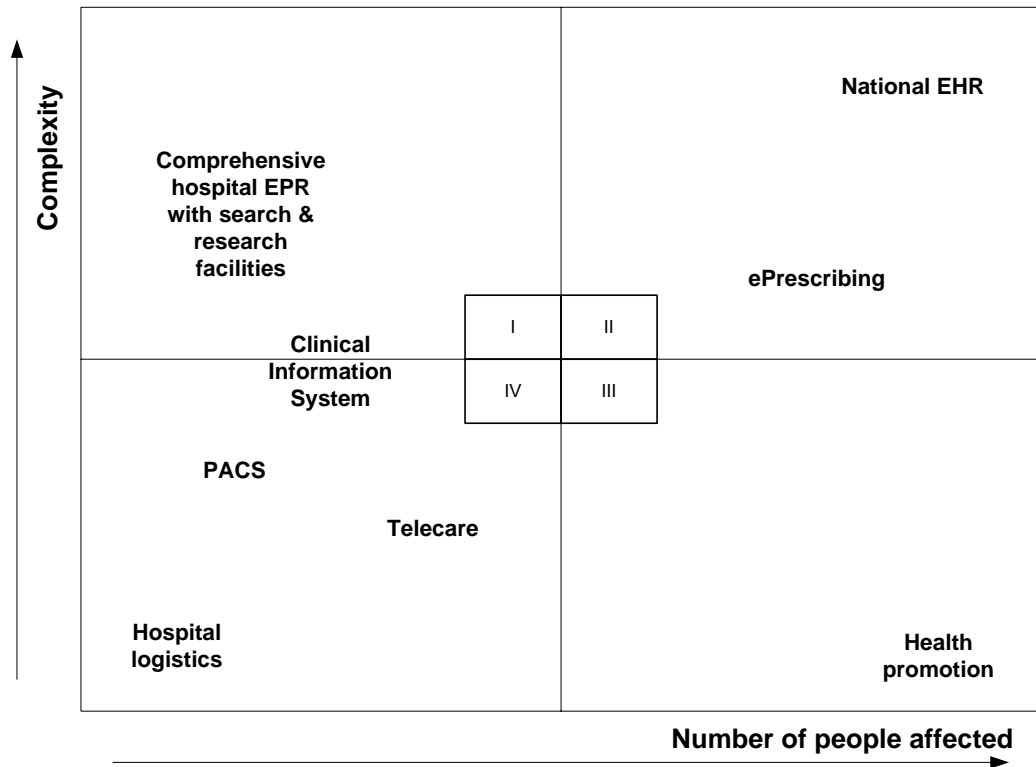
Source: © TanJent/empirica 2006

## 2.5.2 Factors affecting financing options – a typology of eHealth investments

Fisher's theorem of separation states that in efficient capital markets the investment decision is independent of the financing decision<sup>26</sup>. In the setting of eHealth investments, this is not sufficient. Each type of eHealth investment has a profile of resources it requires in terms of type, volume, and timing, which in turn determines the required financing arrangements.

eHealth investments can be classified into profiles that can combine to a typology of eHealth investments, as illustrated in Exhibit 8 below. Each profile in the typology includes a specific investment curve, which gives an indication of the financing needs. It is important to note again that the investment is in *eHealth*, not just ICT. This implies that the identified profiles and needs include all stakeholders involved.

**Exhibit 8: Typology structure for eHealth investment profiles**



Source: © TanJent/empirica 2006

The Y-axis refers to the complexity of the eHealth solution in question. This includes the development, technical, as well as the organisational components of the solution. For example, exchanges of free text messages between a physician's office and a laboratory is a simple application. A comprehensive and structured EHR system is an example of a complex solution. On the X-axis, the determining variable is the number of people affected. An EHR restricted to a hospital has fewer users and affects fewer people than a region-wide or national EHR solution.

<sup>26</sup> For an article on the topic see "The history of economic thought website": <http://cepa.newschool.edu/het/essays/capital/fisherinvest.htm>

The combination of these two characteristics indicates the financial needs of a particular eHealth investment. Each cell in Exhibit 8 represents an eHealth solution and investment profile with a specific economic expenditure curve.

A third dimension that emerged from research is the distribution of effort and risk between users and suppliers of ICT solutions. Broadly, two ways to structure the financing package can be identified: one where the development period needs investment by suppliers and users, illustrated in Exhibit 9, and one where the suppliers have completed the design and development work and supply a completed, proven solution, shown in Exhibit 10. This third dimension goes diagonally across the typology diagram, with eHealth solutions at the lower left in the 4<sup>th</sup> quadrant tending to follow the latter way of structuring, while activities in the top right of the 2<sup>nd</sup> quadrant require an arrangement like illustrated in Exhibit 9.

**Exhibit 9: Joint development of complex eHealth solutions**

Model 1 - eHealth needing joint development, such as EPR						
	External Grants		---	---	---	
	Loans					---
	Suppliers Life-Cycle Finance					
	Suppliers Direct Finance					---
	Risk					---
ICT Suppliers	Plan	Develop	Build	Implement	Operate	---
Interface	Procure	Procure	Procure	Procure	Procure	
eHealth Users	Plan	Develop	Build	Implement	Use	Change
	Risk					
	Users Direct Finance From Revenue					
	Users Life-Cycle Finance					
	Loans					---
	External Grants					---

Source: © TanJent/empirica 2006

In this setting, dealing with relationships between costs, benefits, financing, strategic context, and risk will be challenging to estimate and deliver over a long time scale. Finance for eHealth has to be sustainable throughout the period. The financing package would need to cover the whole lifecycle, and difficulties with budgeting over several years need overcoming by matching realistic timescales and financing demands. Currently, more attention needs paying to the change stage and to risk. From an economic perspective, risk is a cost factor that needs financing along with the more tangible items.

On a relatively simplified scale, ICT suppliers can develop eHealth products such as PACS, and then sell them to HPOs. This leads to an arrangement where suppliers carry much of the development work and risks. Users procure the product only when it is finished, then implement and operate it, adapting their healthcare models to realise the benefits. Exhibit 10 illustrates this setting.

**Exhibit 10: Supplier developed eHealth solutions**

Model 2 - eHealth already developed by suppliers, such as PACS						
	External Grants		---	---	---	---
	Loans					---
	Suppliers Life-Cycle Finance					---
	Suppliers Direct Finance					---
	Risk					---
ICT Suppliers	Plan	Develop	Build	Implement	Operate	---
Interface	---	---	---	Procure	Procure	---
eHealth Users	Plan	---	---	Implement	Use	Change
	Risk					---
	Users Direct Finance From Revenue					---
	Users Life-Cycle Finance From Revenue					---
	Loans					---
	---	---	---	External Grants		---

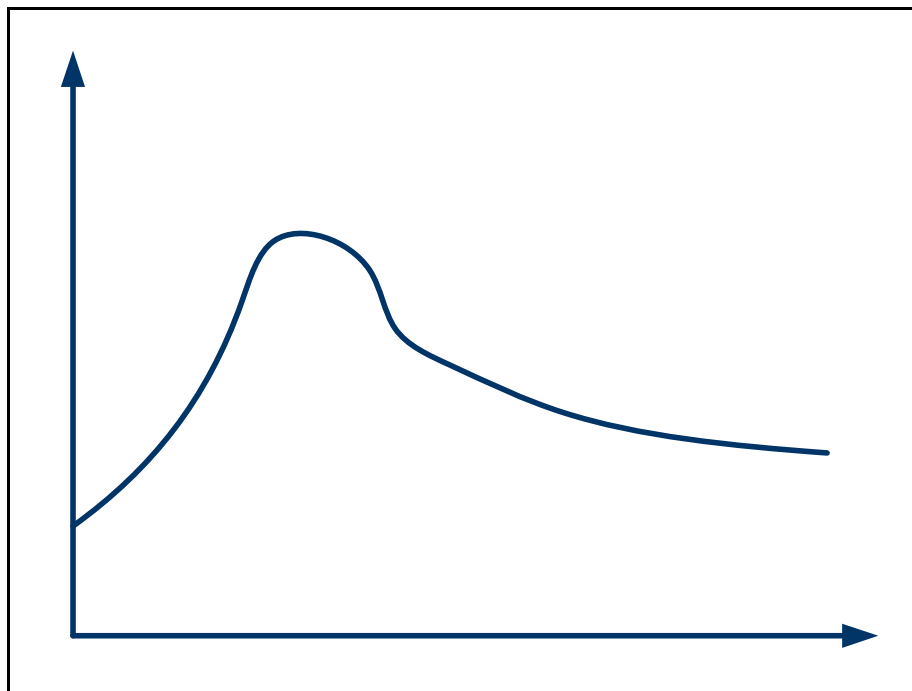
Source: © TanJent/empirica 2006

### 2.5.3 Financial needs of eHealth investments

Independent of the specific type of eHealth investment discussed above, the financial needs follow a general pattern. The financial needs curve, shown in Exhibit 11, has three attributes:

- Shape – height, position and length of hump
- Length of curve
- Position – height of the curve’s starting position, relative to the base.

**Exhibit 11: Example of economic expenditure curve of an eHealth investment**



Source: © TanJent/empirica 2006

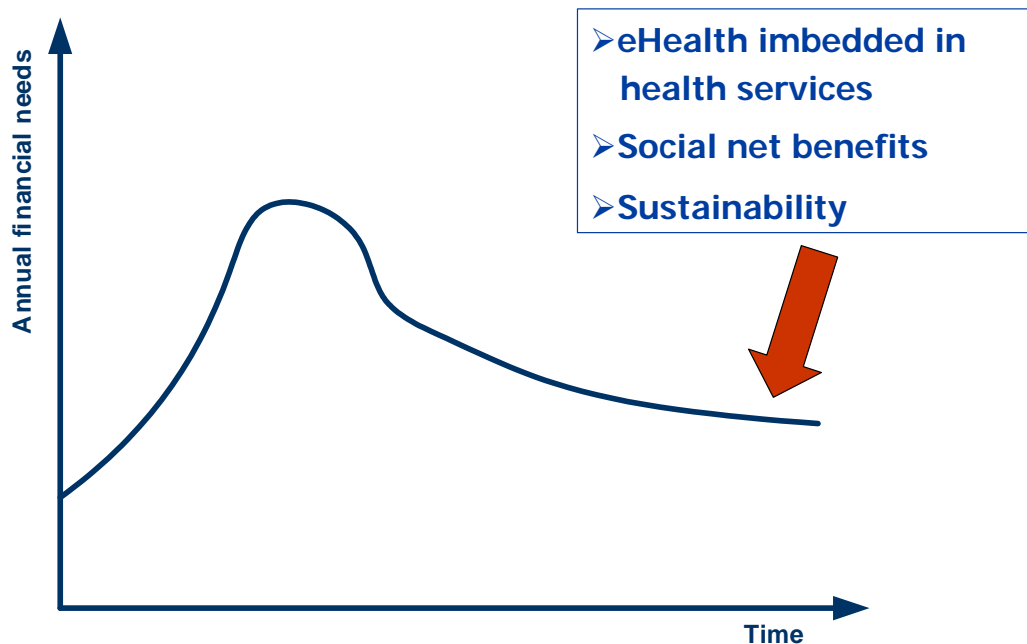
Every eHealth investment starts with a period of planning and development beginning with the investment plan and then the actual solution design. This can include a significant period of ICT design and development, including specifying information requirements. From the beginning of the design and development period, a bulk of financial resources is required up to the end of implementation and change. Procurement of hardware and equipment, infrastructure building, software development, and sometimes buildings and other facilities, takes place in this phase of the investment, represented by the hump in the cost curve. Following this, the application, or solution, entails running costs, such as annual software licences, maintenance and updates of hardware, administrative expenses and new clinical and working practices, with the associated new skills and teams.

Although often regarded as the whole investment, the size of the hump determines only the timing and volume of the bulk of financial resources required. The total length of the curve represents the investment lifecycle: the time period in which financing is required. In practice, the lifecycle can, and often does, include several humps. The position of the curve in respect to the Y-axis shows the relative volume of funds required on an annual basis. The face of the area below the curve is the total financial requirement over the investment lifecycle.

Each eHealth investment divides into three separate sub-investments, each of which represents a specific financing challenge:

- Challenge 1: finance the cost of eHealth development and preparation
- Challenge 2: finance the investment hump(s) in the cost curve usually associated with timing of procurement and implementation
- Challenge 3: finance the consequent annual eHealth running costs and managing eHealth in its role of a production factor.

The third challenge includes restructuring healthcare delivery to ensure sustainable net benefits, realise the financial return and meet increasing demand for healthcare services. This is important, since, as shown in Exhibit 12 below, benefits are often realised at the later stage, when eHealth has become a routine part of healthcare delivery and less effective, old processes withdrawn.

**Exhibit 12: Timing of sustainable benefit realisation**

Source: © TanJent/empirica 2006

Expenditure curves extracted from investment profiles are only the starting point, representing the total financial and financing needs. Financing models can influence the shape of the curve in terms of cash requirements and help to make hump flatter and longer. The curve will still start where it was and the overall volume of financing needs should not change much, yet the balance between one-off and continuous financing can change. For example, by taking a loan from a bank, or signing a leasing contract, an eHealth investor can raise the cash needed to finance the hump. As the expenditure curve changes along with the post contractual financing requirements, the eHealth investor needs less cash in the short-run because the hump is much smaller. However, the investor faces higher annual expenditure levels in the longer run in the flatter, post-hump part of the curve. The overall cost may increase slightly with the inclusion of interest and other charges associated with credits of all kinds.

After selecting the optimal financing package, investors can start their search for specific sources of financing. Deliverable 2.2 of this study<sup>27</sup> provides insights on different sources and choices of financing available for eHealth investors. The following chapter focuses on different financing arrangements available.

<sup>27</sup> Financing eHealth: D2.2: Report on financing opportunities available to Member States to support and boost investment in eHealth, [www.ehealth-financing.eu](http://www.ehealth-financing.eu)



### 3 Financing arrangements for eHealth

Three main types of finance affect eHealth. First, the already defined investment humps, which are temporary increases in expenditure usually during the engagement, development, design, and implementation stage. Second, recurring expenditure each year to support continuing costs, usually for suppliers' contracts and eHealth operations. Third, finance liberated from existing activities, such as legacy ICT spending and the reduced time needed for healthcare activities.

Financing arrangements for eHealth should consider the need for, and include sources of:

- Additional non-recurring finance for investment humps in the earlier years of the investment lifecycle
- Additional recurring finance for increased revenue expenditure over the whole investment lifecycle
- Existing finance redeployed or reallocated from current budgets in the later years of the investment lifecycle.

There are different financing sources available including private equity funds, such as venture capital; public equity funds, such as stocks; loans in the form of bonds; commercial financing, such as direct loans and leasing; and public financing, such as direct government spending and grants. Each of these individual financing sources, or a combination of these sources, is available as a source of finance for eHealth investments for both ICT suppliers and HPOs. A number of factors help to determine the best financing arrangement for an eHealth investment. These factors are:

- Organisation of healthcare systems, such as private or public care provision models
- Financing healthcare, such as public or independent health insurance models
- Provision of ICT, either by HPOs or ICT suppliers
- eHealth investment lifecycles
- Scale of eHealth investment over its lifecycle
- Types of components of eHealth investment over its lifecycle
- Impact of eHealth investment over its lifecycle
- Affordability of eHealth investment over its lifecycle
- Level of risk for each partner.

These factors combine to create an eHealth investment model where ICT suppliers need finance for their activities, including, planning, design, development and implementation. In parallel, HPOs need finance for all the stages: from engagement, design, development, planning, and implementation through to operation, change and benefits realisation. These include payments to ICT suppliers, which help to finance their eHealth investment. From the operational period onwards, HPOs, as primary users, have to be able to finance

the eHealth investment in full across its whole lifecycle, so it should be justified because it offers sustainable economic benefits and is affordable.

There are many different financial arrangements across EU Member States to support eHealth investment. Different types of Public Private Partnerships (PPP) have many different structures and seem to be suitable, and fashionable, for providing eHealth services by private ICT suppliers in public HPOs. However, PPP does not rule out traditional financing models, such loans, leases and internal finance.

A typical eHealth investment extends over several activities. These include planning, design, development, building, testing, implementation and operation of ICT. Suppliers and vendors, HPOs as users, and both working together can undertake all activities to varying degrees. In this setting, finance is needed for both capital and annual revenue expenditure by both sides of the partnership. HPOs also need finance for change, which is often critical to realising benefits from eHealth<sup>28</sup>, leading to the need for a financing model that sustains ICT-enabled change.

Large-scale eHealth investment, such as an Electronic Patient Record (EPR) system for a hospital, needs a long engagement, planning, development, design and build period. Financing this type of eHealth investment may need a period extending beyond five years, as identified by the eHealth IMPACT study<sup>29</sup>. Including implementation, operation, and change activities, financing eHealth needs to match the entire longer-term investment lifecycle, sometimes beyond ten years. These timescales need stable, multi-year budgeting that is problematic for most HPOs used to a financial planning horizon between one and five years. This is the financing challenge for HPOs that eHealth financing models must overcome by effectively linking the general healthcare financing arrangements to eHealth investment lifecycles. Managing each eHealth investment over its whole lifecycle enables the integration of new finance and finance redeployed from existing activities. This helps to fit together the financial impacts, such as withdrawn legacy ICT investment, payments for new ICT, change management effort supported by HPO staff, who can reallocate their time from operational activities to spend time developing and introducing new clinical and working practices.

eHealth investment alongside other strategic investment, such as new assets and new drugs, helps to create the longer-term, financial planning context needed to finance these types of investment decisions. This is especially important in assessing factors including:

- Longer-term affordability
- Links between financing, affordability and economic benefits
- Impact of benefit realisation on allocating operational resources of HPOs to ICT components of eHealth.

---

<sup>28</sup> Greenwalt D., Riney S. "Measuring IT benefits: let us count the ways: healthcare organizations need to achieve value from every investment--including IT. But how is that value measured?", Healthcare Financial Management, 2007.

<sup>29</sup> eHealth IMPACT: Study on Economic and Productivity Impact of eHealth; Reports available at [www.ehealth-impact.eu](http://www.ehealth-impact.eu)

Completing some of these changes runs across several types of HPOs, especially between primary and secondary, hospital services. In the healthcare system, beneficiaries of eHealth are not always the same groups as those who pay for and finance eHealth investment. For example, a hospital may finance extensions to its computerised physician order entry facilities so that local GPs can use it to refer test requests. The GPs may be able to achieve significant time-savings for a small cost, with the hospital achieving relatively small gains for its large costs, but with a combined net benefit to all HPOs and patients. Financial arrangements must address these potential financing disincentives by ensuring that each stakeholder reaps at least a reasonable value of their share of the investment.

The rest of this chapter provides an overview of different financial sources and arrangements that allow investors and funding bodies to secure the financial resources needed for eHealth investments, and accounting for the issues discussed above. Exhibit 13 gives a brief overview of the different arrangements and their suitability for financing different investments fully or partially.

**Exhibit 13: Matching financial needs and sources**

Investment characteristics / Finance sources	Investor's risk level		Time scale		Type of expenditure		Type of target health organisation	
	High	Low	Short-term	Long-term	Recurring	Non-recurring	Private	Public
Venture capital	X			X	X	X	X	
Capital market (stocks and bonds)		X		X		X	X	X
Commercial financing		X	X	X	X	X	X	X
Charities' contribution		X	X	X		X	X	X
Citizens' contribution		X	X	X	X		X	X
Third parties' contribution		X	X	X	X	X	X	X
Reallocation of internal resources	X			X	X	X	X	X
Public financing		X	X	X	X	X		X
Joint financing	X		X	X	X	X	X	X
Public Private Partnership	X			X	X	X		X

Source: © TanJent/empirica 2008

### 3.1 Venture capital

Venture capital is a type of private equity capital that provides finance to high potential growth companies that are too risky for standard investment by capital markets or conventional banks. Its purpose is to accelerate the growth of privately and newly established companies to an Initial Public Offering (IPO) or to a sale to publicly traded companies that are already established.

Venture capital in healthcare aims to boost investment in new, high-risk, often ICT-related projects. Two main uses are in pharmaceuticals and health services where eHealth is an integral component. In particular, there were significant joint ventures between IT and healthcare venture capitalists for eHealth projects in 1999 and the early 2000s. For example in 1999, Earlybird venture capital fund in Germany invested in establishing a company called GMD (Gesellschaft für Medizinische Datenverarbeitung mbH) for providing eHealth solutions. GMD developed a software platform for clinical workflow and Virtual Electronic Patient Records as well as integrating healthcare networks between hospitals, GPs, and other homecare providers. This company was so successful, that an Italian-based company, Dianoema<sup>30</sup> acquired it in 2002. Since then, this type of investments has dropped to a much lower level. A more recent example is the electronic Scientific Medical Information Library Europe (SMILE) established for European medical publications in 2008 by the Scientific Institute for Medical Information and Documentation (SIMID) and jointly financed by some health financial institutions, such as health insurance providers, the pharmaceutical industry and a venture capital fund provided by the Health Innovation Fund I BV<sup>31;32;33</sup>. The Health Innovation Fund I BV is a venture capital fund founded in 2007. It supports innovative entrepreneurs providing technological, modernising solutions and business models for the healthcare industry.

Venture capital in eHealth and ICT investments can support private companies that provide services to HPOs in a PPP model, or private HPOs for eHealth investment financing. The European Private Equity and Venture Capital Association is a major source of venture capital investments throughout Europe<sup>34</sup>. According to 2007 financial reports, venture capital investment in Europe has climbed compared to 2006. Investments in healthcare services increased by 10% and IT by 3% in the second quarter of 2007 compared to the investments in the same quarter in 2006<sup>35</sup>.

<sup>30</sup> Earlybird Venture Capital. "Dianoema has acquired Earlybird portfolio company GMD"; <http://www.earlybird.de/en/press/release/213/>

<sup>31</sup> Scientific Institute for Medical Information and Documentation (SIMID) Main Page; [www.simid.org](http://www.simid.org)

<sup>32</sup> Residex - Investeren in health, Main Page; <http://www.residex.nl/>

<sup>33</sup> eHealth News Eu Portal. "SIMID First European Provider of Online Full Text Publications" 8.2.2008; <http://www.ehealthnews.eu/content/view/980/26/>

<sup>34</sup> European Private Equity & Venture Capital association, Main Page; <http://www.evca.eu/>

<sup>35</sup> Ernst & Young and Dow Jones, "Quarterly European Venture Capital Report", VentureOne, 2007 [http://www.ey.com/global/content.nsf/International/Media\\_-\\_Press\\_Release\\_-\\_Venture\\_Capital\\_Q3\\_2007](http://www.ey.com/global/content.nsf/International/Media_-_Press_Release_-_Venture_Capital_Q3_2007)

This type of financing also helped to establish private HPOs that are highly equipped with ICT. For existing public HPOs though, private venture funding may not be attractive and accessible source of finance, even if the regulations allow for such an arrangement. Public HPOs can receive the equivalent venture capital from public sources. For example, the Entrepreneurship and Innovation Programme (Exhibit 10) sponsored by the European Commission provides grants to public institutions for entrepreneurial investments.

Advantages of venture capital, in addition to being a source of funding, are that it also provides financial and business advice and introduces the company to networks of related businesses and strategic partners for possible acquisitions. They also lead the companies' activities toward preparing an initial public offering (IPO). However, the disadvantage of such control and advice by venture capitalists might be that they can take company strategies and opportunities in directions that may not be favourable to the company's decision makers and owners.

Venture capital investments, as mentioned earlier, are generally more suitable for the industries in their infancy. When an industry becomes more mature, investments backed by public debt in the form of bonds and equities in the form of stocks are more likely. Commercial banks often support more stabilised situations in conventional ways, such as loans. However, commercial banks and financial institutions, such as Chase Manhattan Bank, as well as non-financial institutions, such as IBM or GE, rely on some venture funding as part of their entrepreneur investments<sup>36</sup>.

Investments on innovative eHealth solutions and services are those that are attractive to venture capitalists. A decade ago during dot com ages, providing web-based eHealth solutions was an area of interest to venture capitalist. Nowadays, eHealth industry is becoming older and innovative solutions appear to be more difficult. Solutions for interoperability and integrating various healthcare information systems and data networks for universal access are the potential opportunities for innovation and seem to be able to receive venture capital funding. Innovative solutions in ePrescribing, EHR tools, such as data mining tools in integrated systems that improve decision making, and clinical radio frequency identification (RFID), such as patients tracking systems, are examples of areas which can secure venture capital funding.

## 3.2 Capital markets

Governments and companies can raise funding for asset investments through capital markets by issuing bonds or selling equities as stocks. Equity financing is where a company sells its stocks, and so a share in the ownership. Debt financing is by issuing bonds, so a company can take on a liability and avoid giving up shares of ownership of the company.

---

<sup>36</sup> Robinson, James C. "Financing the Health care Internet" Health Affairs, 19:6, 72-87, November-December 2000.

The return on investment and variability of return are two important parameters for any investor before deciding to buy stocks and bonds. Return on investment is the average financial return. Variability of return is a measure of not earning the expected average return and represents the risk of such an investment. The projected return rate and variability of return are two uncertain aspects in each particular case of eHealth investment. Estimating these two factors uses either an historical pattern, which may not exist for the case of eHealth, or a predictive approach that forecasts the parameters. Evaluating eHealth economic and financial performance, especially benefits, helps to estimate these two factors. Thus far, not many existing studies are available to suggest these numbers<sup>37</sup>.

### Bonds as debt financing

Bonds are similar to loans, in which the bond issuer borrows money from the bond holder, and so is obliged to pay back the principal, the amount of the borrowed money, as well as the interest according to a time plan. Contracts fix the price of bonds and their interest rates at the beginning of the contract. Some healthcare organisations can issue bonds to raise capital for investments. These types of investments are usually long-term investments. If local and national governments approve them, they are appropriate when public funds are not sufficient. For example in 2007, Milford Regional Medical Center in the US planned some fund raising by selling \$95 million worth of bonds, to build and develop some new facilities including a cancer centre<sup>38</sup>. Local and national governments can also use this method of fund raising and issue bonds to support public HPOs' eHealth investments. Another example is the Healthcare Corporation of America (HCA). It has one of the largest hospital chains in the US, raised \$2 billion through selling bonds in the market<sup>39</sup>. Unfortunately, we were not able to find examples of healthcare bonds issued by the governments or private healthcare institutions in Europe. This may indicate the limited potential of bonds for eHealth in the EU.

The disadvantage of raising capital by issuing bonds is that the issuer has to pay interest payments regularly and return the principal at a specified date. These could be significant financial burdens on the issuers, if they have low income, or deferred, insufficient, or non-financial benefits. However, interest is tax-deductible, reducing the net expenditure.

### Stocks as equity financing

Selling stocks is a different way of fund raising for asset investments by companies. Stocks represent shares of ownership in corporations. Companies can sell stocks if they need additional capital, especially for new investments. For example in September 2007, InterComponentWare (ICW), a private German-based health ICT vendor company, sold

---

<sup>37</sup> Stephen A. Ross. Corporate Finance: Core Principles & Applications McGraw-Hill/Irwin, 2007.

<sup>38</sup> Riley, D. "Milford Regional building cancer center" The Milford Daily News, 6.1.2007; <http://www.milforddailynews.com/homepage/8999020194739257343>

<sup>39</sup> Hurtado, R. "Health Care Bonds Pass a Credit Test" New York Times, 20.8.2000; <http://query.nytimes.com/gst/fullpage.html?res=9B02E7DB123EF933A1575BC0A9669C8B63&n=Top/Reference/Times%20Topics/People/H/Hurtado,%20Robert>

some capital stocks to the Strüngmann brothers, an investor company, to raise money to expand its activities in international eHealth markets<sup>40</sup>.

## Bonds or stocks?

Both stocks and bonds are appropriate for long-term investments. Stockholders usually accept more risk than bond holders as the return rate is known for a bond holder from the beginning but it is unknown for a stock holder. Bonds also have a higher priority and status than stocks in the event of liquidation. On the other hand, as a rule of thumb in finance, stocks as the riskier investments could lead to a higher return.

An advantage of issuing bonds compared to stocks as a source of fund raising is that bondholders are just the lenders to the bond issuers and have no control or rights over the issuer's strategies and policies. In selling stocks, stockholders are the owners of the companies and have specific rights to influence decisions. Shareholders, for example, have the right to vote on the election of board of directors or right to the eventual remains of a company's asset during its liquidation.

Equity financing is more suitable for venture capital investments such as ICT start-ups that are ready to go public. They can raise capital by selling their stocks in the publicly traded stock markets in order to expand their current projects and activities. On the other hand, given the regulations for public HPOs throughout Europe, debt financing is more accessible to regional or national governments to finance a group of HPOs' eHealth investments.

## 3.3 Commercial financing

Commercial financing for investments includes loans from banks or other financial institutions. Long-term loans in commercial financing are usually asset-based, securing the loans against various assets. Unpaid loans lead to assets taken by the banks. Loans are available based on the record and history of profitability of similar investments. In asset-based lending models, accounts receivable, real estate, machineries, or equipment can help to secure loans. Financing eHealth and its ICT applications are a bit difficult to fit with this approach. Whilst ICT is an asset in the accounts of an entity, rights and licenses to use healthcare application software is non-transferable, and in case of default the software has no value as an asset. Hardware may be obsolete, with minimal value. Consequently, such borrowing is effectively unsecured<sup>41</sup>.

There are other sources of commercial financing, when commercial banks are not available. Many non-financial institutions, such as IBM, provide commercial financing for their software as well as hardware products and are a financing source in eHealth

<sup>40</sup> E-Health Europe "ICW add the Strüngmann brothers as shareholders" 28.9.07; [http://eHealthEurope.net/News/3069/icw\\_add\\_the\\_str%C3%BCngmann\\_brothers\\_as\\_shareholders](http://eHealthEurope.net/News/3069/icw_add_the_str%C3%BCngmann_brothers_as_shareholders)

<sup>41</sup> Rai, Dick, "Electronic data interchange: Information technology financing options", Healthcare Financial Management. Westchester: Jan 1996. Vol. 50, Iss. 1.

investments. Another example is Bank für Sozialwirtschaft (BFS)<sup>42</sup>, a bank in Germany that provides loans to organisations in the social services sector that have unsecured investments not supported by mainstream commercial banks. Investing in eHealth services are risky and supported by this type of specialist bank operating in niche activities.

The advantage of borrowing through commercial financing is that the lender does not receive any ownership rights. The borrower is obliged to repay the loan with interests. However, the interest payments are tax deductible and paid with pre-tax money, which is of interest to private investors. Default conditions are also negotiable between the borrower and the lender, and must therefore be agreed and written carefully.

This type of financing is more appropriate for low risk investments in industries with sustainable track histories of profitability. They are not suitable for start-up businesses. The investment can be of any scale in terms of lifecycle and budget. The healthcare industry historically has used commercial financing provided by banks or non-financial companies, such as GE commercial finance<sup>43</sup> services, in investing in medical devices and new technology equipment. Some large-scale eHealth investments, such as EHRs or RFID, are at early stages of development and are not mature yet, so there are not many of these projects completed. Consequently, there is no track record of profitability, net benefits and financial outcomes. Therefore, they do not seem to be ready yet for conventional financing by commercial banks.

Mature businesses use this source of financing. IBM commercial financing<sup>44</sup> and Wells Fargo technology finance<sup>45</sup> are examples of lenders for Information Technology investments including software, hardware, and services.

In addition to conventional loans, commercial financial institutions also provide venture capital funding to support entrepreneur investments. More details on venture capital financing are above in venture capital section.

### 3.4 Public financing sources

Given the uncertainties of the financial return on investments in eHealth and, more importantly, the reliance on third party payers for income and payment mechanisms in the healthcare industry, not many private financing organisations may be interested in helping with such investments. Public sources of financing need to take eHealth investments onto a stable and long-standing stage<sup>46</sup> to demonstrate the actual financing

<sup>42</sup> Bank für Sozialwirtschaft, Main Page; <http://www.sozialbank.de/>

<sup>43</sup> GE Healthcare Financial Services, Main Page; [www.geHealthcarefinance.com](http://www.geHealthcarefinance.com)

<sup>44</sup> IBM Global Financing. "It pays to manage your IT with IBM Global Financing"; <http://www-03.ibm.com/financing/europe/itfinancing/>, <http://www.ibm.com/healthcare>

<sup>45</sup> Wells Fargo Technology Finance, Main Page; [https://www.wellsfargo.com/com/bus\\_finance/wfefe/technology](https://www.wellsfargo.com/com/bus_finance/wfefe/technology)

<sup>46</sup> Eriotis N., Vasiliou D., Zisis V., ZoeVentura, "Perception Of Shareholders' Reaction And Best Financing Methods For Initiation Of Telemedicine Projects In Remote Places; Evidence From Greece." EABR (business) & ETLC (teaching) 2006 proceedings, Florence, Italy.



features before private financial institutions may be involved. Regional, national, European, as well as international funds and resources offer different types of public sources of financing. Chapter 3 sets out a detailed description of these sources, along with examples and a list of currently available financing. For example, national governments can serve as the major financing sources for eHealth investments in HPOs by providing fiscal incentives such as tax-credits for HPOs to support recurring costs in eHealth investments. They can also provide financial incentives and low-interest loans for financing both recurring and non-recurring expenditures in HPOs investments. For example, the NHS in England rewards GPs who use Choose and Book services. “The Choose and Book DES [directed enhanced service] offers practices a maximum of 48p per patient for offering patients a choice when referring for a first consultant outpatient appointment and a maximum of 48p per patient if 90% of referrals are made via Choose and Book, with a sliding scale of payments triggered once 50% of referrals have been made via the system”<sup>47</sup>.

As mentioned in the section on capital markets, governments can also issue bonds for fund raising and supporting HPOs’ eHealth investments. Public sources of financing can support both short-term and long-term investments of any size as well as recurring and non-recurring expenditures.

Public financing is a resource that benefits public investments where private financial support is insufficient or not available. However, public financing may not be efficient in leading to the same level of outcomes as investment supported by private parties. There is a general assumption that privately-supported investments are usually more efficient and better run than public investments. Public Private Partnerships (PPP) is a potential solution to such a problem as it combines private and public investing together to help to increase the performance of publicly financed projects<sup>48</sup>. We return to the topic of PPPs below. Another disadvantage of public financing is that there are restrictions on the amount and conditions of spending that may limit their usability.

As an example, public financing sources provided by a World Bank loan, the Structural Funds of the European Union, (SFEU) the Lithuanian Compulsory Health Insurance Fund, in addition to some other financial sources, was used to finance eHealth system development in the healthcare sector of the republic of Lithuania<sup>49</sup>. A list of such public financing sources is available in the exhibits in Chapter 3.

---

<sup>47</sup> E-HEALTH MEDIA Ltd., “GPs to continue to get financial incentives for C+B”, May 2007 [http://www.ehiprimarycare.com/news/2698/gps\\_to\\_continue\\_to\\_get\\_financial\\_incentives\\_for\\_c+b](http://www.ehiprimarycare.com/news/2698/gps_to_continue_to_get_financial_incentives_for_c+b)

<sup>48</sup> Preker AS, Harding A, Travis P. “Make or buy” decisions in the production of health care goods and services: new insights from institutional economics and organizational theory. *Bull World Health Organ* 2000;78:779-90.

<sup>49</sup> See Good eHealth case study at: [http://195.227.12.109/kb\\_empirica/browseContent\\_alt.do?contentId=220&action=v3#editViewToolbar](http://195.227.12.109/kb_empirica/browseContent_alt.do?contentId=220&action=v3#editViewToolbar)

### 3.5 Charitable financing

Philanthropic financial institutions provide most of the charitable sources of financing for eHealth. Charity donations can be effective financial sources for some tangible assets, especially for evocative services like those for babies, infants, and cancer patients. Where complex modern medical and scientific equipment is attractive to charitable donations, it can provide new ICT solutions that enhance the clinical services provided by HPOs.

Donations and charitable funds, for financing recurring and non-recurring costs of investments with any size and timescale, are favourable and valuable sources of funding for any kind of eHealth investments. However, they may be difficult to obtain, since the focus of the investment has to match the philanthropic organisation's goals and intentions. Moreover, the operating and decision processes in the borrowing organisation have to follow the charity foundations' guidelines. Donations by foundations can support research, implementation and routine eHealth service projects, such as using telemedicine in remote or disaster areas.

This type of financing source is available more for investments that benefit the public in general and address important health problems, such as long-term research projects in order to find a deep insight on a wide range of diseases. UK Biobank, for example, is a medical research charity-backed DNA database<sup>50</sup>. UK Biobank is a longitudinal research project of over 30 years, which keeps health records of the participants to provide a valuable resource for research to understand the causes of ill-health. This project is partly funded by the Wellcome Trust, a UK-based medical research charity<sup>51;52</sup>. In another charity-financed effort to serve the public, the Vodafone UK Foundation charity funded an email support service, SANEmail, to provide support and information to people affected by mental health problems. SANEmail is run by Sane, a mental health charity providing services to people affected by mental illnesses<sup>53</sup>.

### 3.6 Citizen contributions

Citizens benefit from eHealth investments and, as stakeholders, should contribute to at least some of the recurring and operating costs of such investments. The benefits of eHealth for citizens are either direct, such as avoiding duplicate laboratory and radiology tests when utilising an EHR system, or indirect, general effects, such as higher quality of service through higher patient safety. Co-payments for healthcare services are common practice in many Member States already, and it may be valuable to investigate the potential of citizens' willingness to pay (WTP) for higher co-payments for eHealth-supported treatment. A preliminary hypothesis is that some willingness exists, as long as

---

<sup>50</sup> U K Biobank, Main Page; <http://www.ukbiobank.ac.uk/>

<sup>51</sup> E-Health Insider. "UK Biobank begins recruiting using NHS data" 21.9.2007; <http://www.e-health-insider.com/News/3050>

<sup>52</sup> The Wellcome Trust, Main Page; <http://www.wellcome.ac.uk>

<sup>53</sup> E-Health Insider Primary Care "Mental health charity launch e-mail support" 9.03.2007; [http://www.ehiprimarycare.com/news/2531/mental\\_health\\_charity\\_launch\\_e-mail\\_support](http://www.ehiprimarycare.com/news/2531/mental_health_charity_launch_e-mail_support)

citizens are aware of direct and indirect outcomes of eHealth investments that benefit them individually. For example, a research on WTP shows that younger people and those with more interest in ICT are willing to pay more for online physician services. One reason for this might be that they are more familiar and have more confidence in information technology. The fact is that if people are aware of benefits of eHealth services, then they may be willing to pay more<sup>54</sup>. However, the EC's EHR IMPACT study<sup>55</sup> showed that some citizens thought that some improvements in data sharing between healthcare professionals through better ICT were already routine, so WTP may be limited in these settings.

An optimal co-payment is to prevent the tendency for over-consumption among patients, but at the same time, it should not prevent patients from seeking necessary treatments<sup>56</sup>. Changing co-payments is always controversial, but given that co-payment levels have to be set to represent the quality of service as well, its increasing role due to eHealth services is completely legitimate. The difficult job to convince patients to pay higher co-payments is to keep patients informed about how eHealth investments increase the quality of service above the levels that they expect. The advantage of this approach is that if it is set well, then it can cover some of the ongoing operating costs of eHealth services.

An example is the Danish Health Data Network (DHDN). There were small increased charges introduced as part of an improved service after the implementation of eHealth<sup>57</sup>, but they were eventually dropped. A general assumption is that citizens may not be keen on paying more, in total, for their healthcare. However, they may be prepared to re-allocate their resources for different and better healthcare, or pay small additional sums where they gain a direct benefit.

### 3.7 Third party payer contribution

Third parties that reimburse the costs of healthcare comprise one group of stakeholders in, and beneficiaries of, eHealth investments. For example, reducing duplicate laboratory and radiology tests by relying on EHRs leads to reduced costs for the reimbursement payers as well. Healthcare reimbursement schemes for HPOs differ significantly across the EU and some are about to change in an attempt to contain the increasing cost spiral in western healthcare systems. Reimbursement models can positively affect eHealth if they provide mechanisms to finance at least some of the operational costs of eHealth solutions. This includes mechanisms like:

---

<sup>54</sup> Linnosmaa I., Rissanen S., "Willingness to Pay for Online Physician Services", Liiketaloudellinen Aikakauskirja, The Finnish Journal of Business Economics, Jan 2006.

<sup>55</sup> Study on the socio-economic impact of interoperable EHR and ePrescribing systems, commissioned by EC, DG INFSO & Media, 2008; [www.ehr-impact.eu](http://www.ehr-impact.eu)

<sup>56</sup> Fendrick AM, Smith DG, Chernew ME, Shah SN. A benefit-based copay for prescription drugs: patient contribution based on total benefits, not drug acquisition cost. *Am J Manag Care.* 2001;7:861-867.

<sup>57</sup> For details see case study from the EC eHealth IMPACT study at <http://www.ehealth-impact.eu>

- Annual lump sum payments, probably within a range for activities such as development, piloting, and testing
- Pay-as-you-use models to reflect changes in utilisation and demand, such as the planned German fee per ePrescription, paid to the GP instead of a lump sum payment to cover initial investment as an attempt to integrate investment financing into the routine operation of the healthcare system<sup>58</sup>
- Payments for a minimum, routine service with supplementary payments for additional services that can be provided using eHealth
- Payments for new healthcare models with eHealth, such as telecardiology and telemedicine services, that reflect the costs of eHealth in providing the new service
- The pay for performance (P4P) model, a relatively new trend in third party reimbursement models, that offers incentives for HPOs if they meet certain efficiency and quality targets, and negative incentives that increase the quality of care by eliminating payments for any medical errors that lead to negative outcomes<sup>59</sup>.

Some ICT systems in healthcare can directly increase quality and efficiency, which in turn leads to higher reimbursements in P4P models. The extra reward can help to finance some of the recurring costs of eHealth<sup>60</sup>. An example is in the NHS in the UK which initiated a program in 2004 for general health called Quality and Outcomes Framework (QOF). It includes predetermined criteria for GPs surgeries that if met, GPs receive some extra rewards<sup>61</sup>.

Generally, it is more feasible to reimburse HPOs for eHealth where the latter is integral to care, such as PACS and telecardiology, which create a new healthcare model. For eHealth solutions such as EPR systems, which are essentially large interconnected databases that can be available at the point of care, the impact on new healthcare models may be less explicit and direct. In this setting, using reimbursement for eHealth is less feasible. Resources for this type of eHealth are more a part of the core healthcare resources and facilities that should be available with modern ICT.

Differences between healthcare financing models can lead to different degrees of reliance on reimbursement. For tax-based Beveridge models, such as the four NHSs in the UK and Scandinavian models, finance for eHealth can more easily be earmarked and top-sliced from national and regional money than in Bismarck models, where several, separate third party payers may be involved in financing healthcare. In these settings, reimbursement models may need to be developed. These new Bismarck models can

---

<sup>58</sup> "Structural Change and Consequences for ICT Applications", White Paper Healthcare Industry in Germany.

<sup>59</sup> The Institute of Medicine (2006). "Rewarding Provider Performance: Aligning Incentives in Medicare". The National Academies Press.

<sup>60</sup> Adams Dudley R., MD. Pay-for-Performance Research. How to Learn What Clinicians and Policy Makers Need to Know. *Journal of the American Medical Association*. 2005; 294:1821-1823.

<sup>61</sup> Roland, D.M. (2006). "Pay-for-Performance Programs in Family Practices in the United Kingdom". *The New England Journal of Medicine* 355 (4): 375-384.

benefit the Beveridge models, where the flow of funds from commissioners to healthcare providers, especially hospitals, is increasingly reliant on internal markets and prices for diagnosis related groups (DRG) and national equivalents, such as the Nordic DRGs and Healthcare Related Groups (HRG) in England.

### 3.8 Reallocation of internal resources

Studies show that there is a positive relationship between hospitals financial indices and adoption of ICTs<sup>62</sup>. Adopting ICT applications in administrative, clinical, and strategic areas in hospitals can improve financial indices such as return on asset (ROA), cash flow ratio, operating margin, and total margin. Implementing ICT leads to more efficiency and quality in healthcare services. This productivity gain, most of the time, releases some resources. For example, EHRs can lead to higher patient safety due to a decreasing number of adverse drug events (ADE). Therefore, fewer staff are needed to fix the problems caused by ADEs. This means that fewer staff are hired to deliver healthcare services<sup>63</sup>. Budget savings based on such recourses after eHealth is operational are then available to finance some of the recurring cost of the ICT systems<sup>64</sup>. Other studies<sup>65</sup> challenge the scope for this kind of reallocation of financial resource. It is possible to liberate financial resources in some cases, especially by improving coding, billing, and resource management processes<sup>66</sup>.

This type of financing source is only available for large-scale eHealth investments, such as EHR focused hospital information systems, which achieve significant changes in healthcare provision. Moreover, ICT benefits accrue only if an ICT solution is successfully implemented, which depends on many different factors, such as the type of eHealth solution and the management of change. Reaching this point in time where all the realised benefits may be quite long for eHealth investments.

### 3.9 Joint financing

Financing large-scale eHealth investments, such as EHRs and sharing data between healthcare professionals, is usually a big challenge for HPOs and no single financing

<sup>62</sup> Menachemi N, Burkhardt J., Shewchuk R., D Burke, and RG Brooks. "Hospital information technology and positive financial performance: A different approach to finding an ROI", *Journal of Healthcare Management*, 2006. 51(1):40-59.

<sup>63</sup> Mohr D.N., Freguson J.A, "Show me the benefits: Implementing an EHR", Mayo Clinic case study, *Proceeding of Healthcare Information and Management Systems Society annual conference*, 2005.

<sup>64</sup> Wang, S., Middleton B., Prosser L.A. , Bardon C.G., Spurr C.D., Carchidi P.J., Kittler A.F., Goldszer R.C., Fairchild D.G. ,Sussman A.J.,Kuperman G.J. , Bates D.W., "A Cost-Benefit Analysis of Electronic Medical Records in Primary Care" *American Journal of Medicine*, (114:397-402) 2003.

<sup>65</sup> Congress of the United States, Congressional Budget Office, "Evidence on the Costs and Benefits of Health Information Technology", Pub. No. 2976, May 2008

<sup>66</sup> Study on the socio-economic impact of interoperable EHR and ePrescribing systems, commissioned by EC, DG INFSO & Media, 2008; [www.ehr-impact.eu](http://www.ehr-impact.eu)

source mentioned in Exhibit 1 above may be enough to initiate and complete a project<sup>67</sup>. For instance, HPOs using a mix by financing some non-recurring costs by venture capital or public sources of financing, while citizens' co-payments and reallocation of internal operating costs of HPOs can defray some of the recurring costs. Initial non-recurring eHealth expenditures can be so high, and some of the benefits enjoyed by other organisations, that only a joint financing between different types of organisations is feasible. This creates two types of joint financing: one is a combination of HPOs or their equivalents. The other is a mix of types of financing, such as venture capital and public financing such as long-term, low-interest government loans that can support them. The common advantage of joint financing is that it distributes the risks of financing such investments among the investors. However, such financing arrangements have their own complications and sometimes there might be some restrictions and conflicts of interest among the stakeholders<sup>68</sup>. This is very prevalent in stakeholder engagement and agreeing requirements. Increasing the number of participants increased the complexity, time needed for completions, and so the investment cost. However, succeeding with any major eHealth investment needs much of this effort too.

A joint financing model involves all the stakeholders in the financing effort of the investment. Different parties, such as patients, several HPOs, and third party payers in a healthcare setting take advantage of an eHealth investment<sup>69</sup> and they should all contribute through the joint financing model proportionally and appropriately. For example, citizens and third party payers should support some of the recurring costs where they benefit. Generally, a joint financing arrangement between types of HPOs can lead to a mix of different financing sources, as each HPOs can make its own sustainable financing arrangements to suit their financing regimes.

Joint financing arrangements have to include clear descriptions of the jointly financed projects and services. There has to be a clear definition of each party's responsibilities and it has to be flexible enough to handle unexpected situations throughout the implementation phases of the investments. They should set out the amount of finance that each party will contribute, when, and for how long, and state the benefits that each party can expect, when and what they have to do to realise them.

### 3.10 Public-private partnerships (PPP)

Public HPOs are usually subject to stringent regulatory constraints set by regional or national governments, such as maximum amount of borrowings by HPOs from commercial banks or restrictions in selling bonds. Complying with these regulations may sometimes prohibit public HPOs from taking advantage of some of the financing options.

<sup>67</sup> eHealth Initiative, 2007 HIE Survey: Financing; <http://www.eHealthinitiative.org/2007HIESurvey/financing.msp#1>

<sup>68</sup> 2007 State Legislation on Health Information Technology Financing, <http://www.ncsl.org/programs/health/forum/Hitch/finance.htm>

<sup>69</sup> Stroetmann K. A., Jones T., Dobrev A., Stroetmann V. N., "eHealth is Worth it: The economic benefit of implemented eHealth solutions at ten European sites" European Communities 2006 ISBN 82-79-02762-X [www.ehealth-impact.eu](http://www.ehealth-impact.eu)

One way to solve this problem is through arrangements between public HPOs and private ICT suppliers in the healthcare market. This public-private partnership (PPP) model can help public HPOs handle non-recurring costs, especially the investment hump, which is a challenge in eHealth investments.

PPP is a general solution to address the shortage of financial and managerial resources in public organisations<sup>70;71</sup>. PPP in eHealth investment is a contract for services over a number of years between a purchaser, for example a public HPO, and a private partner as an operator, which can be a single entity or a consortium of suppliers<sup>72</sup>. A common theme is that operators take on an expanded role in designing, building, financing and operating eHealth systems. With this extended, transferred responsibility, operators expect to take on more work and risk, and so can expect greater rewards. In PPP models, operators are not expected to provide eHealth financing without a change to the balance of their risk and reward. For HPOs, this can reduce their capital and non-recurring expenditure, and increase their recurring annual expenditure.

Generally, PPPs are contracts for services rather than for eHealth products. A PPP can also include a special purpose vehicle (SPV), also called special purpose entity (SPE). Operators can own SPVs as defined and structured differently in different Member States. Connecting for Health in the English NHS relies on PPP models for the national Care Records Services (CRS). Suppliers relying on sub-contracts are providing ICT and some of the change management resource, especially training.

Where services include assets, such as hardware, lease agreements can secure their supply, and so have to be included on the HPOs balance sheet in line with International Accounting Standard 17<sup>73</sup>. The economic and financial aspects of a purchasers' sound business case are the main determinants of the scale of a PPP. Sustainable affordability by an HPO is a core driver of scale.

Risk transfer and sharing should be explicit in a PPP. It relates partly to the rewards provided to the operator, and partly by the responsibilities assigned to the purchaser and operator. It is feasible for several eHealth suppliers to be part of a consortium and for several HPOs to provide appropriate rewards. PPPs can require operators to provide direct inputs into their purchasers' eHealth strategy for at least the medium-term, and this requires the operators to have a sound grasp of health, healthcare and ICT themes.

Direct services provided by PPPs include eHealth strategy, planning, development, design, building, testing, implementation, operation, operational support, project management, and some change management, especially training. It is unlikely that it extends comprehensively into direct change management and benefits realisation in purchasers' organisations. A PPP is usually a significant, high-value contract extending

---

<sup>70</sup> Michael R. Reich, Public-private partnerships for public health, *Nature Medicine* 6, 617 - 620 (2000)

<sup>71</sup> Sania Nishtar, Public - private 'partnerships' in health - a global call to action, *Health Research Policy and Systems* 2004, 2:5.

<sup>72</sup> "eHealth and Public Private Partnerships", ACCA 2002

<sup>73</sup> International Accounting Standard (IAS) Board

over several years, so rigorous procurement is needed, complying with current EU guidelines on public procurement<sup>74</sup>.

Two critical PPP themes, and routine contracts, are demand risk and design risk. Dealing with demand risk needs answers to two questions:

- 1) Does the purchaser have to pay regardless of the utilisation of the eHealth service?
- 2) Who will gain if demand is greater than expected?

Where HPOs as purchasers have to pay a minimum sum to the operator, then the HPO carries the risk of utilisation falling away. Caps on HPOs payments are matched by a limit on the capacity provided by suppliers. As a result, risk from increasing demand may appear to be transferred to the operator. Where no corresponding reward is available, risks tend to be left with the HPOs as purchasers. In this respect, the answer to the second question may be straightforward. Where utilisation, and so demand, increases well above contracted levels, operators may be able to request increased payments to provide the additional capacity needed to meet the increased demand. In this setting, the risk remains with the HPOs as purchasers.

Design risk usually reflects the nature of the health informatics requirements of each Member States' health service. Purchasers' schedules of data requirements usually reflect these. In this setting, HPOs as purchasers, not the operators, are explicitly determining the key features of the eHealth service provided through the PPP. The risk that the eHealth service, even where it is superbly constructed, may not meet the needs of HPOs, remains with the HPOs as purchasers. In PPPs for eHealth, the design should link to functionality, interoperability and usability. The HPOs design specification determines its role in these activities. There will also be additional factors in measuring the overall exposure to, and transfer or retention, of risk. For eHealth investment such as EPR systems, the HPOs have a direct role in setting their requirements at the development and design stage. For eHealth that is integral to the care model, and applies to a narrower range of healthcare, such as PACS and telecardiology, suppliers can take a more direct role in setting development design and requirements, and so take more of the risk. For this type of eHealth, where suppliers can provide the ICT component of the eHealth investment on their own and to the satisfaction of purchasers, PPP may be less appropriate than conventional, direct procurement.

Generally, the longer the time scales of investments, the greater the risks. Identifying and mitigating risks are essential parts of PPP, and its impact is on the annual payments from the purchasers to the operators. However, risk occurs mainly through the performance, or limitations on the required performance, of both purchasers and operators. Both have obligations as part of the partnership and both must perform; this is consistent with the concept of risk sharing.

The operators usually provide some of the finance for developing, designing and implementing the eHealth solutions. This upfront investment can be recoverable from the annual fees for the continuing service. This leaves the HPOs as purchasers to finance

---

<sup>74</sup> Available at [http://ec.europa.eu/internal\\_market/publicprocurement/docs/guidelines/services\\_en.pdf](http://ec.europa.eu/internal_market/publicprocurement/docs/guidelines/services_en.pdf)



their part of the planning, development, design and implementation stages, together with the operational and change costs. The overall effect, compared to a conventional eHealth finance model, is for HPOs to avoid most of the finance needed for the hump, and to need increased finance for the additional recurring revenue expenditure incurred on the PPP annual fees. The financing value of PPP is where non-recurring finance is constrained, but finance for increased annual revenue expenditure is available.

Decisions on risk exposure translate into annual PPP payments. This is especially the case for the extent to which they are either fixed within a floor and ceiling, or set as an annual value, then varied, probably by marginal prices, in line with changes in demand or utilisation. These affect the costs and so financing requirements of PPPs.

Decisions to switch from a conventional finance model to a PPP must rely on a realistic risk assessment of affordability that includes all the income and expenditure for the whole eHealth investment lifecycle. It is critical to approach risk transfer rigorously. Risk models tend to be part of the HPO PPP model and not public data. Purchasers in PPPs have little data from research or practices to draw from, increasing their potential vulnerability to risk. It may be that their perception of risk transfer or sharing may not match the reality. This is the start point to assess a PPP's potential.

### Advantages and disadvantages of PPP

The general advantages of PPP include:

- Provides a solution for shortages of capital and non-recurring finance
- Introduces private sector disciplines to eHealth investment
- May build and maintains eHealth to a higher quality and longer life
- Non-core, highly skilled services handled by those most capable, usually excluding clinical and medical skills
- Risks transferred to the party best capable of mitigating it.

Disadvantages of PPPs include:

- Cost of capital to a PPP operator can be higher than for governments and non-government organisations (NGOs)
- HPOs can take on a significant, fixed commitment for PPP fees, increasing annual revenue expenditure over the longer-term
- Potential oligopoly of operators that need direct management by the HPO, especially complex sub-contracting relationships
- Some operators may not find PPP appealing and so withdraw from the PPP market
- Operational transaction costs reduced through-life flexibility
- Lack of integration between eHealth and new clinical and healthcare models
- Risks not measured realistically, transferred or shared as envisaged.

The oligopoly power of operators and suppliers arises from their greater experience in dealing with the scale of eHealth investment compared to the HPOs as purchasers. The latter does it only once, the former many times with different users. However, as PPP is

relatively new, some operators may not have significant experience of eHealth investment in this setting.

PPP contracts can be very long and complex. Seeking 100% contract coverage and completeness usually means that purchasers have to spend extra money on legal advice and work, especially on defining and setting all the performance measures. These are difficult to specify in advance. When a degree of contract incompleteness is accepted, incentives are significant in aiming to reduce costs over time, but, relatively weak at aiming for quality improvements over time. This can create a dilemma where quality change is required of HPOs in the future, and the quality of their information, measured as appropriate, accurate, complete and available, will be critical to success.

The impact of incompleteness is evident in the Care Records Service (CRS) project that is part of the National Programme for IT (NPfIT) in the NHS in England. The timescales through planning, development, design build, and to implementation, referred to as deployment, are several years. It is extremely difficult to be explicit and complete about performance measures over the whole time period and over different segments of the investment. NHS CfH is aiming to reset some of these PPP contracts now that they have entered the deployment stage.

Interoperability is a vital part of these types of eHealth investments. Generally, as the HPOs as purchasers manage interoperability, markets may be able to become more competitive, purchasers may have increased choice of operator and suppliers, services may become cheaper and, as a result, purchasers may be able to make the available money go further. However, this remains largely unproven.

Features of PPP are that most, and possibly all, annual payments will be higher than the revenue expenditure of conventional finance models, and they tend to be fixed, reducing the flexibility of, and executive influence over, a proportion of eHealth and healthcare financing. This limitation is in the context where increased debt commitments arising from PPP can help to accelerate change and benefit realisation. Debt then becomes a good discipline.

## 3.11 Other arrangements relevant in the context of eHealth investment

### 3.11.1 Procurement and pre-procurement

Restructuring procurements in an investment model can lead to cost and quality benefits<sup>75</sup>. An important part of any eHealth investment is the potential sharing of effort needed at the planning, design, and development stages. More sophisticated procurement models transfer and share these roles, either as a pre-procurement step before procuring the ICT solutions, or for larger scale regional or national projects, made

---

<sup>75</sup> "Modern Government, Modern Procurement", Office of Government Commerce , UK, [http://www.ogc.gov.uk/documents/modern\\_government.doc](http://www.ogc.gov.uk/documents/modern_government.doc)

available to HPOs as part of a call-off contract. The timescales for these pre-procurement stages can be up to seven or eight years for complex, large scale projects such as regional or national EHR and EPR systems, and with this elapsed time, both suppliers and HPOs will be exposed to significant risks that need very specific, and costly, mitigation measures. These risks extend across a sequence of roles and activities of:

- Management
  - Leadership > Strategic Fit > Clinical Engagement
- Technical
  - Requirements > Functionality > Interoperability > Usability > Acceptance

The goals should be to combine each of these activities in order to facilitate an eHealth solution that would otherwise not be feasible because the ICT components need creating. From this position, HPOs can expect to pursue their eHealth investment and realise the benefits needed for their strategic goals, and suppliers can expect to gain the business benefits from the availability and sales of new ICT products and services. These efforts translate into an expectation that the pre-procurement will glide effortlessly into full procurement.

When pre-procurement is part of a PPP arrangement, it reflects one of the goals of PPP from the perspective of HPOs. The procurer is to be able to manage the market, competition and the availability of appropriate suppliers. For more complex eHealth investments, it is unlikely that suppliers will invest unless there is a potential market for the products, and this is an important feature of HPOs financing fully their role in this stage of the eHealth investment. This situation has several implications for eHealth finance:

- Finance must be sustained throughout the whole pre-procurement period
- Finance must be provided to procure the resulting ICT products and services, and to complete the remainder of the eHealth investment
- Finance must be provided for contingencies
- Managing risk and optimism bias must be reflected in the finance provided.

These factors are prevalent in England's NPfIT for the CRS, managed by NHS CfH. Several suppliers developed the electronic CRS for payment on implementation, to the healthcare contractor, supporting the take-up of the resulting ICT applications. In some parts of England, the transition from pre-procurement to the implementation stages has resulted in some dissatisfaction of HPOs with some of the CRS products, which has triggered a review by NHS CfH of the original contracts with an aim to reset them. Additional finance of over £5m was set aside for this.

### 3.11.2 Collaboration and purchasing power in procurement

Some procurement models, for example in Canada, Sweden and the UK, seek to maximise the purchasing power of combined HPOs and related organisations acting in various forms of consortia. These can be effective in reducing products' costs, improving the affordability position and so maximising the available real financing for investments in

eHealth. For more complex eHealth solutions, suppliers can work in partnership and sub-contracting relationships. A general principle is that procurers should seek ways to maximise and use their purchasing power in the eHealth market.

Financial resources liberated and enhanced by reorganising procurement can help to sustain eHealth investment. For example, centralisation of procurement for hospitals in a region, streamlining the supply chain by sharing one procurement department, leads to synergies, economies of scale and potentially lowers unit prices of purchases, liberating staff and other resources. Redeploying these into planning, development, and implementation of eHealth solutions is an indirect source of internal finance. The re-organisation itself can also include implementation of one or more eHealth solutions, as in the case of MedicalORDER@Center Ahlen (MOC), in Germany<sup>76</sup>.

Sharing technical and financial information of eHealth solutions in regional, national or European level databases also helps. Keeping records of all eHealth solutions currently utilised throughout Europe in a comprehensive database can lead to HPOs obtaining the eHealth solutions they are looking for more easily. They may find their needs matched to those eHealth solutions already listed in the database. Therefore, they can share experiences and save time as well as money in the procurement process. Moreover, this type of information increases the purchasing power of HPOs throughout the procurement process even if they need to have new eHealth solutions that do not already exist.

NHS CfH in England aims to procure specified ICT centrally for the NHS in England<sup>77</sup>. A core principle in this undertaking is the transfer of risk by contracting vendors to develop and supply solutions, such as CRS, and arranging payments only on delivery. Suppliers take the risk because they get access to the NHS as a customer. However, much of the risk remains with HPOs in the NHS, which provide much of the finance for change management and carry the cost of disruption where CRS may not perform as required. Another risk that has become obvious in later stages is the risk of overloading suppliers with design risk, which leads to a withdrawal of suppliers from the project, creating a new challenge of replacing them on relatively short notice.

NHS CfH has three large-scale procurement projects:

- 1) National Programme for IT (NPfIT) Procuring the Core Contracts
- 2) Additional Supply Capability and Capacity (ASCC) Project
- 3) Enterprise Wide Agreements.

The core contracts include five geographic sector contracts and three national ones: the Spine, connectivity and infrastructure in HPOs, and the Choose and Book solution.

The ASCC concept is to procure once, and allow HPOs to choose between two or three suppliers and thus implement the solutions quicker. Participation is not mandatory; trusts

---

<sup>76</sup> An eHealth IMPACT case study report on MedicalORDER@center Ahlen (MOC), Germany, is available at <http://www.ehealth-impact.eu>

<sup>77</sup> Sugden B, Wilson R., Cornford J. "Reconfiguring the health supplier market: changing relationships in the primary care supplier market in England" HEALTH INFORMATICS J.2008; 14: 113-124.

can choose to go through the process separately. Through the enterprise wide agreements, NHS CfH uses combined NHS buyer power to secure cheaper licences, such as those from Microsoft and Novell. For a common EPR for England, NHS CfH estimates in 2003 were that the total estimated ICT cost of local procurement would be some £11.5 billion. This compares to the initial NHS CfH estimate of some £6.2 billion for the original value of the eight core contracts for five local service providers in the five regions, the NHS Spine, the N3 network, and Choose and Book.

Lessons learnt to improve future performance include:

- Procurers must know what the market can offer both in providing current ICT products and services, and the capacity and capability of suppliers to develop new products and services
- Procurers must be able to commission suppliers as consortia to create the required capacity and capability
- Procurers have to be able to work directly with both the main contractors and their sub-contractors
- Procurers must engage effectively with clinicians and HPOs to be clear about their eHealth requirements, and so avoid a position where a different, inappropriate product is provided at a higher cost when corrections and work-arounds are needed
- Shortfalls must be recognised and dealt with, while success should be marketed.

### 3.11.3 eHealth investments in services, not products

An important principle of PPP is that the contracts are for services. These include products, but they are set in the context of the assets and tools needed by operators to fulfil their contractual obligations. This concept also applies to conventional procurement, without the PPP context. Instead of supplying ICT products to HPOs for them to use, suppliers can work with other suppliers to provide the ICT services as an external service needed by HPOs as part of their eHealth investment. This offers the opportunity to transfer some risk to suppliers for them to mitigate, especially some of technology risks and resourcing risks. An example is in France, where Agfa Healthcare currently has a contract to operate electronic networks that connect hospitals and laboratories<sup>78</sup>.

From a financing perspective, the user, the HPO, does not bear the bulk of the investment costs. In addition, users are able to transfer part, or all, of the responsibility for maintenance and up-grading of the technology elements of the investment to the supplier. Thus, such an arrangement is likely to have a positive impact on the levels of eHealth investments.

These types of service contracts change suppliers' investment, commercial and financial profiles, and can be problematic for them. Payback periods may exceed five years, which is long timescale for suppliers and their bankers, calling for some adjustment to pricing

---

<sup>78</sup> See [http://www.agfa.com/en/he/news\\_events/news/archive/he20060615\\_toulouse.jsp](http://www.agfa.com/en/he/news_events/news/archive/he20060615_toulouse.jsp)

and contract periods for these services to be sustainable on a large scale. However, Agfa's overall experience is positive, as the service model opens up new markets. It may be that this model offers further potential to meet the financing and commercial needs of HPOs and suppliers.

### 3.11.4 Industry-health authority relationships and networking

The concept of eHealth extends well beyond ICT. It includes changes to clinical and working practices because of new ICT solutions being available at the point of care that can result in new models of healthcare being available for the benefit of citizens and HPOs. Realising this outcome requires excellent leadership of IT-enabled change. Seldom are the skills and knowledge for all these factors available to one organisation. Accessing and using these requires organisations to have an effective relationship that enables long-term partnership and networking.

At the theoretical end of the spectrum, the ICT industry has limited knowledge about healthcare, with HPOs at the other end, with limited knowledge about the potential of ICT. Somewhere in the middle is an optimal relationship built on shared and enhanced knowledge. This setting may not provide direct financial support for eHealth investment, but may be a precursor for success. Most contracts for eHealth services have medium to long-term timescales. Over this period, most ICT will become obsolete, but may still be useful, new ICT concepts and applications will become possible and new demands will be made by HPOs on ICT to support new healthcare opportunities and goals. Additionally, risks of inertia may increase.

Effective industry-health authority relationships and networks can lead to new, more comprehensive solutions, sharing of investment costs, financial and economic gains, and better risk mitigation. They should be part of all HPO and supplier relationships. The goals should include:

- Sharing good practice in net benefits realisation and risk mitigation from current eHealth investment plans
- Identifying the impacts of medium and long-term health and healthcare policies and strategies
- Identifying the eHealth investment needs of these policies and strategies
- Commissioning health informatics, ICT and skill projects to prepare for future planning, development and design stages of eHealth projects
- Helping to develop a market for future eHealth investment.

## 4 Issues determining sustainability of eHealth investments

This and the next chapter highlight the main challenges that Member States and the EC should address with view to support and boost investment in eHealth. A pragmatic guide for investors, including those at the micro level, is available in another deliverable to the Financing eHealth study<sup>79</sup>. The following issues, addressed from a high-level perspective, meet the needs of policy makers.

### 4.1 Costs and benefits – common misunderstandings

Managing the extremely wide reach of eHealth relies on segmentation of effort and expertise. As a result, comprehensive, complete financing arrangements are not always in place, but tend to link to explicit, overt activities. This is evident in national eHealth strategies that allocate finance for national activities, leaving HPOs to set up their own arrangements<sup>80</sup>.

A similar phenomenon faces HPOs. For example, finance for contracts with ICT suppliers is explicit, but there is little or no finance allocated specifically to the time of healthcare professionals needed for activities such as engagement, setting information requirements and refining solutions after testing. These types of partial arrangements reflect the two main components of eHealth finance; extra and reallocated finance. Extra costs are usually made available, yet reallocated resources, such as time reallocations, are often understated. In a clinical setting, eHealth directly affects the performance of healthcare professionals, where information activities exceed more than 20% of healthcare professionals' time<sup>81</sup>. This is especially significant where staff can account for some three-quarters of all spending in HPOs.

Activities such as setting ICT contracts with suppliers, project management, and training need extra finance to support increased spending. Working across healthcare and clinical activities to advance **eHealth projects tend to rely on healthcare professionals and other healthcare workers reallocating their time to eHealth** and away from other activities. Finance for these resources is within organisations' existing budgets and critical to successful eHealth. **Identifying and planning this part of finance for eHealth is seldom completed.** Exhibit 14 provides examples of the activities in each type of finance. In practice, finance for each of these can be a mix of extra and reallocated

<sup>79</sup> Financing eHealth, D4.2: Guide on effective and efficient management of eHealth investments, [www.financing-ehealth.eu](http://www.financing-ehealth.eu)

<sup>80</sup> Financing eHealth, D2.2: Report on financing opportunities available to Member States to support and boost investment in eHealth [www.financing-ehealth.eu](http://www.financing-ehealth.eu)

<sup>81</sup> Robert Bosman, Emmy Rood, Heleen Oudemans-van Straaten, Johan Van der Spoel, Johannus Wester, Durk Zandstra, *Intensive care information system reduces documentation time of the nurses after cardiothoracic surgery*, Intensive Care Medicine Volume 29 Number 1 January 2003 <http://dx.org/10.1007/s00134-002-1542-9>.

finance, so Exhibit 14 shows the main, but not the only types of financing for the respective activities.

**Exhibit 14: Examples of activities financed by extra and reallocated finance**

eHealth Activity	Extra Finance	Reallocated Finance
Engagement with healthcare professionals		X
Consultation with users		X
Project management	X	
Business case development	X	X
Application design	X	
Application development	X	
Testing	X	X
Setting up contracts with ICT suppliers	X	
Procurement		X
Legal advice on procurement	X	
Trainers	X	
Training time for users		X
Implementation	X	X
Organisational change		X
Benefits realisation		X

Source: © TanJent / empirica 2008

A related theme is the search for financial savings as part of eHealth financing. Savings include improvements in daily cash flows. These are often a relatively small percentage of total economic benefits, and may take several years to achieve. However, some eHealth investments can provide the information needed to optimise the cash flow.

Benefits from eHealth have three components. Financial savings arise from direct improvements in cash flow, such as those resulting from better data used to increase billing, or reductions in outgoings by reduced stock holding and consumption of drugs. These financial savings range from 0% to over 50% of benefits, but are mostly concentrated towards the bottom end of the range. The other two types of benefits are redeployed resources and intangible benefits, described as non-financial. Redeployed resources usually arise from time-savings that are individually minimal, but occur with a high frequency, creating a significant value. The challenge is to manage the reallocation of time in a way improving productivity and thus converting this redeployed resource into



financial benefit. Intangible benefits include mainly reductions in exposure to risk of avoidable errors and consequent complaints and law suits.

Preliminary findings from the EC's EHR IMPACT<sup>82</sup> study show that an average ratio of extra finance to redeployed resource, to support investment costs over an eHealth investment cycle, is about 55:45 for EHRs. Extra finance from benefits is an average of about 20% of all benefits. The result is a brake on performance. Without utilising the 50% redeployed resources, the benefits cannot cover the financial requirements of the investment. Some 30% of the benefits are intangible and cannot be converted into finance of any kind. Reallocating from existing activities is more demanding to identify and realise than exploiting extra finance. It can extend into many different budgets in HPOs, and the larger the scale of the eHealth investment, the more the reallocated finance web becomes more complex and extensive, and so more difficult to manage and sustain.

When the cash flow of the initial eHealth investment hump is included<sup>83</sup>, the impact on cash flow is usually negative over a ten-year period: **eHealth is usually a net investment, with a negative financial return.** Where the cash generated is a significant proportion of the investment, the investment often bundles clinical and administrative/managerial components with the latter being responsible for the generation, or saving, of extra cash.

The challenge is to ensure that the total investment matches an appropriate total economic benefit. In this respect, it is important to treat eHealth investment in the same way as other new investments in healthcare, such as new drugs and surgical techniques. It should not be a means of saving money and improving overall cash flow, but an investment in better healthcare. A recent report by the US Congressional Budget Office<sup>84</sup> supports this conclusion.

**Sustainable eHealth investment requires that all decision takers and financial stakeholders are clear about the distinction between economic benefits and financial savings,** and the impact of each eHealth investment on future cash flows when decisions are taken.

Cases where the financial returns are sufficient to repay for the investment tend to be an exception featuring a very specific situation, for example, implementing advanced eHealth applications alongside basic solutions to improve administrative processes and general management. Such basic solutions are already in place in many HPOs, with the financial savings long utilised. Thus, the scope for such bundling of investments is limited, and more likely where eHealth systems replace paper systems rather than legacy IT systems.

---

<sup>82</sup> [www.ehr-impact.eu](http://www.ehr-impact.eu)

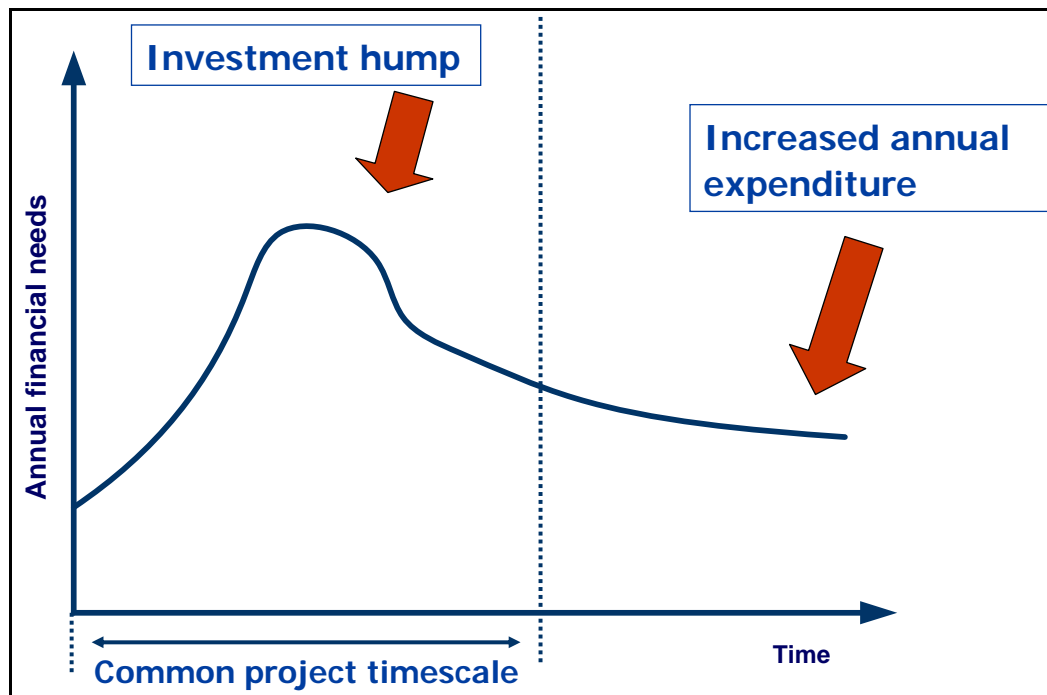
<sup>83</sup> Cf. Section 2.5.3

<sup>84</sup> Congress of the United States, Congressional Budget Office, "Evidence on the Costs and Benefits of Health Information Technology", Pub. No. 2976, May 2008

## 4.2 Timescales for eHealth

When the economic case for an eHealth investment is in place, a range of appropriate sources, such as borrowed funds, external funds, or funds generated internally, can combine to finance eHealth investment. These financing arrangements, discussed in chapter 3 above, must reflect two general features of eHealth investment, as illustrated in Exhibit 15 below. One is the finance needed for the investment hump in the earlier years. The other is the finance for the increased recurring annual expenditure from eHealth; a feature that is common in eHealth.

**Exhibit 15: Illustrative financing needs curve of eHealth investments**



Source: © empirica / TanJent 2006

Project management for some eHealth projects focuses mainly on deploying and managing the resources during the design, development and implementation stages, and possibly the initial stages of operation. This timescale can be too short for sustainable eHealth investment. It may fit an ICT project, but seldom provides the time required for the activities needed to realise net benefits; typically, about four years on average and at least eight years for EHRs. **The appropriate timescales extend well beyond the business and financial planning of most national health agencies and HPOs and can present financing challenges for eHealth.**

Most of the extra finance needed is in the earlier years of the lifecycle to finance the investment hump, which includes costs for engagement, design, development, and contracts with ICT suppliers. This usually fits into the shorter, project management timescale, which is often set to reflect either the implementation of the new ICT contract as the end of the project, or the financial planning horizon of the organisation. These are seldom appropriate conditions for eHealth financing which aims to support long-term realisation of benefits.

Instead, **the eHealth investment lifecycle should be set by the time needed to realise the required net benefit**, the ultimate objective. This will enable the

management and productive utilisation of all the reallocated resources, as part of change lifecycle. For large-scale eHealth investment that includes several HPOs, this is crucial. Excluding the potential to realise and exploit redeployed resources with a timescale that is too short, omits the vast majority of finance from management action and scrutiny, and so leaves it to chance.

A whole lifecycle model also improves the realism of the affordability arrangements. **Relying on sustained, reallocated time of busy healthcare professionals without their explicit consent may not be realistic.** An example is the eHealth investment in training stages, especially after implementation. It may not be practical for doctors and nurses to reallocate time away from clinical activities on the scale required for success. A solution may require extra finance for locum or temporary staff to cover. If the extra finance needed is unaffordable, the eHealth investment plan should include an ingenious, affordable solution.

**For national and regional eHealth investments, it is essential that lifecycles and timescales used by Member States' health entities and HPOs are consistent.** It is not essential that they are the same, but there must be some congruence. Activities that must be integrated include financing timescales and requirements; design and development timescales; implementation dates and sequences and the time to realise net benefits. Disharmony disrupts financing arrangements.

Another relevant feature of eHealth is its scale. **Step-by-step, slow burn eHealth investment builds continuously from relatively small scale successes.** Large parts of the experience is transferable to other parts of HPOs, other communities and other HPOs and can form platforms for more sophisticated eHealth solutions in the future. It means that the resulting eHealth at any point in time will not be the same across Member States. Some communities and HPOs may be further ahead than others. This is likely to be a permanent condition as new technologies for eHealth continue to emerge and need testing and trialling before extended availability and use. Telehealth, with its expanding range of technologies and applications, as well as impact on clinical and working practices, is an example. Investment differences between communities and HPOs will be prevalent in Member States and different continuous investment between locations may be a regular feature. Sustained finance is essential in these settings. Pump-priming finance on its own will seldom be sufficient to achieve a level of operation where new healthcare models optimise the potential net benefits.

These scenarios deal with eHealth pioneering and roll out simultaneously, together with the required continuous organisational changes needed to optimise both benefits and net benefits. This reveals an important feature of eHealth investment: its time horizons to reach a net benefit can exceed four years and can exceed eight years for more complex investment such as EPRs. Financing in this context exceeds the time scales of the financial and business plans of most HPOs, creating a planning mismatch. Member States and HPOs have to recognise that eHealth investment can commit finance well beyond their normal planning horizons.

## 4.3 Risks of eHealth

Like all investments, eHealth carries inherent risks. For those who need to be convinced, a claim is that 74% of all IT projects in 2008 failed; the same percentage as in 1980<sup>85</sup>. Failure includes budget overruns and missed deadlines. About 28% fail completely. It seems that **over the last 28 years, skills and knowledge of risk have ossified.**

Like all investments, as complexity and scale increase, so do the scope, probabilities and costs of risk. **Plans for eHealth investment seldom evaluate the potential of risk realistically. The result is no recognition of risks as costs, no mitigation and no respective financial provision. This in turn leads to understated costs and overstated benefits, which is not a good foundation to boost eHealth investment.**

Some eHealth investment plans include potential general benefits, but have limited, or no, plans to realise them. The goal is mainly to contain the costs of eHealth. At the other extreme, financial benefits can be overstated. Some claims for economic benefits are confused with, and presented as, financial savings. They are not the same, and this discredits the overall eHealth investment case. As already discussed, economic benefits and net benefits over time can be substantial, but they usually require additional finance; cash savings are seldom sufficient to finance eHealth investment<sup>86</sup>. Another approach is to invest in process change to secure the benefits, and hopefully net benefits, usually in parallel to ICT implementation. Process changes are far from easy and require behavioural changes among a sometimes large number of people, so carry increased risks. So, what needs to be in place to identify measure and mitigate risk?

First, there are over 80 recognised good practices for eHealth investment. This report discusses some the most important ones. The extent to which an eHealth investment includes and complies with these is a good start to identifying risks. Many large-scale eHealth investments do not have enough good practices in place, and sometimes have a massive gap. Excessive optimism, reinforced by remoteness, reinforces this lack of reality, so increases risk. Risk mitigation improves with compliance with all recognised good practices.

Second, the probability of adverse events occurring needs to be, but is difficult to assess. **Research on risk exposure and probabilities in the context of eHealth is extremely limited.** Probabilities used in business cases tend to be understated compared to the small number of identified probabilities that exceed 50% of both total costs and total benefits. More research on this theme will be very valuable, as proven in the knowledge of risk in building projects. The limited knowledge in HPOs of risk probabilities of eHealth investment matches an equivalent knowledge gap in ICT suppliers and national health agencies in Member States. Weak risk mitigation usually inhibits efforts to boost investment.

<sup>85</sup> Tranfield, D., and Braganza, A., Business Leadership of Technological Change, Chartered Management Institute, British Computer Society, The Change Leadership Network, London 2007 ISBN 0-85946-470-9

<sup>86</sup> [www.ehealth-impact.org](http://www.ehealth-impact.org); [www.ehr-impact.eu](http://www.ehr-impact.eu)

Engagement with users and other stakeholders is another high-risk activity. Where it is not successful, the effect can inhibit eHealth activities for many years. Where it is successful, **eHealth investors tend to apologise for the extended timescales, understating the significant reduction in risk by pursuing effective collaboration and engagement, especially with healthcare professionals.** Also, eHealth that relies on a step-by-step, or slow burn, approach to implementation tends to offer more scope to succeed than big bang models. Important features in these successful cases are that:

- Availability of finance is often not a constraint
- The slow burn approach offers a project structure that inherently mitigates risks from the outset
- It lays a foundation for continuous eHealth investment.

However, rapid implementation across whole sites can succeed, such as in specialised hospitals with good leadership and management of the combination of ICT and organisational change. The three requirements above still apply.

Comparing this slow-burn approach to large-scale, big bang eHealth investments shows the relative risks. **Large-scale big bang eHealth carries increased risks of isolation and disconnection from benefits and net benefits.** Risks of large-scale eHealth investments increase because the scale itself creates complexities that are inherently more risky. Large-scale eHealth investment is harder to stop rapidly or change when required and its increased remoteness makes effective engagement more difficult to achieve. These features translate into an increased requirement for additional finance. As **risk is a cost needing finance**, large-scale, big bang projects are more financially demanding than small-scale, slow burn eHealth investment models. However, this does not mean that slow-burn eHealth is risk free. Their longer timescale carries an inherent risk. The interesting phenomenon is when large-scale big bang eHealth initiatives suffer from risk exposure and their timescales stretch to and equivalent for slow-burn eHealth. Then, the risk exposure of large-scale, big bang increases exponentially.

The impact of risk in large-scale projects is illustrated by the following: “in 2003...established a clear vision for electronic patient records systems. Four years later, however, the descriptions of the scope and capability of planned DCR [*detailed clinical records*] systems offered by officials and suppliers were vague and inconsistent”<sup>87</sup>. Information from these types of assessments of eHealth projects provides excellent material about the risks, their values, their probabilities and ways to mitigate them. When financing arrangements for eHealth reflect these themes, it supports robust investment, helps to mitigate risks and lays the foundation to expand the finance available.

Large-scale, big bang eHealth investment is a relative term. For a Member State, it can include EPR and EHR projects for all citizens. However, some Member States aim to achieve this by relying on a series of small-scale, lower risk investments. Similarly, some HPOs have eHealth investments that are large-scale in concept, but pursued in a series

---

<sup>87</sup> *Electronic Patient Records Sixth Report of Session 2006-07 Volume 1* Health Committee House of Commons UK

of small, manageable steps, which can increase the opportunities to manage and mitigate risks by designing and constructing lower risk eHealth projects.

These differences in risk are critical in boosting eHealth investment. In any investment, the people who have the money want to know that the people who want the money can manage their exposure to risk. eHealth is no different.

## 4.4 General strategic fit

All eHealth investment should have a sound fit to the organisation's strategic goals for health and healthcare. Many Member States, HPOs and ICT suppliers have clear statements of the strategic fit of eHealth, and they are not necessarily the same. Member States have perspectives of their populations and the need to meet increasing demand and improve healthcare quality. eHealth can be one strand alongside several other strategic initiatives. HPOs can adopt a similar perspective but also have to deal with the requirements of organisational change to realise benefits and have to pursue affordable strategies. ICT suppliers have eHealth strategies that may emphasise the ICT components of eHealth, such as communications capacity, architecture and functionality, and so can become isolated from other components of healthcare strategies.

eHealth strategies can often be articulated in high-level documents and generalised vocabulary. An example is eHealth that improves healthcare quality and the performance of HPOs. Whilst this may be correct, it does not show how eHealth fits into the whole strategic picture. Many other initiatives, such as using new drugs, can improve quality and performance. Patients can sometimes understand this better than eHealth strategies. eHealth investments may take several years to come to fruition, have no direct impact on patients, and are derived from ICT solutions that are tainted with historical reputations for not delivering in full, in budget and on time.

As detailed eHealth decisions and activities move down national organisations responsible for statutory healthcare provision, and down into health service provider organisations, eHealth can become a specialised, parallel and isolated activity disengaged from other healthcare priorities. Sometimes, these healthcare goals become secondary to the urgency of implementing information systems on time and on budget, and with a simultaneous reduction in the priority for benefits realisation. Evidence from the US shows that top priorities for hospital managers are "project on time and budget" and "happy top management", well before successful improvement of clinical outcomes<sup>88</sup>. Many experts see this as a parallel universe to healthcare professionals and managers, and an unsustainable position in boosting eHealth investment.

Where this strategic misfit occurs, financing eHealth can also become detached from the eHealth effort, increasing the risks of cost over-runs and constraints on eHealth resources that disrupt the investment. Finance managers, consulted for the study, were not aware of the strategic impact, costs, benefits, risks, and financing of eHealth. This

---

<sup>88</sup> Survey by HIMSS Analytics, presented by Dave Garets, World of Health IT Conference and Exhibition, October 2006, Geneva, Switzerland

alone has significant implications of relying on financial measures alone to boost eHealth investment.

The strategic fit is especially important for more complex eHealth that requires a considerable long-term investment in design and development, such as comprehensive national EPRs and EHRs. These types of investment tend to be set in a national context and so are inherently more remote and isolated from healthcare professionals and other stakeholders when compared to the equivalent smaller-scale eHealth investment of HPOs. HPOs' eHealth investment can also be remote and isolated from general healthcare strategy, and for all types of organisations, **the challenge is to ensure that eHealth investment has, and sustains, a direct link with mainstream strategic goals for health and healthcare.** The more remote and isolated the eHealth activity, the more difficult it is to achieve, and to sustain a match to the timescales, priorities, resources and finance of HPOs.

eHealth dealing extensively with technical aspects of health and healthcare information and information systems, rather than the direct needs of users and other beneficiaries, exacerbates the challenges of integrated investment and finance. These arcane eHealth investments can often be pre-requisites to national scale initiatives, so set a demanding context to achieve a strategic and financing fit. Investments in existing proprietary eHealth applications, such as PACS, are less constrained, and have different impacts, so have a relatively simple strategic and financing model. In between these are eHealth investments such as telemedicine, telehealth and telecare. They are developed and increasing in scope, but often need considerable changes in working practices across healthcare value chains, across several HPOs, and that needs long time-scales.

ICT suppliers in this context bring their specific ICT and health informatics expertise to eHealth investment. Their roles are critical components of eHealth projects, but the strategic fit of their activities is not always clear, and not easy to make clear. Their contributions can range from direct supplier to partners in design and development. Across this wide divide, their direct role in benefits realisation is usually limited, as this is the direct responsibility of HPOs. **It is essential that boundaries between ICT suppliers' and HPOs roles are explicit to achieve effective assignment and management of eHealth finance.**

Strategic fit and integration of eHealth is required for effective financing to help to maximise financial flexibility, and so overall value and impact. In scenarios where eHealth can offer increased potential, entities will want the opportunity to reallocate finance from other initiatives to boost finance for eHealth. Entities may want to defer financial transfers where eHealth shows reducing value, or they may want to transfer finance from eHealth to boost finance for other initiatives. Effective strategic planning and programme management are two way to support this.

Clarity about the type and nature of eHealth investment is essential in dealing with financing arrangements and other enabling activities. **Achieving a strategic fit for eHealth depends on the type and scale of eHealth and the number and type of actors, especially national bodies, HPOs, ICT suppliers and stakeholders.**

## 4.5 eHealth procurement

Effective procurement can help to reduce costs and so enable existing finance to support more eHealth. Examples are healthcare agencies and HPOs that can combine into consortia to procure proven, proprietary products, such as PACS. In this setting, buyers and suppliers should know the potential benefits and risks. Joint and aggregated procurement may be less effective where complex products, such as EHRs, need developing to match Member States' specific health informatics requirements.

In the more centrally managed healthcare systems and markets, such as Scandinavia and the UK, joint procurement may be more feasible than in distributed healthcare markets, such as France and Germany. In these healthcare systems, aggregated procurement may be more viable. Some Member States in Eastern Europe are redesigning and redeveloping their healthcare systems and markets. In these cases, a move towards increased joint procurement should underpin arrangements for information and information sharing.

Expanding joint and aggregated procurement within Member States and between Member States are parallel initiatives. The EC has set in train many eHealth research projects that may have cost more if each Member State had pursued its own course. An example is the Pre-Commercial Procurement of Innovation<sup>89</sup> that supports the procurement of research and development services before eHealth products are commercially available, and where the benefits do not accrue exclusively to the contracting authority.

**Financial benefits from appropriate joint and aggregated procurement can be considerable**, and increase the impact of available eHealth finance. It is feasible for price reductions of proprietary ICT solutions to exceed 50%. Reduced prices are possible for a wide range of items, including health cards, secure networks, licences, and hardware.

Public private partnerships (PPP) have been fashionable over recent years. There are many PPP models, including private finance initiatives (PFI), joint ventures and outsourcing. Probably the most significant and well-publicised PPP is the UK's National Programme for IT (NPfIT) for the NHS in England, run by NHS CfH with a combined value of over £6billion. It includes long-term contractual relationships with several ICT suppliers to achieve successful innovation and investment initiatives. An aim of PPP is to share or transfer appropriate risks with private sector partners in exchange for a spending regime that transfers some the purchaser's costs into the future. Some capital and non-recurring costs transfer to private partners, who can then increase their annual prices to reflect their costs. This is an advantage where capital finance is scarce and annual revenue finance is plentiful. However, PPP is not a cast-iron deal. Partners can cancel PPPs, as experienced by NHS CfH in 2008. Disruption, waste and abortive expenditure from increased risk can be considerable in these circumstances.

---

<sup>89</sup> Pre-Commercial Procurement the Missing Link in the European Innovation Cycle, EC DG Information Society and Media  
[http://ec.europa.eu/information\\_society/tl/research/key\\_docs/documents/procurement.pdf](http://ec.europa.eu/information_society/tl/research/key_docs/documents/procurement.pdf)



A reality test for PPP was in 2007, when Fujitsu, one of NHS CfH's main contractors as a local service provider, pulled out of its contract. NHS CfH claims that PPP enabled it to mitigate its exposure to risks by transferring risks to ICT suppliers. This seems to exclude the abortive costs of NHS CfH and many HPOs who can no longer proceed as planned, but have to find another supplier at new costs. The risk of the cancelled contract is recognised by the UK's Audit Commission, reported as in "this uncertain situation, the National Programme for IT in the NHS remains a key risk" for strategic health authorities (SHA), which should "reassess the risks associated with the termination of the Fujitsu contract and develop and implement an appropriate action plan"<sup>90</sup>.

The new International Accounting Standard (IAS) 17, for leases, has disrupted the value of some PPPs, especially PFIs, by introducing the principle of treating most leases as assets, requiring disclosure in balance sheets, contrary to one of the advantages. This could have implications where leases are part of hardware procurement. Simple tests for PPPs as a financing model are: do they offer real financing advantages and are they sustainable over the whole investment lifecycle.

As described above, finance for PPPs can be a major part of the extra finance needed for eHealth, but not always the major part of the total finance needed over the whole investment lifecycle. Whichever procurement model is used, the goal is to procure the ICT and eHealth that is needed, and from the right supplier. This can be a very challenging goal when regarding an important consideration for eHealth procurement raised during some interviews. ICT suppliers are involved in more procurement than the HPOs and healthcare agencies they deal with. Consequently, ICT suppliers will be more experienced. Addressing this imbalance is important in maximising the eHealth finance available.

Another concern, made clear at the workshop on procurement in Copenhagen<sup>91</sup>, is that there is still a mismatch between supply and demand for eHealth systems and tools. Experts reported of **repeated occasions in which ICT suppliers were not in the position to supply the solutions needed for benefit realisation**, leaving investors with the task to develop rather than procure. At the same time, **procurers do not always set their requirements effectively, making the life of ICT vendors more difficult**. For some eHealth projects, about 80% of requirements are in a range that includes requirements "Not defined"<sup>92</sup>. There is a need for much more development in this area.

---

<sup>90</sup> E-Health Insider

[http://www.e-health-insider.com/news/4285/auditors\\_warn\\_of\\_npfit\\_risk\\_to\\_southern\\_shas](http://www.e-health-insider.com/news/4285/auditors_warn_of_npfit_risk_to_southern_shas)

<sup>91</sup> Expert workshop on "Procuring for health benefits: critical factors for beneficial deployment of innovative eHealth and telemedicine services" held at the World of Health IT conference, 06 November 2008, Bella Center, Copenhagen, Denmark; see [www.financing-ehealth.eu](http://www.financing-ehealth.eu)

<sup>92</sup> Expert workshop on "Procuring for health benefits: critical factors for beneficial deployment of innovative eHealth and telemedicine services" held at the World of Health IT conference, 06 November 2008, Bella Center, Copenhagen, Denmark; see [www.financing-ehealth.eu](http://www.financing-ehealth.eu)

## 4.6 Reimbursement and business models

Some types of eHealth investment, such as telehealth, can change the healthcare business model and create new types of services and protocols that can supplement, and even replace existing, traditional services. Creating new, appropriate reimbursements for these new services is part of eHealth financing. The importance of new reimbursement models lies in securing finance for long-term recurring costs.

There is a view that financing arrangements, including new reimbursement models, should be in place before procurement for such new services begins<sup>93</sup>. However, the reality is more subtle. New reimbursements are only required at the implementation stage, so timing should aim for this. At the same time, designing new reimbursements is a complex and time-consuming endeavour and may take several years to complete. Third party payers and HPOs should begin the reimbursement design as part of the telehealth business case. This is before procurement, but not with the aim of having the reimbursement in place at that stage.

An important consideration in reimbursement is the different impacts of benefits and savings. Benefits are an economic concept that can justify an eHealth investment. They can include improvements in patients' experience, satisfaction and confidence; better patient safety; expanded access to healthcare for citizens; improve utilisation of resources by HPOs; time savings that cannot easily be redeployed; and future costs avoided. For eHealth investment, where these economic benefits exceed costs, eHealth can be worth pursuing. As stated earlier, financial savings may not generate enough extra finance for new reimbursement models, so the design task is very demanding. Information needed includes:

- How much does the new service cost to provide, including the cost of capital?
- How will new reimbursements reflect the take up of the new services and the impact on fixed and semi-fixed costs absorption?
- Will the users of the new service be reimbursed, or the HPOs providing the new service?
- If users are reimbursed, how should the money flow to the HPOs that carry the cost?
- What are the double running costs of traditional and eHealth-based services, and for how long?
- How much cash can be transferred from traditional services and when?
- When should new reimbursements begin and the traditional reimbursement stop?

Answers to these questions link directly to a recurring theme in many eHealth investments: who pays, and who benefits? Many eHealth investments require significant investment by HPOs, and offer significant benefits for other stakeholders, such as

---

<sup>93</sup> Expert workshop on "Procuring for health benefits: critical factors for beneficial deployment of innovative eHealth and telemedicine services" held at the World of Health IT conference, 06 November 2008, Bella Center, Copenhagen, Denmark; see [www.financing-ehealth.eu](http://www.financing-ehealth.eu)

citizens and third party payers. Similarly, one type of HPO, such as a primary care centre may benefit from an investment by an HPO providing hospital services. eHealth finance, including reimbursements, should provide incentives to eHealth investors across the whole healthcare value system and be able to link these to appropriate contributions from stakeholders who benefit. It means that **reimbursement models have to be more responsive to continuous change, which is not just an eHealth matter.**

## 5 Skills & knowledge needed to boost investment in eHealth

Many interviewees identified the **need to improve managerial knowledge of eHealth in dealing with eHealth investment**, and bring it up to the level of other types of healthcare investment, such as new drugs, new techniques, extra staff and new hospitals. This issue links to a **skills gap identified in the specifics of the eHealth domain in all Member States that impedes progress**. Taken together, these show the need to invest in developing eHealth skills and knowledge for leaders, executives, healthcare professionals, general managers, departmental managers and ICT teams; in essence, all types of managers and eventual users.

It may be surprising that interviewees did not identify current or planned financial provisions as constraints on eHealth investment. Instead, they **identified shortfalls in the real resources for eHealth as:**

- **Significant lack of skills and capabilities in the workforce to deal with all the eHealth requirements**
- **Limited view of the potential of eHealth by many healthcare professionals, executives and managers leading to narrowly defined eHealth investment plans.**

**Only limited financing opportunities are available to fix these shortfalls.** If they are not fixed, they will be a continuous constraint on boosting eHealth investment. The phenomenon seems to prevail in some parts of the USA where the EHR take up by physicians has increased from 26% in 2006 to 30% in 2008<sup>94</sup>. The top two inhibitors identified were cost and lack of interest; the latter offering a parallel factor consistent with the two factors reported above by the Financing eHealth interviewees.

Success stories of eHealth are an essential source for this knowledge, and they need to reach these people to support their activities in boosting eHealth investment. This reveals a chicken and egg conundrum: successful eHealth promotes eHealth investment skills and knowledge, but achieving successful eHealth investment needs the same expertise in advance. Something must break into this cycle, and it is a combination of knowledge and tools. This chapter draws attention to the main skills and knowledge themes.

### 5.1 What is eHealth?

First, there is **some confusion about the concept of eHealth. It has become an overused term with many meanings**. It can mean a single ICT application, or several ICT applications, or ICT applications with organisational change. Terms such as EPRs and EHRs can have the same or different meanings. ePrescribing can mean the electronic transmission of prescriptions from GPs to pharmacies, or access to a decision

---

<sup>94</sup> HIMSS Analytics [www.himssanalytics.org](http://www.himssanalytics.org)

support system that can help to prevent inappropriate prescribing and improve patients safety. Terms such as telehealth, telecare and telemedicine are perceived to be interchangeable and thus imprecise. Interoperability can be so complex, that it may be better to wait until someone else finds a solution before committing large sums of cash to eHealth. Other areas, such as PACS, are more consistent in their definitions. Other EC reports on eHealth<sup>95</sup> deal with these definitions. It is beyond the scope of the Financing eHealth project to attempt to create a dictionary of eHealth definitions and functionality, but it is essential that information about eHealth is clear, consistent and easy for healthcare staff to understand alongside the mountains of other information that they have to deal with each day.

Similarly, it is not always clear what is included in an eHealth investment, and so what is being financed and for how long. The definition of eHealth used for the Financing eHealth project includes both ICT and organisational change, because they can have different financing requirements and realising net benefits relies on both factors. Financing eHealth investment over time requires additional cash and resources, especially healthcare professionals' time, reallocated from routine healthcare activities.

Dealing with information comprises over 20% of healthcare resources and activities, so **an eHealth definition that includes both ICT and organisational change is essential for managers.**

## 5.2 Managing the variables in eHealth

Perhaps **the most important requirement for leaders, executives and eHealth stakeholders is to be able to deal with eHealth investment as an integrated part of all healthcare investment.** This is consistent with the EIB healthcare investment policy where eHealth should be part of a healthcare development or initiative, and not be an investment on its own. Integration requires all types of managers to know:

- The different types of impacts of various types of eHealth
- How to realise net benefits over time
- How long these investments take to realise net benefits
- How to manage and mitigate risks
- How to deal with each eHealth project as part of a programme of healthcare investments
- How to sustain eHealth investment as new opportunities become available
- The sustainable, comprehensive financial and affordability requirements over the longer-term
- How to integrate eHealth with other healthcare investments.

---

<sup>95</sup> See conceptual reports to the following studies: [www.financing-ehealth.eu](http://www.financing-ehealth.eu); [www.ehr-impact.eu](http://www.ehr-impact.eu)

**Two methodologies are required: one to support decision taking, the other to support investment management after decisions.**

### 5.2.1 Taking investment decisions

Decision taking requires a comparison of the opportunity costs of all proposed investments. eHealth has to be measured alongside its competing options. Chapter 2 and the model shown in Exhibit 5 provide a good starting point.

#### Assessing different investment options

Executives and managers need to understand and compare the costs, benefits, and net benefits over time of a range of potential projects, then finance those with the best economic returns from the amount money available. Strategy and planning systems should already be in place in most healthcare systems to deal with decisions to invest in new healthcare resources, such as new drugs, extra doctors and nurses and new facilities. Proposals for eHealth investment need to be set alongside these, so executives manage all proposed investments together, and select the best opportunities. In many cases, **the best investments include a combination of conventional resources and eHealth.**

However, eHealth can be an arcane world. **Managers need the capability to produce comparable economic assessments of each possible project. Executives need the capabilities to challenge these constructively and either change the proposals or agree them.** Information about economic and financial performance of comparable eHealth already in place in other organisations offers a valuable knowledge base for these reviews. The management support proposed above should fill this gap and help to improve executives' eHealth decisions.

Good methodologies for assessment of eHealth investment decisions are readily available but do not seem to be used effectively or fully. Two examples are the Treasury Green Book<sup>96</sup> in the UK and the WiBe<sup>97</sup> in Germany. These are not investment models, but set out rigorous principles. Using them requires managers to adopt an approach of an open mind that seeks a good decision. They are not a set of hurdles to navigate through to justify a previously preferred option.

A first step towards sound, realistic investment decisions is recognising that **planning processes need developing, because realistic eHealth investment decisions usually have longer timescales than other types of healthcare investment.** Business and financial planning horizons for HPOs are often about three to five years ahead, which compares to an average of about four years for eHealth net benefits and well short of the net benefit timescales of EHRs of about seven to beyond ten years. **Planning eHealth**

---

<sup>96</sup> HM Treasury, "The Green Book, Appraisal and Evaluation in Central Government. Treasury Guidance", London: TSO, 2003; <http://greenbook.treasury.gov.uk/>

<sup>97</sup> WiBe 4.1. Recommendations on Economic Efficiency Assessments in the German Federal Administration, in Particular with Regard to the Use of Information Technology, 2007, based on the version 4.0, 2004.

**on shorter-term horizons of less than five years leads managers to focus on the investment in costs, which then become detached from the investment needed to realise benefits.** It also creates pressure for eHealth to deliver on **unrealistically short timescales, resulting in increased risk and optimism, weak business cases, and so weak decisions.**

## Optimism bias

**Optimism bias is a common feature of all investment plans, so eHealth is no exception.** It distorts financing requirements and impairs financial sustainability. Eradication is essential. A weak eHealth business case full of optimism bias:

- Has time scales too short and unrealistic
- Has estimated costs that are too low
- Omits some costs, especially costs of organisational change
- Makes absurdly excessive claims of the benefits that can be achieved over unrealistic timescales
- Includes useless assessments of risks, their and probabilities and costs
- Excludes risks from costs, resulting in understated costs
- Overemphasises costs to the detriment of benefits or net benefits
- Oversimplifies requirements for engagement with healthcare professionals
- Focuses on systems implementation instead of step-by-step gains by users
- Overstates the short-term need for change management in parallel with ICT implementation
- Understates the longer-term for change management when users can change organically with the right support from ICT staff
- Confuses economic benefits with financial savings, which are usually small, except in rare, specific circumstances
- Understates the need for extra finance needed to achieve the net benefits.

These provide a simple schedule of themes for managers to avoid in eHealth business cases. The challenge is to provide them with the information about good and bad eHealth performance needed for a sound assessment that supports effective programme and project management.

## Value for money and affordability

Cost benefit assessments and forecasts show the potential for value for money, or lack of it. Cost benefit assessments include the main data needed for financial assessments and forecasts. After adjusting these financial forecasts for items such as depreciation, amortisation and transfer payments such as value added tax (VAT) to fit the standards of annual financial statements and balance sheets, they provide the foundation for affordability requirements. **It is essential that eHealth investment plans offer value for money and are affordable**, and passing both tests often needs adjustments to proposals

that improve one position and disrupt the other. Eventually, affordability becomes the most dominant, so two recommendations are:

- Begin the affordability assessment at the outset of decision taking so that complex iterations with value for money is not left until the end stages
- **Ensure that meeting affordability requirements does not diminish a positive value for money** so the eventual eHealth investment becomes unviable or unsuccessful.

## Financial planning

Effective financial planning may be difficult to ensure. Several discussions with healthcare finance professionals and some of their professional bodies show a lack of knowledge, understanding of eHealth, its risks and the priority that they assign to the topic. This needs changing. **Finance managers need to understand the value and impact of eHealth, so they can extend and develop financial planning to deal with eHealth investment timescales.** Their role in risk management is also critical so they can mitigate an adverse impact on their organisation's financial performance.

### 5.2.2 Supporting investment management after decisions

After the decisions, attention switches to managing progress and taking appropriate action. A core of successful delivery is a strong, independent and impartial programme office and team with the goal to achieve successful change<sup>98</sup>. Every eHealth project in the organisation should be within its scope so that the programme is the aggregation of all eHealth investment. This will enable a frequent and regular review of all eHealth projects on the same time intervals and drifting projects stopped or deferred so that their resources and finance are available to transfer to eHealth investment that offers better net benefits.

**Accountability and reporting by the programme office for eHealth should integrate with the equivalent arrangements for other investment programmes.** Executives can then have routine reports on progress, or lack of it, and take corrective and fine-tuning action in the context of all healthcare investment. Again, executives need the freedom to stop drifting projects so that their resources and finance are available to transfer to investment that offers better net benefits. Weak business cases leading to hard decisions in this context comprise good practices in programme and project management for eHealth investment. Unsurprisingly, risk increases.

## Realising net benefits – the role of engagement

Benefits depend on several factors being in place. They include effective:

- Engagement with users and stakeholders

---

<sup>98</sup> Tranfield, D., and Braganza, A., Business Leadership of Technological Change, Chartered Management Institute, British Computer Society, The Change Leadership Network, London 2007 ISBN 0-85946-470-9



- Requirement setting
- ICT functionality
- ICT usability
- ICT utilisation
- Change of clinical and working practices.

Leaving aside the ICT themes, **achieving successful engagement and change are essential skills for managers**. Engagement is working with users and stakeholders so they can participate in the design, development, requirements and constraints of eHealth. Doctors and other healthcare professionals are always important stakeholders in eHealth, so their engagement from the outset is essential. Engagement provides them with a role to participate in eHealth investment as part of the team. **Dealing with positions, propositions, concerns and requirements distinguishes engagement from consultation**. Executives and managers can ignore advice and views provided through consultation. In engagement, dealing with advice and views is essential in order to gain subsequent commitment to changes in clinical and working practices that realise the benefits from eHealth.

Changing clinical and working practices is usually essential to realise the benefits from eHealth. The timing of the activity is critical. Engagement should have laid a foundation. From this, successful eHealth projects<sup>99</sup> show that change management is effective after healthcare professionals have achieved a reasonable level of utilisation. Starting before this has two drawbacks. One, the benefits are potential, not tangible. Two, it creates **two sets of changes: ICT use and new practices to be implemented simultaneously, which can be too much to cope with successfully**. Managers need to design and apply their change projects in this context.

Many eHealth benefits are relatively small amounts of time savings for large numbers of healthcare professionals and other healthcare workers. Redeploying these liberated resources individually is not practical. They need grouping to form large blocks of resources that can offer more potential for redeployment. However, this is still very demanding. It requires effective engagement between managers and healthcare professionals to succeed and builds from the initial engagement required at the start of eHealth investment.

The role of executives, especially the chief executive, includes creating an appropriate culture for regular reviews. Features include:

- Create transformational value rather than just implement ICT projects
- Build capability for continuous change
- Create a climate of open communication
- Manage confidence and risk

---

<sup>99</sup> [www.ehealth-impact.org](http://www.ehealth-impact.org); [www.ehr-impact.eu](http://www.ehr-impact.eu)

- Build personal capability and learning about ICT<sup>100</sup>.

Whilst simultaneously developing the positives, executives must avoid the negatives. The top ten reasons for failure are:

- Inadequately trained or inexperienced project managers
- Expectations not set or managed
- Poor leadership at all levels
- Requirements not adequately identified, documented and tracked
- Poor plans and planning processes
- Poor estimates of effort required
- Cultural and ethical misalignment
- Misalignment of project teams and organisation it serves
- Inadequate or misused methods
- Inadequate communication, including progress tracking and reporting<sup>101</sup>.

### 5.3 Developing health ICT staff

ICT staff in healthcare are a scarce and underdeveloped resource. Effective eHealth investment requires them to work as part of multi-disciplinary healthcare teams and engage effectively with each person at design and development, requirements, implementation and operational stages of eHealth investment. Generally, ICT staff are the only ones who know about ICT functionality in an eHealth investment. Often this is not about the whole functionality, so they often need more time and resources so they can acquire more and comprehensive knowledge. This will be **critical for their colleagues who are healthcare professionals to exploit the full functionality of the eHealth system**; a common requirement for realising net benefits and achieving a return on the eHealth investment.

**An additional role for ICT staff, a combined role of change manager and trainer, is part of some successful eHealth investments.** This new role involves supporting healthcare professionals, managers, and other healthcare workers during implementation and beyond. This ensures that functionality matches needs and helps users to develop their knowledge of functionality, and so maximise the potential of the eHealth investment. This role for ICT staff above their pure technical role may be a difference between

<sup>100</sup> Tranfield, D., and Braganza, A., Business Leadership of Technological Change, Chartered Management Institute, British Computer Society, The Change Leadership Network, London 2007 ISBN 0-85946-470-9

<sup>101</sup> Winters, F., *The Top Ten Reasons Projects Fail 2002 to 2004* [www.gannthead.com](http://www.gannthead.com); and McBusted, B. Mittelsdorf, Singapore Project Management Institute <http://www.pmi.org.sg/calendarimg/68/SPMI%20PMP%20Focus%20Gp%20May%2026%20-%20McBusted.ppt>

success and failure, so they need to be equipped to work in this extended way; an extensive personal development programme.

## 5.4 Managing risk

*Financing eHealth* interviewees suggested that many politicians involved in health and healthcare seem to be comfortable in dealing with the risks of eHealth investment. However, some executives and high-level managers in healthcare may be risk averse, and so may inhibit eHealth investment. Two factors may explain this. One is a tendency to be risk averse to anything, the other is to be **risk averse due to a lack of knowledge**; it is this latter feature that needs to be addressed. Understated probabilities and values of risk in eHealth investment are common when they are usually considerable. This applies especially for EHRs, where the estimated risk-adjusted cost may exceed 100% of the planned investment costs at the initial planning stages. Executives and managers need information about the scale and probabilities of eHealth risks, and need to know how to use this to adjust and test investment plans for the effect.

Sometimes, detailed risk assessments, by focusing on the trees, may lose sight of the wood. Estimates of the financial costs of risks may be between about 0.4% and 2.6% of an HPO's total annual turnover<sup>102</sup>. This compares with a suggested goal to increase eHealth investment from about 2% to 4% of turnover; an increase that the unmitigated cost of risk could exceed. On this scale, **the financial costs of risk can exceed the extra finance generated from an eHealth investment**. Unmitigated risk represents a significant estimated cost and avoiding it is critical. **Executives and managers can use this range of 0.4% to 2.6% to test the risk-adjusted cost of eHealth investments**. If the risk impact is below this range, it may be a weak assessment. If it exceeds 2.6% of annual revenue, then beware; either the risk-adjustment is wild, or the proposed investment is a bad idea.

Interviewees identified mitigation measures included the abilities to:

- Stop an eHealth investment at a low cost
- Manage suppliers and their sub-contractors actively and effectively
- Replace suppliers at a low cost
- Design low risk eHealth investments from the outset, such as slow burn, step-by-step projects
- Set requirements accurately and fully
- Train and retain scarce health ICT staff
- Engage with healthcare professionals effectively and fully.

These are some of the measures essential to mitigate risk. They are not the only ones. The challenge in supporting managers in risk mitigation is that **limited information is available about the types of risks, their values and their probabilities in eHealth**.

<sup>102</sup> Private research TanJent Consultancy UK 2007 to 2008

The paucity of information is clear when compared to the equivalent knowledge in the construction industry<sup>103</sup>. However, risk management methodologies are available<sup>104</sup> and executives and managers should use them.

## 5.5 Creating an information culture

Healthcare professionals, executives and managers with an information and eHealth culture are essential for successful eHealth investment. Several different types of information and eHealth cultures prevail in healthcare, dependant mainly on the degree of exposure to information as a resource. The Oliver phenomenon, from the Charles Dickens novel *Oliver Twist*, is at the more mature end of the culture spectrum. Here, **healthcare professionals and managers want more information from more eHealth investment. This culture increases the chances of successful eHealth investment, and is a priority for additional finance.** It can take about twelve years or more to achieve this level of managerial attitude. Its prevalence depends on continuous successful eHealth investment that meets people's needs and motivates them.

Currently, extensive resistance to change with a few pioneers prevails, but not many eHealth supporters stand at the other end of the spectrum. There are several causes, such as **experiences of botched eHealth; lack of, or inappropriate engagement; silo organisations with weak teamwork; inappropriate people in highly skilled eHealth roles; inability to recruit, train and retain the skilled people needed; and the wrong kind of leadership.** These cultural conditions need changing before allocating finance to eHealth investment. The risk of failure is too high.

It is unrealistic to expect organisations' cultures to switch across the full length of a continuum. Instead, they change gradually, especially in healthcare. Exhibit 17 is a model with nine stages:

---

<sup>103</sup> Office of Government Commerce (OGC), Construction projects A manager's Checklist, Crown Copyright 2007, <http://www.ogc.gov.uk/documents/CP0071AEManagersChecklist.pdf>

<sup>104</sup> ICT Standards and Guidelines on Risk Tools and Techniques: [www.osmar.gov.lb](http://www.osmar.gov.lb)

**Exhibit 16: TanJent nine-level eHealth development and culture wall**

Level	Clinical Culture						
9	Healthcare Transformers, Innovators and Informators					Leaders	
8	Healthcare Transformers	eHealth Specifiers	eHealth D&T	MDT	Professional Teams as Users	Individual Users	Leaders
7	eHealth Specifiers	eHealth D&T	MDT	Professional Teams as Users	Individual Users	Leaders	Resisters
6	eHealth Demanders and Takers (D&T) – Oliver's	MDT	Professional Teams as Users	Individual Users	Leaders	Resisters	
5	Multi-disciplinary Teams (MDT) Users	Professional Teams as Users	Individual Users	Leaders	Resisters		
4	Professional Teams as Users	Individual Users	Leaders	Resisters			
3	Individual Users	Supporters	Leaders	Resisters			
2	Supporters	Pioneers	Resisters				
1	Pioneers	Resisters					

Source © TanJent Consultancy / empirica 2008

Before financing eHealth, an assessment should be made of the eHealth culture. HPOs and other organisations with people who are at levels one and two may only be capable of dealing with relatively small scale, low impact eHealth investment. HPOs at level five and above should be able to succeed with sophisticated high impact eHealth; but an assumption that this culture is always compliant is a naive idea. Effective engagement is still required for all types of organisational cultures.

## 5.6 Procurement expertise

Some discussion partners highlighted differences in procurement expertise between HPOs and national healthcare agencies and ICT suppliers. Put simply, ICT suppliers are more skilled. Several strands of skills need to be developed. For such significant procurements, direct engagement of chief executives, other executives and non-executives of HPOs and equivalents is essential. **Procurement staff need inherent knowledge of the specifications that will allow the procured systems to meet the procuring organisation's needs. They also need direct knowledge of risk transfer and sharing, as illusions often prevail.** In practice, HPOs can seldom afford the cost of increasing the rewards to suppliers, needed to transfer risks. **Arrangements for payment deduction for penalties also need to be realistic.** For example, it is not sensible for a penalty deduction to be below the cost to the ICT supplier of fixing the performance. In this case, the penalty is an incentive not to fix it.

Whilst there is a need for longer-term partnerships, **contracts should be in small manageable steps, with performance linked to payments.** This is critical for eHealth

investments of larger scope that needs design, developing and testing. Payments for each step should provide enough finance for ICT suppliers to succeed. Where ICT suppliers rely on sub-contractors, HPOs must have a right to oversee the sub-contractors performance.

Finally, **HPOs must be able to cancel contracts with minimal cost and disruption.** This is relatively easier at the stages before implementation. From implementation onwards, it can be, and usually is, a mess. HPOs should use this as a break point to reset contracts based on destruction testing that proves the ICT component of eHealth before going past this point.

## 5.7 The new jobs of executives

As already stressed, the most important requirement for leaders, executives and eHealth stakeholders is to be able to deal with eHealth investment as an integrated part of all healthcare investment. When the investment is complete, the executives will have a different organisation to lead and manage. It is feasible for eHealth to change clinical and working practices, and so the performance of the organisation, and for executives to continue to manage the previous model. A result is executives who are out of touch. Avoiding this requires executives to use the new information that is available to improve their leadership and management.

Finance executives and managers have a more specific role. First, they need to understand the value and impact of eHealth, so they can extend and develop financial planning to deal with eHealth investment timescales. Second, they need to extend their financial management skills to be able to develop ways to invest in better value. This has to be alongside, and does not necessarily have to replace the current focus on continuous cost containment. Dealing with this needs the application of long-standing principles of good management. Executives should:

- Establish and maintain a communication system with the stakeholders
- Secure essential services from individuals who are new users
- Formulate the organisation purpose and objectives<sup>105</sup>.

In this setting, organisations knit together by information, not ownership or command, and focus on opportunities. New information now available from the eHealth investment requires executives to review their own performance. This could include a series of changes:

- Switch from problem solving to taking opportunities
- Extend a focus on short-term performance to a longer-term view<sup>106</sup>

<sup>105</sup> Barnard, C.I., *The Functions of the Executive*, Harvard College Copyright, USA, 1938, 1968 ISBN:0-674-32803-5

<sup>106</sup> Drucker, P.F., *Managing for Business Effectiveness*, Harvard Business Review, May to June 1963, USA

- Look for information that can diagnose improved allocations of resources and add more value<sup>107</sup>
- Constantly test the theory of the organisation and its ability to change<sup>108</sup>.

This expands the principle of organisational change from healthcare professionals who use the eHealth investment directly, to the whole organisation. It is just as uncomfortable for executives as it is for healthcare professionals. As healthcare professionals use new information to improve quality, access and efficiency, executives have a different organisation to run. They must do more than keep up. They must be ahead, looking for new opportunities, leading on to their second new job: using the knowledge and experience of the eHealth investment to construct and plan the next one.

With these two changes in place, executives can be sure that the finance allocated has proved beneficial, and can take decision for continuation. This will facilitate the required boost to eHealth investment.

---

<sup>107</sup> Drucker, P.F., *Managing for Business Effectiveness*, Harvard Business Review, May to June 1963, USA

<sup>108</sup> Drucker, P.F., *The Theory of the Business*, Harvard Business Review, September to October 1994 USA

## 6 Policy recommendations

At the core of the policy recommendations is the most important finding from the study, that better, more widespread skills and knowledge in taking and delivering eHealth investment decisions is more important than more finance. Skills and knowledge in the areas discussed in chapter 5 are in short supply across the EU, so their rapid enhancement and expansion needs new policies and action. Overcoming this limitation needs investment, so enhancing skills and knowledge is the top priority for finance for eHealth. Six policy initiatives are needed:

- Promote eHealth as a resource in healthcare and services, not as an end in itself
- Focus on improving several aspects of health services, not on cash savings
- Facilitate effective, comprehensive financing packages covering the whole investment lifecycle, including long-term, recurring expenditure
- Invest in more evidence on investment risks
- Promote and facilitate stakeholder engagement, not just consultation
- Provide resources to develop skills and knowledge.

### 6.1 Promote eHealth as a resource in healthcare and services, not as an end in itself

Policy makers should promote eHealth as one of the resources needed for health and healthcare, and stop promoting eHealth as a separate, arcane investment. An example of an alternative perspective to eHealth is investment in information for health and healthcare (IHH). Such an expression may be longwinded, but it emphasises the purpose of the investment and its strategic position. It also helps to focus policies on the organisational part of eHealth and set the emphasis on ICT into a health and healthcare context.

### 6.2 Focus on improving several aspects of health services, not on cash savings

Claims and aspirations to invest in eHealth for cash benefits are extremely misleading and disrupt success. The circumstances and opportunities to achieve this are extremely rare, so it is appropriate to disregard them and focus on eHealth investment as one of the resources needed to improve healthcare's quality, access and efficiency. Policies and strategies that pursue these goals should be developed and promulgated. They include:



- Produce national policies and strategies for healthcare professionals using eHealth to improve healthcare quality<sup>109</sup>
- Promote investment in better information for patients, citizens, and health and healthcare professionals
- Never imply that financial gains are cash saving when they are not.

### 6.3 Facilitate effective, comprehensive financing packages covering the whole investment lifecycle

Many investment plans provide finance for short project stages, such as development, testing and implementation. Finance for other stages, such as the cost of organisational change and operation, are omitted from plans, leaving projects underfinanced from the medium term, leading to drift and increasing the risk of net costs. Further, many sources of additional finance available tend to focus on ICT components. This is important, but not enough. There is a requirement for additional finance for the organisational changes needed to realise the benefits, since organisational challenges can comprise up to 60% of total investment costs.

A practical approach will be to link all eHealth financing to benefits in health and healthcare delivery over time. The core policy is to ensure that all financing requirements are in place over the whole eHealth investment lifecycle. This may involve planning and financing investments over timescales of ten years or even more. Specific points of focus should be:

- Ensure that finance for pilots and testing is part of a comprehensive financing package, with the real option to abandon the financing package and the project if the pilots and testing show failure, and to sustain it if the pilots and testing succeed
- Provide, or facilitate the long-term finance of recurring costs in parallel to dealing with initial start-up finance. This involves changes to reimbursement models to match services that rely on eHealth investment, or encouragement of certain financing arrangements. An example is financing models where ICT suppliers finance more, if not all, development costs, with users paying increased annual payments for availability and use, but reducing their development costs. ICT suppliers will take on an increased role in development for eHealth investment, with users avoiding their development costs, and paying more for availability and use. This model is already partially in place. It may require increased access to finance by ICT suppliers and increase the initial risk to suppliers. Subsequently, users share the cost of risk in the annual payments when ICT suppliers provide beneficial solutions
- Secure commitment to providing redeployed finance when providing additional finance. Sources for redeployed finance tend to be HPOs that support healthcare

---

<sup>109</sup> Arrangements should be set in place to monitor and review all policy initiatives. Health Ministries in each Member States should develop policies and initiatives as required

professionals and other healthcare workers in allocating their time to eHealth investment. It is essential that this resource is sufficient, sustainable and with the appropriate skills, knowledge and authority. A pragmatic approach to securing comprehensive redeployed finance is to require eHealth business cases to extend to a lifecycle beyond the first year of net cumulative benefit and show all the required sources of redeployed finance and other resources needed.

## 6.4 Invest in more evidence on investment risks

Part of the recommended skills and knowledge is the ability to assess risks associated with eHealth investments. However, as already discussed, evidence on such risks is extremely scarce. Thus, policy agencies should:

- Require financing agencies to collect information about risk and risk mitigation from the eHealth initiatives they finance
- Directly commission research studies to compile and collect information about ICT and eHealth risk probabilities, impact, and exposure in healthcare.

Executive can then use the collected evidence in their plans.

## 6.5 Promote and facilitate stakeholder engagement, not just consultation

This is a pre-requisite for success. Engagement means listening to and meeting the concerns and requirements of all types of stakeholders. These can range from security and confidentiality to functionality and usability of ICT. There are many types of stakeholders. They include professional bodies of clinicians, local groups and team of healthcare professionals, patient groups and their representative bodies, community groups, citizen and consumer groups, healthcare provider organisations and ICT suppliers. A common thread is that effective engagement invariably requires time. Policies to improve effective engagement need to:

- Integrate with policies for clinical and executive leadership
- Specify a right for professional bodies to be engaged in proposed eHealth investment
- Support HPOs in financing the additional resources needed for effective engagement as part of the overall investment cost.

It is critical to stress the fact that we talk about engagement and not about consultation. There is a fundamental distinction between the two, in that engagement deals with positions, propositions, concerns and requirements. Executives and managers can ignore advice and views provided through consultation.

## 6.6 Provide resources to develop skills and knowledge

The challenge is to develop and apply policies that enhance and expand the required skills and knowledge among a wide range of clinicians and healthcare professionals, including doctors, nurses, pharmacists, therapists, dieticians. They work in all areas of healthcare, such as primary, secondary, tertiary, and public health. In addition, executives have to improve their managerial skills in deciding upon, and leading their organisations through eHealth investments.

The core policy requirement is to provide access to all the additional finance to develop, enhance, and expand the skills knowledge and capabilities needed to succeed with eHealth. The requirements for better eHealth and eHealth investment management combine into four main initiatives needed on European and country level:

- Find and appoint centres, either in each Member State or across Europe, that can hold and build the eHealth information and knowledge required to expand the skills and capability needed to boost eHealth investment
- Ensure that the centres support healthcare professionals, executives, managers and ICT staff directly in providing the techniques needed for plans, strategies, business cases, financial plans and programme and project management
- Seek to include themes of eHealth and eHealth investment skills and knowledge in healthcare professionals' conferences and events, as well as other components of continuous professional education
- Provide incentives for people to acquire the needed skills and knowledge. Investment plans should also account for this by analysing and setting the right incentives to each stakeholder group.

Only when these conditions are in place and are effective, can access to finance increase and boost successful eHealth investment.

## 7 Acknowledgements

The Financing eHealth study team would like to thank all discussion partners for their insights, critical review, and support. Particular thanks to all the participants of the two study workshops (some 40 participants each) and the following experts, with whom we had exchanges that were more intensive:

Alvarez, Richard, Canada Health InfoWay, Canada

Cameron, Jonathan, NHS Scotland

Cleland, Prof. John, HeartCycle project, University of Hull, UK

Davis, John, European Investment Bank, Luxembourg

Garets, David, HIMSS Analytics, USA

Geissbuhler, Antoine, Geneva University Hospitals, Switzerland

Granström, Agneta, Assembly of European Regions

Guanyabens, Joan, Dept. of Health, Catalonia, Spain

Haazen, Dominic, World Bank

Hamilton, Andrew, European Centre for Connected Health, Northern Ireland

Hanhijarvi, Hannu, SITRA Finnish Innovation Fund, Finland

Horsch, Alexander, University of Tromsø, Norway

Juffernbruch, Klaus, Internet Business Solutions Group, Cisco

Koprowski, Adam, Centrum Systemów Informacyjnych Ochrony Zdrowia, Poland

Loonsk, John, Office of the National Coordinator for Health Information Technology, Department of Health and Human Services, USA

Mac Ginnis, George, Assistive Technology, NHS CfH, UK

Maurincomme, Eric, COCIR, IHE-Europe

Nardi, Maurizio, Health Telematic Network, Italy

Pedersen, Claus D., MedCom, Denmark

Pilossoff, Vladimir, National Heart Hospital, Sofia, Bulgaria

Pöttgen, Uwe, Asklepios, Germany

Roca, Josep, Lung Function Unit, The Hospital Clinic, Spain

Romao, Mario, Continua Health Alliance

Setz, Robert, Dr. Hein GmbH, Germany

Stuttard, Alan, NHS Connecting for Health, UK

Szymkowiak, Christof, Strategy Dept., Techniker Krankenkasse, Germany

Thomas, Gwyn, NHS Wales

## 8 Disclaimer

This report is part of a study on financing opportunities available to Member States to support and boost investment in eHealth ([www.financing-ehealth.eu](http://www.financing-ehealth.eu)) commissioned by the European Commission, Directorate General Information Society and Media, Brussels. The content of this paper reflects solely the views of its authors. The European Commission is not liable for any use that may be made of the information contained in the report.

## List of abbreviations

ADE	Adverse Drug Events
ASCC	Additional Supply Capability and Capacity
BFS	Bank für Sozialwirtschaft
CBA	Cost Benefit Analysis
CME	Continuing Medical Education
COM	Commission of the European Communities
CPD	Continuing Professional Development
CPOE	Computerised Physician Order Entry
CRS	Care Records Service
CRS	Care Records Services
DCR	Detailed Clinical Records
DES	Directed Enhanced Service
DG INFSO	Directorate General Information Society & Media
DHDN	Danish Health Data Network
DRG	Diagnosis Related Groups
EC	European Commission
EEA	European Economic Area
EHR	Electronic Health Record
EIB	European Investment Bank
EIF	European Investment Fund
EPR	Electronic Patient Record
EU	European Union
FBA	Finance Benefits Analysis
FP 7	Framework Programme 7
GMD	Gesellschaft für Medizinische Datenverarbeitung mbH
GP	General Practitioner
HCA	Healthcare Corporation of America
HPO	Healthcare Provider Organisations
HRG	Healthcare Related Groups
IAS	International Accounting Standard

ICT	Information and Communication Technology
ICW	InterComponentWare, a private German-based health ICT vendor
IHH	Information for Health and Healthcare
IPO	Initial Public Offering
IT	Information Technology
MOC	MedicalORDER®Center Ahlen, Germany
NGO	Non-Government Organisation
NHS	National Health Services
NHS CfH	NHS Connecting for Health
NPfIT	National Programme for IT
P4P	Pay for Performance
PACS	Picture Archiving and Communication System
PFI	Private Finance Initiatives
PHR	Personal Health Records
PPP	Public Private Partnership
QOF	Quality and Outcomes Framework
R&D	Research and Development
RFID	Radio Frequency Identification
ROA	Return on Assets
SFEU	Structural Funds of the European Union
SHA	Strategic Health Authorities
SIMID	Scientific Institute for Medical Information and Documentation
SMILE	Scientific Medical Information Library Europe
SPE	Special Purpose Entity
SPV	Special Purpose Vehicle
VAT	Value Added Tax
WHO	World Health Organisation
WTP	Willingness to Pay

## References

### European Commission studies:

**eHealth IMPACT:** Study on economic and productivity impact of eHealth - developing a context-adaptive method of evaluation for eHealth, including validation at 10 sites - covering the whole spectrum of eHealth applications and services; [www.ehealth-impact.org](http://www.ehealth-impact.org)

**EHR IMPACT:** Study on the socio-economic impact of interoperable electronic health record and ePrescribing systems; [www.ehr-impact.eu](http://www.ehr-impact.eu)

**Good eHealth:** Study of best practice across Europe in providing innovative eHealth-related services; [www.good-ehealth.org](http://www.good-ehealth.org)

**eHealth ERA:** Towards the establishment of a European eHealth research area - coordination of Member State innovation-oriented eHealth RTD as the basis for a common roadmap and joint RTD activities, thereby establishing an effective ERA; [www.ehealth-era.org](http://www.ehealth-era.org)

**Financing eHealth:** Assessment of financing opportunities available to Member States to support and boost investment in eHealth; [www.financing-ehealth.eu](http://www.financing-ehealth.eu):

- D1.3: Report on conceptual framework, healthcare and eHealth investment context and challenges
- D2.2: Report on financing opportunities available to Member States to support and boost investment in eHealth
- D3.1: Report on options and methods for obtaining value added among Member States in the context of eHealth investments
- D4.1: Report on effective and efficient healthcare management support for eHealth investment
- D4.2: Guide on effective and efficient management of eHealth investment
- Expert workshop on “Innovative approaches to financing eHealth solutions” held at the World of Health IT conference, 25 October 2007, Vienna, Austria
- Expert workshop on “Procuring for health benefits: critical factors for beneficial deployment of innovative eHealth and telemedicine services” held at the World of Health IT conference, 06 November 2008, Bella Center, Copenhagen, Denmark.

### Other literature

ACCA 2002, “eHealth and Public Private Partnerships”

Adams Dudley R., MD. Pay-for-Performance Research. How to Learn What Clinicians and Policy Makers Need to Know. *Journal of the American Medical Association*. 2005; 294:1821-1823.



Barnard, C.I., The Functions of the Executive, Harvard College Copyright, USA, 1938, 1968 ISBN:0-674-32803-5

Bosman, R., Rood, E., Oudemans-van Straaten, H., Van der Spoel, J., Wester, J., Zandstra, D., Intensive care information system reduces documentation time of the nurses after cardiothoracic surgery, Intensive Care Medicine Volume 29 Number 1 January 2003 <http://dx.org/10.1007/s00134-002-1542-9>.

Commission of the European Communities - COM (2004) 356: 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 health care better for European citizens: An action plan for a European e-Health Area, Brussels, 2004-04-30.

Congress of the United States, Congressional Budget Office, "Evidence on the Costs and Benefits of Health Information Technology", Pub. No. 2976, May 2008

Drucker, P.F., Managing for Business Effectiveness, Harvard Business Review, May to June 1963, USA

Drucker, P.F., The Theory of the Business, Harvard Business Review, September to October 1994 USA

Earlybird Venture Capital. "Dianoema has acquired Earlybird portfolio company GMD"; <http://www.earlybird.de/en/press/release/213/>

E-Health Europe "ICW add the Strüngmann brothers as shareholders" 28.9.07; [http://eHealthEurope.net/News/3069/icw\\_add\\_the\\_str%C3%BCngmann\\_brothers\\_as\\_shareholders](http://eHealthEurope.net/News/3069/icw_add_the_str%C3%BCngmann_brothers_as_shareholders)

eHealth Initiative, 2007 HIE Survey: Financing; <http://www.eHealthinitiative.org/2007HIESurvey/financing.msp#1>

E-Health Insider Primary Care "Mental health charity launch e-mail support" 9.03.2007; [http://www.ehiprimarycare.com/news/2531/mental\\_health\\_charity\\_launch\\_e-mail\\_support](http://www.ehiprimarycare.com/news/2531/mental_health_charity_launch_e-mail_support)

eHealth Insider, Auditors warn of NPfIT risk to southern SHAs, 30 Oct 2008 [http://www.e-health-insider.com/news/4285/auditors\\_warn\\_of\\_npfit\\_risk\\_to\\_southern\\_shas](http://www.e-health-insider.com/news/4285/auditors_warn_of_npfit_risk_to_southern_shas)

E-Health Insider. "UK Biobank begins recruiting using NHS data" 21.9.2007; <http://www.e-health-insider.com/News/3050>

E-Health Insider: E-HEALTH MEDIA Ltd., "GPs to continue to get financial incentives for C+B", May 2007 [http://www.ehiprimarycare.com/news/2698/gps\\_to\\_continue\\_to\\_get\\_financial\\_incentives\\_for\\_c+b](http://www.ehiprimarycare.com/news/2698/gps_to_continue_to_get_financial_incentives_for_c+b)

eHealth News EU Portal. "SIMID First European Provider of Online Full Text Publications" 8.2.2008; <http://www.ehealthnews.eu/content/view/980/26/>

Electronic Patient Records Sixth Report of Session 2006-07 Volume 1 Health Committee House of Commons UK

Eriotis N., Vasiliou D., Zisis V., ZoeVentura, "Perception Of Shareholders' Reaction And Best Financing Methods For Initiation Of Telemedicine Projects In Remote Places; Evidence From Greece." EABR (business) & ETLC (teaching) 2006 proceedings, Florence, Italy.

- Ernst & Young and Dow Jones, “Quarterly European Venture Capital Report”, VentureOne, 2007 [http://www.ey.com/global/content.nsf/International/Media\\_-\\_Press\\_Release\\_-\\_Venture\\_Capital\\_Q3\\_2007](http://www.ey.com/global/content.nsf/International/Media_-_Press_Release_-_Venture_Capital_Q3_2007)
- European Commission, Guide to the Community rules on public procurement of services, Directive 92/50/EEC, available at [http://ec.europa.eu/internal\\_market/publicprocurement/docs/guidelines/services\\_en.pdf](http://ec.europa.eu/internal_market/publicprocurement/docs/guidelines/services_en.pdf)
- Fendrick AM, Smith DG, Chernew ME, Shah SN. A benefit-based copay for prescription drugs: patient contribution based on total benefits, not drug acquisition cost. *Am J Manag Care*. 2001;7:861-867.
- Greenwalt D., Riney S. “Measuring IT benefits: let us count the ways: healthcare organizations need to achieve value from every investment—including IT. But how is that value measured?”, *Healthcare Financial Management*, 2007.
- Healthcare Industry in Germany, “Structural Change and Consequences for ICT Applications”, White Paper
- HM Treasury, “The Green Book, Appraisal and Evaluation in Central Government. Treasury Guidance”, London: TSO, 2003; <http://greenbook.treasury.gov.uk/>
- Hurtado, R. “Health Care Bonds Pass a Credit Test” *New York Times*, 20.8.2000; <http://query.nytimes.com/gst/fullpage.html?res=9B02E7DB123EF933A1575BC0A9669C8B63&n=Top/Reference/Times%20Topics/People/H/Hurtado,%20Robert>
- IBM Global Financing. “It pays to manage your IT with IBM Global Financing “; <http://www-03.ibm.com/financing/europe/itfinancing/>, <http://www.ibm.com/healthcare>
- ICT Standards and Guidelines on Risk Tools and Techniques: [http://www.omsar.gov.lb/ICTSG/01.%20OMSAR%20ICT%20Standards%20-%20Web%20Help%20Files/Web%20Help%20Folders/206%20-%20RM%20WebHelp/6.2\\_Various\\_Methods\\_for\\_Identifying\\_Risks.htm](http://www.omsar.gov.lb/ICTSG/01.%20OMSAR%20ICT%20Standards%20-%20Web%20Help%20Files/Web%20Help%20Folders/206%20-%20RM%20WebHelp/6.2_Various_Methods_for_Identifying_Risks.htm)
- Irving Fisher, 1930, *Theory of Interest*, Chapters 6 to 8
- J-C Healy, *Integration and Informatics and Communication Technologies (ICT) in the EU national health systems: status and trends*, *Swiss Medical Informatics (SMI 52)*, 2004
- Linnosmaa I., Rissanen S., “Willingness to Pay for Online Physician Services”, *Liiketaloudellinen Aikakauskirja*, *The Finnish Journal of Business Economics*, Jan 2006.
- Menachemi N, Burkhardt J., Shewchuk R., D Burke, and RG Brooks. “Hospital information technology and positive financial performance: A different approach to finding an ROI”, *Journal of Healthcare Management*, 2006. 51(1):40-59.
- Michael R. Reich, *Public-private partnerships for public health*, *Nature Medicine* 6, 617 - 620 (2000)
- Ministerial Declaration, eHealth 2003 conference, Brussels, 22 May 2003 [http://europa.eu.int/information\\_society/europe/ehealth/conference/2003/doc/min\\_dec\\_2\\_2\\_may\\_03.pdf](http://europa.eu.int/information_society/europe/ehealth/conference/2003/doc/min_dec_2_2_may_03.pdf)
- Mohr D.N., Freguson J.A, “Show me the benefits: Implementing an EHR”, *Mayo Clinic case study*, *Proceeding of Healthcare Information and Management Systems Society annual conference*, 2005.
- NHS Funding and Reform: the Wanless Report *House of Commons Library UK Research Paper 02/30* 3 May 2002

- Office of Government Commerce (OGC), Construction projects A manager's Checklist, Crown Copyright 2007,  
<http://www.ogc.gov.uk/documents/CP0071AEManagersChecklist.pdf>
- Office of Government Commerce, UK, "Modern Government, Modern Procurement",  
[http://www.ogc.gov.uk/documents/modern\\_government.doc](http://www.ogc.gov.uk/documents/modern_government.doc)
- Porter, M. Competitive Advantage. New York: The Free Press, 1985, p. 34
- Pre-Commercial Procurement the Missing Link in the European Innovation Cycle, EC DG Information Society and Media  
[http://ec.europa.eu/information\\_society/tl/research/key\\_docs/documents/procurement.pdf](http://ec.europa.eu/information_society/tl/research/key_docs/documents/procurement.pdf)
- Preker AS, Harding A, Travis P. "Make or buy" decisions in the production of health care goods and services: new insights from institutional economics and organizational theory. Bull World Health Organ 2000;78:779-90.
- Rai, Dick, "Electronic data interchange: Information technology financing options", Healthcare Financial Management. Westchester: Jan 1996. Vol. 50, Iss. 1.
- Riley, D. "Milford Regional building cancer center" The Milford Daily News, 6.1.2007;  
<http://www.milforddailynews.com/homepage/8999020194739257343>
- Robert Bosman, Emmy Rood, Heleen Oudemans-van Straaten, Johan Van der Spoel, Johannus Wester, Durk Zandstra, Intensive care information system reduces documentation time of the nurses after cardiothoracic surgery, Intensive Care Medicine Volume 29 Number 1 January 2003 <http://dx.org/10.1007/s00134-002-1542-9>.
- Robinson, James C. "Financing the Health care Internet" Health Affairs, 19:6, 72-87, November- December 2000.
- Roland, D.M. (2006). "Pay-for-Performance Programs in Family Practices in the United Kingdom". The New England Journal of Medicine 355 (4): 375-384.
- Sania Nishtar ,Public – private 'partnerships' in health – a global call to action, Health Research Policy and Systems 2004, 2:5.
- State Legislation on Health Information Technology Financing, 2007  
<http://www.ncsl.org/programs/health/forum/Hitch/finance.htm>
- Stephen A. Ross. Corporate Finance: Core Principles & Applications McGraw-Hill/Irwin, 2007.
- Stroetmann K. A., Jones T., Dobrev A., Stroetmann V. N., "eHealth is Worth it: The economic benefit of implemented eHealth solutions at ten European sites" European Communities 2006 ISBN 82-79-02762-X [www.ehealth-impact.eu](http://www.ehealth-impact.eu)
- Sugden B, Wilson R., Cornford J. "Reconfiguring the health supplier market: changing relationships in the primary care supplier market in England" HEALTH INFORMATICS J.2008; 14: 113-124.
- Survey by HIMSS Analytics, presented by Dave Garets, World of Health IT Conference and Exhibition, October 2006, Geneva, Switzerland
- The Institute of Medicine (2006). "Rewarding Provider Performance: Aligning Incentives in Medicare". The National Academies Press.
- Tranfield, D., and Braganza, A., Business Leadership of Technological Change, Chartered Management Institute, British Computer Society, The Change Leadership Network, London 2007 ISBN 0-85946-470-9

Wang, S., Middleton B., Prosser L.A. , Bardon C.G., Spurr C.D., Carchidi P.J., Kittler A.F., Goldszer R.C., Fairchild D.G. ,Sussman A.J.,Kuperman G.J. , Bates D.W., “A Cost-Benefit Analysis of Electronic Medical Records in Primary Care” American Journal of Medicine, (114:397-402) 2003.

WiBe 4.1. Recommendations on Economic Efficiency Assessments in the German Federal Administration, in Particular with Regard to the Use of Information Technology, 2007, based on the version 4.0, 2004.

Winters, F., The Top Ten Reasons Projects Fail 2002 to 2004 [www.gannthead.com](http://www.gannthead.com); and McBusted, B. Mittelsdorf, Singapore Project Management Institute <http://www.pmi.org.sg/calendarimg/68/SPMI%20PMP%20Focus%20Gp%20May%2026%20-%20McBusted.ppt>

### Web pages:

“The history of economic thought website”:

<http://cepa.newschool.edu/het/essays/capital/fisherinvest.htm>

Agfa Healthcare, News & Events:

[http://www.agfa.com/en/he/news\\_events/news/archive/he20060615\\_toulouse.jsp](http://www.agfa.com/en/he/news_events/news/archive/he20060615_toulouse.jsp)

Bank für Sozialwirtschaft, Main Page; <http://www.sozialbank.de/>

EEA Financial Mechanism & Norwegian Financial Mechanism, Main Page: <http://www.eeagrants.org>

European Commission, Main Page: <http://ec.europa.eu>

European Investment Bank, Main Page: <http://www.eib.org>

European Investment Fund, Main Page: <http://www.eif.org>

European Private Equity & Venture Capital association, Main Page; <http://www.evca.eu/>

GE Healthcare Financial Services, Main Page; [www.geHealthcarefinance.com](http://www.geHealthcarefinance.com)

Good eHealth case study:

[http://195.227.12.109/kb\\_empirica/browseContent\\_alt.do?contentId=220&action=v3#editViewToolbar](http://195.227.12.109/kb_empirica/browseContent_alt.do?contentId=220&action=v3#editViewToolbar)

HIMSS Analytics [www.himssanalytics.org](http://www.himssanalytics.org)

ICT Standards and Guidelines on Risk Tools and Techniques: [www.osmar.gov.lb](http://www.osmar.gov.lb)

Residex - Investeren in health, Main Page; <http://www.residex.nl/>

Scientific Institute for Medical Information and Documentation (SIMID) Main Page; [www.simid.org](http://www.simid.org)

The Wellcome Trust, Main Page; <http://www.wellcome.ac.uk>

UK Biobank, Main Page; <http://www.ukbiobank.ac.uk/>

Wells Fargo Technology Finance, Main Page;

[https://www.wellsfargo.com/com/bus\\_finance/wfefe/technology](https://www.wellsfargo.com/com/bus_finance/wfefe/technology)

World Bank, Main Page: <http://web.worldbank.org>

World Health Organisation, Main Page: <http://www.who.int>