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Authors: *TanJent, empirica, project team*

Partners:	empirica Gesellschaft fuer Kommunikations- und Technologieforschung GmbH, Bonn, Germany
	TanJent Consultancy, Hereford, UK
	ESYS Consultancy, Guildford, UK
	Jagiellonian University, Krakow, Poland
	KADRIS Consultants, Paris, France

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Project Co-ordinator

Company name:	empirica Gesellschaft fuer Kommunikations- und Technologieforschung mbH
Name of representative:	Simon Robinson
Address:	Oxfordstr. 2, D-53111 Bonn, Germany
Phone number:	+49 (2 28) 9 85 30-0
Fax number:	+49 (2 28) 9 85 30-12
E-mail:	*ehealth-impact@empirica.com*
Project WEB site address:	www.ehealth-impact.org

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Executive Summary

The methodology needed for the eHealth IMPACT study was identified from of a focused review of the state-of-the-art of economic evaluation techniques and assessments of ICT applications in healthcare. Cost benefit analysis (CBA) became the preferred economic concept. Each eHealth application is approached from an economic perspective, identifying, in a comprehensive manner, all relevant costs and benefits for all stakeholders: citizens, healthcare provider organisations (HPOs), eHealth providers, and third party payers. The method focuses on measuring net economic gains, the difference between the economic values of direct benefits minus the identified costs; eHealth utilisation, defined as the usage of the service that is supported by ICT; and productivity. Productivity is measured by changes in the unit cost of the service provided. Economic variables are followed through three periods in the life-cycle of the eHealth application: planning and development, implementation, and routine operation. The method can be used both for ex post evaluation and ex ante assessment based on past experience and expert forecasts of future values. In our case studies, forecasts were obtained up to 2008.

Costs are divided into two main categories: investment costs and costs of running the healthcare related service. eHealth investment includes initial and replacement costs for ICT hardware and software, and costs of process and organisational change. Operational costs include mainly staff costs, for professionals and support staff, and related other healthcare process costs. Benefits are identified from the respective stakeholder groups involved. They cover three main categories: quality, access and efficiency. Quality includes the following subcategories: informed citizens and carers, information designed around the citizen, timeliness of care, safety, and effectiveness.

To allow for an economic assessment, all benefits are assigned a monetary value. Where estimations are required, these are based on conservative assumptions. Willingness to pay (WTP), inferred from behaviour, is the main estimation method used in eHI evaluations for the monetary value of intangible benefits that have no market price. All monetary values are converted into comparable measures by presenting them in present values.

The extensive use of estimated values, indispensable for a pragmatic approach to measuring the impact of eHealth, requires adjustments for optimism bias and contingencies. The size of the adjustment depends on the availability and quality of the actual estimates. A sensitivity analysis further helps test and verify the results for possible weakness of the available data.

Technical tools of the methodology are a spreadsheet data collection and analysis model and a text-based description template to facilitate data collection and results presentation.

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1. Overview

1.1 General concepts

Several perspectives had to be linked to evaluate the economic impact of eHealth applications. They are the impact on:

- Citizens
- Health provider organisations (HPO)s; including physicians in private offices, and other professionals
- Third party payers, including insurance funds
- Other parties, if relevant.

Each of these perspectives is analysed over three time periods of the eHealth investment – planning and development, implementation, and routine operation.

Benefits were defined initially as quality, access, and cost-effectiveness. As the sites were all proven eHealth applications, it was expected that the performance of most, or all, of them would improve after the eHealth investment had been successfully implemented. Identifying the improvements is a core goal of the eHI methodology and model.

For an economic analysis, data to measure the benefits and costs for each stakeholder are needed. Monetary values have to be assigned to enable the economic and productivity performance to be evaluated. This enables, in the aggregate, potential common patterns, trends and relationships to be identified. The economic method that enables these data to be linked is cost benefit analysis (CBA). It allows different outcomes to be evaluated by common measures and can reflect a different allocation of resources before and after an eHealth investment. The decision to base the eHI methodology on CBA principles was derived from a focused state-of-the-art review. The merit of CBA lies in that it allows for comparative, as well as single-option evaluation.

The sites that were selected all have proven eHealth investments. They all have been recognised as effective eHealth applications and judged, informally, to achieve good economic performance. They were not selected at random. This must be taken into account when transferring the findings from the eHI study.

An important principle applied in developing and using the eHI model for economic evaluations is that the methodology and eHI model adapt to the healthcare and eHealth setting of each site. The data from each site must not adapt to the eHI model.

Another central feature of the eHI methodology is that the conclusions from the economic evaluations should be used at a relatively high level. It provides a robust estimate of the economic performance over time, but is not an incisive tool that produces precise, undisputable numbers. This means that the focus is on showing whether a particular eHealth application has a positive or a negative economic impact, measured mainly in net benefits and productivity improvements, rather than on the exact amount of the achieved benefits. The same principles apply to the other eHI measures; for example, a 70% share of benefits to citizens should be interpreted as a considerable majority of benefits, rather than exactly 70%.

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1.2 State-of-the-art review

The methodology needed for the eHI study was identified from of a focused review of the state-of-the-art of economic evaluation techniques and assessments of ICT applications, particularly in healthcare. The review aimed at:

- Selecting an appropriate economic concept
- Seeking a methodology that applied the concept.

Cost benefit analysis (CBA) became the preferred economic concept because it enables the impact on all stakeholders to be included. Also, CBA allows for an assessment of a totally new, stand-alone application, as well as outcomes from a range of options can be evaluated. Cost-effectiveness (CEA) and cost minimisation analyses (CMA) were not selected because they do not enable the evaluation of a range of outcomes. CBA has been reflected in the methodology of the economic case in the Green Book, Appraisal and Evaluation in Central Government, HM Treasury, UK[1].

The insights of the Green Book provide effective analytical frameworks, guidance on methodologies and insights to estimating monetary values for tangible and intangible benefits. They do not, however, provide a model that can be used for economic evaluation of specific eHealth sites. Enhancements are needed to adapt the methodology to the context. These are provided as an additional approach of designing bespoke methodologies and features for evaluations and analyses by the eHI team to fit the needs of each site, and the eHI study goal to seek economic findings that can be used to guide future eHealth investment decisions.

1.3 The structure of an eHealth Impact evaluation

This can be summarised as:

- Cost Benefit Analysis - costs and benefits for all stakeholders: citizens, HPOs including professionals, 3rd party payers, others when of considerable relevance – an economic perspective
- eHealth Utilisation
- Productivity measures – unit costs
- Three eHI investment periods:
  - Planning and development
  - Implementation
  - Routine operation.

eHI focuses on identifying costs and benefits, changes in productivity, and utilisation levels of the eHealth application or a clearly delimited system. Costs are divided into two main categories: investment costs and costs of running the healthcare related service. They include costs for citizens, application development, software and hardware costs, and costs of eHealth operation and service provision for HPOs and the eHealth investor. Benefits include benefits to all stakeholders. Citizens often benefit from better quality of care, better access to care and time savings. The impact on HPOs is mainly improved healthcare quality outcomes, better performance, time savings, resource liberation, and cost avoidance.

eHealth utilisation is a measure of the use of the new service supported by the eHealth investment, de-rived from data such as the growth in the number of users or transactions. It is important in setting a con-text for estimated benefits. In particular, investments often lead to benefits that arise only after a reason-able level of utilisation, not always immediately after implementation. Productivity is measured by changes in unit costs.

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[1] HM Treasury (2003): The Green Book, Appraisal and Evaluation in Central Government. Treasury Guidance, London: TSO, January 2003, http://www.hm-treasury.gov.uk/media/785/27/Green_Book_03.pdf

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Time is an important feature of economic evaluations. The three time periods used in the eHI model are:

- Years for planning and development, from conception up to the year of implementation
- Years from implementation start to the year of full operation
- Years of full, routine operation.

For the 10 sites evaluated, the years of full operation have been extended by a three-year forecast of the utilisation, costs and benefits up to and including 2008. This reflected changes in these three factors, and so enables a forecast economic performance to be included in the evaluation. This is valuable extra information for the sites with a:

- Relatively short history of proven eHealth
- Steeply rising curve of utilisation with an equivalent impact on the value of benefits
- A flattening curve of utilisation, where the main net benefits were achieved on, or before, 2004, to see whether the net benefits were diminishing towards negative.

These are not always consecutive time periods. Overlaps are usually found with eHealth development, which is a continuous process in most sites. Planning and implementation of new elements or modules can be continuous, and this is reflected in the estimates used for each site.

2. Measuring the impact of eHealth

2.1 Approach to data collection and structuring

The eHI methodology is adaptive to the context and data availability of each eHealth application. Detailed schedules of cost and benefit factors must be created for each site to reflect its respective specific characteristics. Nevertheless, there are some common themes examined is each evaluation. These ensure completeness of the evaluation so that no major, relevant costs or benefits are ignored. The structure of data collection is:

- Identify the scope and borders of the service using the eHealth application
- Define the relevant eHealth service, and corresponding utilisation
- Estimate costs
  - eHealth investment
    - Direct investment and re-investment in ICT: hardware, software, licences
    - Changes to process and organisation: procurement, project management and change management
  - Operational costs of healthcare supported by ICT
    - Healthcare professionals
    - Support staff
    - Cost of healthcare process
- Estimate benefits – quality, access, efficiency
  - Citizens
  - HPOs
  - Third party payers
  - Others.

2.1.1 Defining units of utilisation

Utilisation levels are often drivers of benefits. It is thus important to define the relevant units of ICT and eHealth utilisation. ICT utilisation is the use of the technological component of an eHealth application alone. This, however, is not necessarily the relevant unit when trying to assess the impact of the application. The service that is supported by ICT is usually more relevant as a driver of benefits and indicator of productivity. Utilisation of this service is defined as eHealth utilisation. This can be significant for identifying and estimating costs and

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benefits, and in particular, ensuring that the costs for, and benefits from eHealth, refer to the same entity.

2.1.2 Estimating costs

Estimated costs and timing of eHealth investment include recurring and non-recurring costs. Examples of non-recurring costs for ICT are hardware, and process and organisational change costs, including procurement, project management, change management for new practices and processes and extra training costs around the time of implementation. Some of these are included in other costs. For example, procurement and project management can be part of a person's job, rather than a complete, intact, additional resource. In cases like this, estimated costs were apportioned.

Annual running costs of healthcare supported by the eHealth investment are estimated in a timeframe ranging from the planning and development stage, through to the routine operation phase ending in 2008. This allows for the actual impact to be clearly illustrated. Operational costs include mainly staff costs, for professionals and support staff, as well as non-employment costs associated with the healthcare, such as costs of surgical operations, equipment and medical consumables.

2.1.3 Estimating benefits – quality, access, efficiency

Benefits each year are identified according to the stakeholders: citizens, HPOs, third party payers, and others when relevant. In this way, all beneficiaries are included, and the full impact of eHealth is revealed. Three main types of benefits arising from the eHealth investment are sought for each stakeholder. These are quality, access and efficiency. The impact on quality and access can be direct for citizens, or indirect, by enabling healthcare professionals to improve the quality and efficiency of healthcare that they provide.

Five factors facilitating benefits to **quality** are investigated:
- Informed citizens and carers
- Information designed around the citizen
- Timeliness of care
- Safety
- Effectiveness.

Informed citizens and carers refers to citizens and carers having direct access to data, information and knowledge about their conditions, diagnoses, treatment options and healthcare facilities, to enable them to take effective decisions about their health and lifestyles.

Information designed around the citizen allows healthcare professionals to have access to more complete and focused information. As a result, they can be more citizen-focused in their work.

Timeliness of care refers to appropriate timing of healthcare. This is not necessarily fast treatment. Information is used to enable all types of healthcare to be scheduled and provided at the right time, to meet citizens' needs.

Safety can be improved where information contributes to reducing risk, potential injuries and possible harm to patients to be minimised.

Effectiveness provides an improved positive impact to resource ratio. This refers to the related service, not the eHealth application itself. Making the best decision on the most appropriate healthcare depends on information about the possible service options and their outcomes, and these can be influenced by eHealth.

Benefits to **access** can have different forms. Equity of access is the same quality healthcare and health related services available to all those who need, when they need it. A gain to access can be achieved by the provision of a service to more citizens for a given time period. Better information flows, supported by ICT, can lead to increase in capacity that can provide greater access.

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Efficiency benefits are reflected in improved productivity, avoided waste, and optimisation of resource utilisation. Two common signs of increased efficiency are time savings and cost avoidance. Cost avoid-ance conceptualises the estimated virtual cost of providing the standard of performance as achieved by eHealth, but by conventional methods in use before the eHealth investment. This requires estimates of the additional staff and other resources needed. In practice, the eHealth performance cannot be attained easily, if at all, by these means, but the cost avoided is a proxy for the enhanced performance of eHealth.

2.2 Tools

2.2.1 Estimates, optimism bias and contingencies

Collecting and compiling data for the wide range of variables and three time periods as specified in the methodology rely to some extent on estimation. This is needed to overcome information shortfalls, due to factors such as the historical perspective of a site, sometimes starting in 1994, and the general lack of actual, accurate accounting information about some cost items. Even data about some of the more recent factors cannot always be analysed in the required detail, because the local financial and cost systems do not hold the data in the way that it is needed. For future costs and benefits up to 2008, estimation is inevitable. Data are estimated jointly by the local team at each site and the eHI team, and are compared, where appropriate, with data from other sites, and sometimes data know from published sources, to establish their plausibility. This ensures consistency in principles and practices across all sites, and improves the overall reliability of results.

This extensive use of estimated values, indispensable for a pragmatic approach to measuring the impact of eHealth, requires adjustments for optimism bias and contingencies. Estimates of costs and benefits tend to understate costs and overstate benefits. This bias is greater where the basis of estimates relies more on judgement than facts, and where the person making the judgements is too close to the subject of the evaluation. Some costs are impossible to extract precisely from the total cost of a larger service. Some benefits that are the result of factors indirectly linked to the eHealth application cannot be allocated or apportioned reliably. In order to account for these drawbacks of using estimated data, the eHI methodology uses a contingency adjustment that increases costs and reduces benefits. Contingency adjustments are applied before conclusions about net economic impact are drawn and sensitivity analysis is applied. The size of the adjustment depends on the availability and quality of the actual data and the degree of estimation used at each site. When reliance on estimates is material, the percentage for contingencies is high. For the ten sites evaluated, it ranged between 5% and 40%; however, this range is not restrictive for future evaluations. Differential percentages are applied to costs and benefits in some sites.

2.2.2 Monetary values

All benefits are assigned a monetary value. Most data is gathered from internal sources at each site. However, in some cases concrete numbers are not available and proxies from relevant studies are used.

Assigning value to time and other resources saved, or the use of which is avoided because of eHealth, is most common. Time as a healthcare resource is valued in full time equivalent employment costs. Time for individual citizens is valued on the basis of net earnings. The value of other resources is assigned according to market prices. The latter technique is also used for measuring travel costs and time, either as costs to a service, or for measuring the benefit of reduced travel.

Willingness to pay (WTP) is the main estimation method used in eHI evaluations for the monetary value of intangible benefits without a market price. These are usually benefits to citizens, such as improved quality, convenience, less stress, and more attention from medical staff. The aim is to simulate a market by estimating how much users or beneficiaries will be willing to spend if they could receive the benefit, but only against payment. Where impacts

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cannot be readily measured and quantified, or prices determined from market data, the WTP can be determined by inferring a price from observations of consumer behaviour. This is a recognised approach used in CBA. Conservative assumptions are made for all estimates to avoid overvaluing benefits.

The merit of the WTP method is that it is a measure that can be used for attributing monetary values to benefits from eHealth applications regardless of the kind of benefit. The only condition is that an improved service is provided, and that someone, a citizen, a professional, administrative staff, is using it. As long as this is the case, a value can be attributed to the provision of that service. The economic good can be in the form of benefits from services that may range form feeling more comfortable with the knowledge of a complete health insurance cover when travelling to avoiding death through a more effective emergency service control and allocation system.

Quality adjusted life years (QALY), as a summary measure of benefits from a new medical intervention or a new medical device may be used in particular cases, according to data availability and the appropriate-ness of such a measure. Where eHealth applications improve citizens' experience of healthcare, but do not change the clinical outcome, QALY it cannot be used as a measure for eHI. Similarly, QALYs are not helpful measures for time saving and improved productivity from eHI. The same holds, for example, for ICT in support of administrative processes, such as insurance cover validation. Measuring the impact of eHealth in terms of QALY is thus not appropriate in such a setting. QALY have not been found to be an appropriate measure for any of the ten evaluations conducted as part of the project.

2.2.3 Present values – discounted cash flow

All monetary values are converted onto a comparable base by presenting them in present values, using the discounted cash flow technique. For each case study, a discount rate of 3.5% is used to reflect the social time preference rate, opportunity costs and differences in the time value of money.

The present value concept reduces nominal monetary values in the future by the discount rate to show their value at present, thus reflecting an opportunity cost of time. The base year is different for each evaluation. It is the first year of the planning and development phase. For eHI purposes, the actual base year can be different between sites, as the aim is to show costs and benefits over time for each site.

2.2.4 Sensitivity analysis

The results of the evaluation are always tested for robustness by a sensitivity analysis. This consists of:
- Increasing the costs in every year by 50%
- Decreasing the benefits in every year by 50%
- Increasing the discount rate by 50%
- Decreasing the discount rate by 50%.

It is observed whether the findings of the evaluation, like net benefits and time to achieving those, change materially as a result of any of the above four manipulations. Possible reasons for such changes can be identified, such as the nature of assumptions, or expected small difference between costs and benefits up to the last year of forecast.

2.3 Technical tools for calculations, analysis and reporting

A mathematical spreadsheet tool is an adequate means for the eHI model. It comprises several sheets:
- Activity data
- Cost data
- Benefits data

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- Data summary
- Calculations
- Values on non-generic themes as appropriate, such as the impact on a group of citizens or a part of a service, according to the specific case.

The cases are described according to a common template in a well-structured text format. It has six mains headings:

- Executive summary
- Policy background and context
- The subject of the case study
- Case analysis
- Technical characteristics of the eHealth application
- Conclusions.

Every case analysis includes several standard eHI charts that show:

- Changes in utilisation levels
- First year where the present value of estimated annual benefits exceeds annual costs
- First year where estimated present value of cumulative benefits exceeds cumulative costs
- Changes in productivity, measured as unit costs
- Distribution of benefits between main stakeholder groups.

3. Sites for developing and validating the methodology

3.1 Proven eHealth

The eHI methodology was not created in isolation. Rather, through an iterative, stepwise approach it has been developed by the study team, applied, tested, adapted and improved based on concrete experience and lessons learned together with the many colleagues and professionals involved at the local level at each site. Across the European Union, ten sites with proven eHealth applications were selected to demonstrate the economic impact of eHealth services.

3.2 First two sites

A sequence was applied to site selection. Two sites, the NHS Direct Online (NHSDO) service in England, UK, and Kind & Gezin (K&G) vaccination service in Flanders, Belgium, were selected early in the project, and the initial eHI methodology was tested with them. As a result, some changes were made. These included an increased significance of cost-avoidance factors in benefits, and improved precision in their estimation and inclusion in the eHI analysis. Another change was the practice of identifying the critical factors in the evaluation. For example, some costs and benefits could be the same for both the with eHealth and the without eHealth settings. These rendered them less critical, or neutral to the analysis, and enabled equivalent factors to be identified in the other eight sites. A third factor was the scope to draw data from the findings from other studies, and apply these at each site. An example is the use of data from the eUser[2] survey as a proxy for estimating some of the NSHDO benefits.

The two sites also revealed the need to rely on estimates. Comprehensive actual data, even from a few years ago, is seldom available. Reliance on estimates was inevitable. As a result, the need for the contingency adjustments for optimism bias gained more importance.

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[2] eUSER - Evidence-based support for the design and delivery of user-centred online public services, http://www.euser-eu.org

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At K&G, the need was revealed for additional analysis to reflect the impact of eHealth on specific events that would not be generic. In this case, they were cessations of vaccination supplies. A specific analysis was needed to show the beneficial eHealth impact in this unusual setting.

With two sites that were so different, the initial eHI model was applied with different emphases. This con-firmed the initial concept that whilst the eHI methodology can be generic, the eHI model must adapt to the sites, not the data of the sites adapt to the eHI model.

3.3 Next eight sites

These further eight sites offered a wide range of different eHealth and healthcare settings, including electronic patient records, a nation-wide medical record system, ePrescribing, dispatch service for ambulances, or supply chain management. The methodology continued to be refined within the eHI evaluation principles. In particular, the eHI model was adapted to fit each sites' eHealth setting. This ensures that the findings are not distorted by methodological factors, and also retains the consistency needed for the virtual health economy analysis.

4. Web-based tool

The findings from the ten sites have been used to design the web-based tool. This is a simplified compilation of the eHI models used at each site. It can be used to test the economic impact of planned or actual eHealth investments.

5. Outlook

Development of the eHealth Impact methodology and translating it into a practical and pragmatic tool adaptable to a wide variety of eHealth investments was complex. Confronting theory with reality and the data availability in the healthcare environment, dealing with administrative structures and professional colleagues who are not used to such a terminology and whose foremost responsibility is to care for citizens and patients, and not to support an economic evaluation, turned out to be a task not as fast accomplished as we assumed when embarking on this exercise.

But, the results achieved have been worth it. The initial assessment of the performance of all ten sites shows that eHealth was, and can be expected to be, a significant factor in the improved economic performance of healthcare. The data on economic performance reflect the often very positive, and sometimes multi €m economic impact that eHealth applications and services have already achieved. It can be expected at an even larger scale in future. Benefits can probably also be expected from many applications already implemented, or about to become reality. However, our empirical results should only be transferred directly to other sites only where the context and the effectiveness of the eHealth application, and the associated changes in organisation and process, are equivalent. The selection of the ten sites evaluated by eHI was not random, and the results are to be seen as an indication of the potential of eHealth, not average performance.

6. Disclaimer

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Appendix 1: eHealth Impact case description template

Guidance

Delete when the report is finished!

This paper presents suggestions on a generic structure for the respective case descriptions. In each instance, it may have to be adapted to the specific case under consideration. Nevertheless, the main headings at section levels 1 and 2 should be kept if possible. This document can be saved and used as a template for the case report. When deemed necessary, adaptations, deletions or additions to the subheadings may be made. The sections will also be of different length depending on the case.

Data and charts from the ***eHealth impact economic and productivity model*** (E-HIEPM) should be used to support the description wherever meaningful. The specific model that fits the concrete case has to be finalised after a first comprehensive draft of the description is available. This allows choosing better and more relevant indicators and thus contributes to the quality of the economic analysis.

Extensive use of **charts**, **diagrams** and **tables** is essential. Also, when available, **screenshots** and **photographs** of sites, users at work etc. should be included! Please try to insert these as graphs, thus avoiding huge electronic file sizes.

Content Boxes: Boxes containing short anecdotal evidence of benefits, e.g. a particular example of things going well because of the application, statements from involved staff, users etc. can be included in the description.

Reporting process

Versions of the report should be produced during the working with the site team, but the final version of the description can only be completed when the output from the E-HIEPM is available. Three versions should be the goal, an *initial* version after the first site visit, an *interim* when the required data has been added to the E-HIEPM and a *final* that uses the review response from the site team and final output from the E-HIEPM. This final version may need to be refined several times, but this 3-step process should enable the number of versions to be controlled and held at a minimum.

Writing a first draft of the description without any data has proven helpful. It gives a structure for the data gathering process, helps to identify the data required, as well as possible sources for that data (sometimes other than the contact organisation). It also helps afterwards with the first steps on assigning monetary value to intangible benefits.

Executive Summary

Case Title:	XXX
Location:	Town, Region, Country
Host Organisation:	XXX

Awards, key presentations, etc.	• **Award 1** • **Award 2** • **Presentation 1.**
Core impact	o **Core impact 1** o **Core impact 2** o **Core impact 3** o **Core impact 4** o **Core impact 5** o
Main beneficiaries	• e.g.: Citizens are better...... • e.g.: Doctors and other healthcare providers have ... • e.g.: Insurance companies and the healthcare system benefit from.....
Lessons learned	o Lesson 1 o Lesson 2 o Lesson 3 o Lesson 4 o Lesson 5 o
Economic results	• First year of **annual net benefit: year XXX** • First year of **cumulative net benefit: year XXX** • Estimated **productivity gain: XXX%** • Distribution of direct benefits to 2008: **Citizens – XX%; HPOs – XX%; Third party payers – XX%**
Internet links	o http://www.... o http://www....

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Organisation	Name
contacts	Address
	Tel.:
	Fax:
	Email:
	Contact person:

Summary Case Description:

A good, but concise summary will allow for key results and a **1 page** focused overview of the case, so that the reader can decide whether it is worth to read the details, including context, drivers and promoters, main features of the application, techniques applied, key results of the impact assessment, economic results, lessons learned, conclusions, as well as awards, PR publications etc. that give a 'higher status' to the project. The summary is to be put into the following:

Policy background and context

Background

Health system setting

The idea is to provide the reader with a brief overview of the wider environment of the specific eHealth service. This may include national / regional **health and healthcare policy priorities and health system settings**, a brief description of national / regional peculiarities, of the competitive situation in a particular sector of the health system, like public or not-for-profit versus private hospitals, etc. **Note that this section is about 'health' or healthcare, not 'eHealth'**. eHealth, or rather ICT, is only the tool that helps provision of 'healthcare'. Relevant institutions are part of this setting.

eHealth policy strategy and framework

Describe the national, regional, or local **eHealth public policy strategy and framework, implementation measures and activities.** This includes the roles of relevant organisations.

Seek some general information on the situation that is appropriate for the case. Illustrate this with data and statistics if available.

EU policy context

Please use the following text to introduce this section:

"The EC action plan for a European eHealth area sets out several goals. These are set out at

http://europa.eu.int/information_society/doc/qualif/health/COM_2004_0356_F_EN_ACTE.pdf
. This case study addresses the following action plan themes:"

Please list from the contents page of the EC action plan document, the themes that the case study addresses.

You may also reference other relevant European policy documents like the policy paper on patient mobility, or Public Health information needs, which may give a wider perspective to the case at hand. The aim is to provide a reference to general priorities on the type of service provided – e.g. what policy issue does it address, or is it something that has not been explicitly mentioned at the European level.

Context

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The previous section provides the 'big picture'. This section has to set the application in a concrete context of operation. Depending on the case, the focus will be on activities, organisations, or both. In case there are other relevant factors (e.g. other stakeholders of high significance, key interconnections to other local or regional actors, unusual environmental factors or recent developments), please include them. Adapt the sub-sections as appropriate. Information on awards, important press coverage, references concerning the specific application that is subject of the study or the organisation that has developed this application should be included!

Organisation

This is a short section – it should not go beyond 2 paragraphs. The aim is to set the concrete organisational context of the case study. Describe the role and goals of the healthcare organisation(s) providing the service, including its main patient or client groups, volumes of activity and workload, and the trends and changes. Critical links with other healthcare organisations should be described.

This is about the overall **organisation using the evaluated eHealth application**, not about the application itself! Some details should include important facts like, e.g. "It is a hospital with X beds, Y staff and Z operations per year."

eHealth dynamic

Usually, **the assessed application is not a one-off project, but part of continuous activities** in the eHealth domain. It is useful to provide a brief overview of these activities. This can be a more detailed account of an activity, of which the evaluated application is a sub-activity. E.g. a local network of a hospital, GPs and pharmacies may have an integrated EHR system, but the case may be concentrating on the ePrescription aspect of it. In this section, then only the network is to be briefly described.

This is the place to give an account of events, projects, and other management activities that have preceded the investment in the application that is being evaluated. Usually, these management activities are in some way facilitating factors.

Also, planned overall developments for the near and distant future can be included here.

The subject of the case study: _please insert the name of the actual eHealth application_

No text here please.

Identifying and carefully describing the boundaries of the actual subject of the study is crucial when it comes to measuring costs and benefits! We must, e.g., avoid comparing the costs of an application with the benefits from a whole system of applications. Writing up the following subsections must meet this objective.

The boundaries of the healthcare service

This is a crucial part of the description that will describe and set the structure of the economic analysis.

It is important to draw explicitly **the borders of the service/activity the impact on which is being evaluated**. This involves distinguishing between the ICT application and the service/activity it supports. E.g., ePrescribing is the service/activity, but it has an ICT component – the software and network connection between physicians and pharmacies – and a non-ICT component – the actual prescribing, which can take place without ICT. We are evaluating the impact of ICT on the healthcare service/activity, not the ICT component alone.

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State what the 'e' part in the whole service is. Also, any other special characteristics: innovative, pragmatic, novel, sound, smart… These can apply to the ICT application itself and/or the service supported by the ICT application.

A description of the processes involved – how the service/activity works respectively is rendered to its clients – illustrates best what the case is all about and also points directly to the potential benefits to be expected. E.g. the process of GP referral to hospital is that the GP inputs the information required into the standard format patient's record (on the GP's PC) and sends it to the hospital. A diagram will be useful (if available).

In order to make these boundaries clear, it might be of help to put the service description into something like an **"input (incl. by whom or which co-operating actors) – process – output (including who is affected, or who is to make which use of it)"** structure.

Process change

The aim is to illustrate the difference between clinical and working practices before and after introducing the eHealth application. The 'after' situation is the one described in the previous subsection.

Describe the structure, changes and trends of the processes of the healthcare setting that is the subject of the eHI case study. This should identify any case mix themes that are important and any classifications, such as inpatient and ambulatory care. Any links with the processes of other healthcare organisation and/or citizens' behaviour should be identified.

This description of workloads is not utilisation analysis (which comes later). Here, a rather qualitative account of changing working practices is to be given.

Any changes to the care pathway or patients journey should be described.

Benefits should become obvious at this stage. They can be mentioned, but details should be kept for the later section.

Change management resources

Identify and describe the key resources, usually people and teams, who drive, organise, and steer the changes in clinical and working practices. Describe the impact they have on achieving the changes.

Who supported this idea at the highest level in the organisation (promoter), who led the planning and project management (champion), how where other professionals, staff, clients, politicians, other stakeholders involved (what methods - like training, workshops, internal meetings, ..., communication channels etc.), what mechanisms, like meetings, requests for submission of ideas, leaflets and local newspaper reports, were used for this.

Also, which problems, barriers and resistances were encountered, and how did the organisation, and champions of the new process succeed in overcoming them.

Training requirements

Training is an extensive part of implementing eHealth applications. Identifying the specific training requirements is important as a 'learning' support tool for future applications and will also help identify the cost of training. The role of training in staff motivation should be identified. I.e. were staff motivated to start using the new application in the first place, or did training contribute greatly to increasing the acceptance in changing practices?

The citizens who benefit

'Citizen' is used as a term encompassing patients as well as healthy individuals being affected by the service, or making direct use of an eHealth application.

Describe the patient focus of the eHealth application.

Then identify the main citizen groups who benefit.

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Then, give **an account of the 'representative' citizen who** is affected by the ICT supported health or healthcare service, i.e. type, associated needs…

Do not show utilisation levels. In case citizens are the main users of the eHealth application, on an annual scale will come in the Utilisation/Demand section below.

It will also be of great interest how they reacted to the new service, what training and persuasion was needed, what means of communications, such as leaflet, video, personal interview or group involvement, were most successful.

The origin of the initiative to use an eHealth application and planned eHealth impact

For the overall analysis, it will be interesting to gather some information on what caused the initial planning for the new eHealth service under consideration. This is either meeting a requirement of public policy strategy, mentioned above, or is part of an organisation's internal strategy. If it is the former, refer to section 1 and keep this section short. If it is the latter, describe what triggered this and why.

The aim of the planned impact is to set out the desired goals and benefits of the eHealth application when starting its planning or implementation, in the context of overall healthcare systems and goals.

Case Analysis

Timeline

Identify – including overlaps – the three time **phases of development, implementation, and routine operation**. E.g. development of application – 02.1996 to 07.1998, implementation and further development – 03.1998 to 12.2000, routine operation – since 01.2001:

Planning & development stage (19xx to 200x)

Implementation stage (xxxx to xxxx)

Running stage for routine operation, since xxxx, forecast to 20xx

Other relevant framework information is welcome.

Benefits

The benefits are most easily and completely identified by one stakeholder at a time. We have seven categories of benefits to draw from. These are described at the end of the section and should be deleted after completing the case description. Most of the content of the section should follow directly from the process changes described in the sections above.

The structure of the section is according to stakeholders. The 'usual suspects' are:

Citizens

Citizens can have access to data, receive more citizen focused service, save time, face lower risk, better access to services… Details from other relevant studies on citizens' behaviour and impact can be included.

What is new/different for the citizen?

Healthcare Provider Organisations (HPOs)

Hospitals, physicians, ambulance services, etc.

Direct benefits may include improves scheduling; lower risk, such as lowering risk of clinical errors and potential law suits…; effectiveness such as complying with evidence based medi-

cine; efficiency, including cost avoidance, increase in capacity through time savings, payment issues…

Where unplanned or unforeseen changes have occurred in the organisation's services, the value of the eHealth application in coping with them or succeeding should be described. Examples are where the supply of resources is limited, unexpected workload changes or changes in medical technological and techniques.

Benefits in this section **exclude** lower running costs, which will show up in the cost section.

Third party payers

This can be an insurance fund, local or other government, association etc. that is only involved in the financial aspect, but not the use of the application. Benefits are less likely to be easily identifiable, as the projects are usually part of some wider strategy.

Others

Please delete the following box after completing the benefits section

For the synthesis report, we will extract the benefits from each stakeholder section in line with the following benefit categories. It is thus important to take this into account.

– **Informed citizens**

Citizens can have access to data, information and knowledge about their conditions, diagnoses, treatment options and healthcare facilities, to enable them to take effective decisions about their health and lifestyles and those of the citizens they care for.

– **Information designed around the citizen**

When healthcare professionals have access to such information, they can be more citizen focused and so add to the benefits for citizens.

– **Timeliness**

Information is used to enable all types of healthcare to be scheduled and provided at the right time, to meet citizens' needs.

– **Safety**

Information enables risk, injuries and harm to citizens to be minimised.

– **Effectiveness**

Information enables healthcare is developed, planned, scheduled and derived from evidence and provided consistently to citizens who can, or may, benefit, and not provided to those who can not; and healthcare professionals are enabled to work effectively in multi-disciplinary teams.

– **Efficiency**

Information enables waste to be avoided, resource utilisation optimised and costs contained to budgets.

– **Access**

Information ensures that healthcare is available and accessible at the same standard to all those in need.

These benefit categories are consistent with the eHealth Impact specification of quality, access and cost-effectiveness.

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Costs

Data on cost will be provided in the appendix, so it is more a qualitative account of the nature of costs involved that is to be included here.

Costs of developing the application

This is the investment that would not have been made without the introduction of ICT solutions

Running costs of services

These are operating costs. How does the cost structure without (before) the eHealth application was introduced compare to the cost structure after. The default expectation is that cost of equipment will rise and staff cost for the particular service will decrease.

Utilisation / demand

The aim is to show how much the application is used, trends of usage levels and difference between actual and potential demand if appropriate. The main users should be identified. This gives a good illustration of the scale of actual and potential operation. The larger the demand / utilisation, the larger the expected impact.

Forecast up to 2008 should be included. Where sites are unable to provide forecasts up to 2008, please compile a scenario based on recent trends.

CHART 1: NUMBER OF ……….. PER YEAR

Economic and productivity analysis

This section will include standard charts drawn from the generic data summary table.

First year of net benefits

CHART 2: ESTIMATED PRESENT VALUE OF ANNUAL COTS AND BENEFITS

First year of cumulative net benefits

CHART 3: ESTIMATED PRESENT VALUE OF CUMULATIVE COSTS AND BENEFITS

Productivity

CHART 4: PRODUCTIVITY – UNIT COSTS

Distribution of benefits

CHART 5: DISTRIBUTION OF BENEFITS, SHOWING THE MAIN BENEFICIARIES.

Sensitivity analysis

The senility analysis tests the robustness of the conclusions on the worthiness of the eHealth investment. The tests include artificial speculations about the summary data in which the sensitivity to the assumptions made during data collection is identified.

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Technical characteristics of the eHealth application

The aim is to describe these for the healthcare process supported and the IT content of the eHealth application being used. It could cover a lay-person description of

Hardware

Software

Architecture

Infrastructure connections and networks connected to in-house and external communications

Any specific security, data protection or other issues and standards applied.

It can also be sub-divided into technical systems characteristics relevant for inputs, processing and management, and outputs.

Conclusions

Important lessons learned

The aim is to identify the important lessons for other sites. It will indicate the some of the factors that must be in place to succeed with an equivalent eHealth application. Categories include:

- The extent to which the eHealth application was used to solve a problem.
- Ultimate focus on citizen by improving the interaction between citizens and healthcare professionals
- Focus on improving the productivity of healthcare resources
- Importance of effective teams and people with specific skills, knowledge and abilities
- eHealth dynamic – benefits result from continuous investment and development on a corporate level, not a single eHealth solution on its own. These processes together, represent the eHealth dynamic – a continuous chain of ideas and realisation of benefits from numerous individual eHealth investments.
- Effective strategies, such as eHealth is an investment in healthcare, not cost saving
- Critical success factors
- Potential barriers to success
- Others

Transferability

State the potential of the application to be transferred to other sites. This means both, transferring the technology used, and the organisational component of the eHealth application.
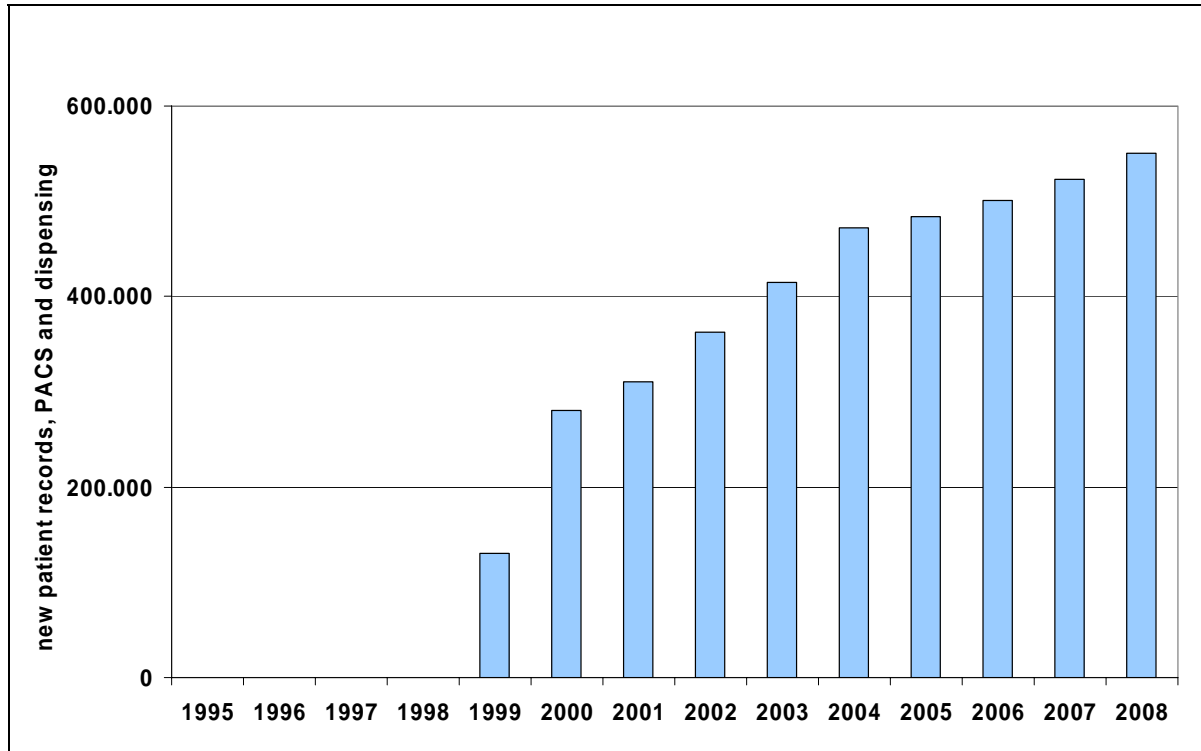
Summary of eHI evaluation data

References

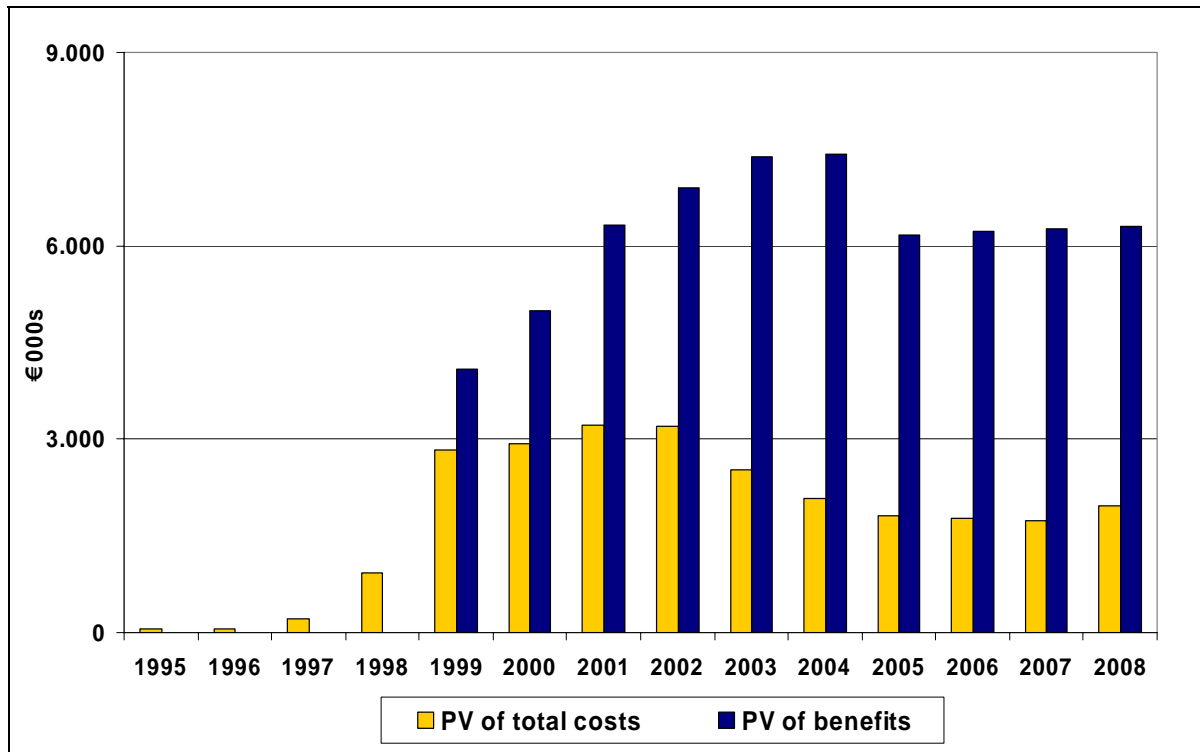# Appendix 2: eHealth Impact standard results charts

Utilisation

CHART 1: NUMBER OF ……….. PER YEAR
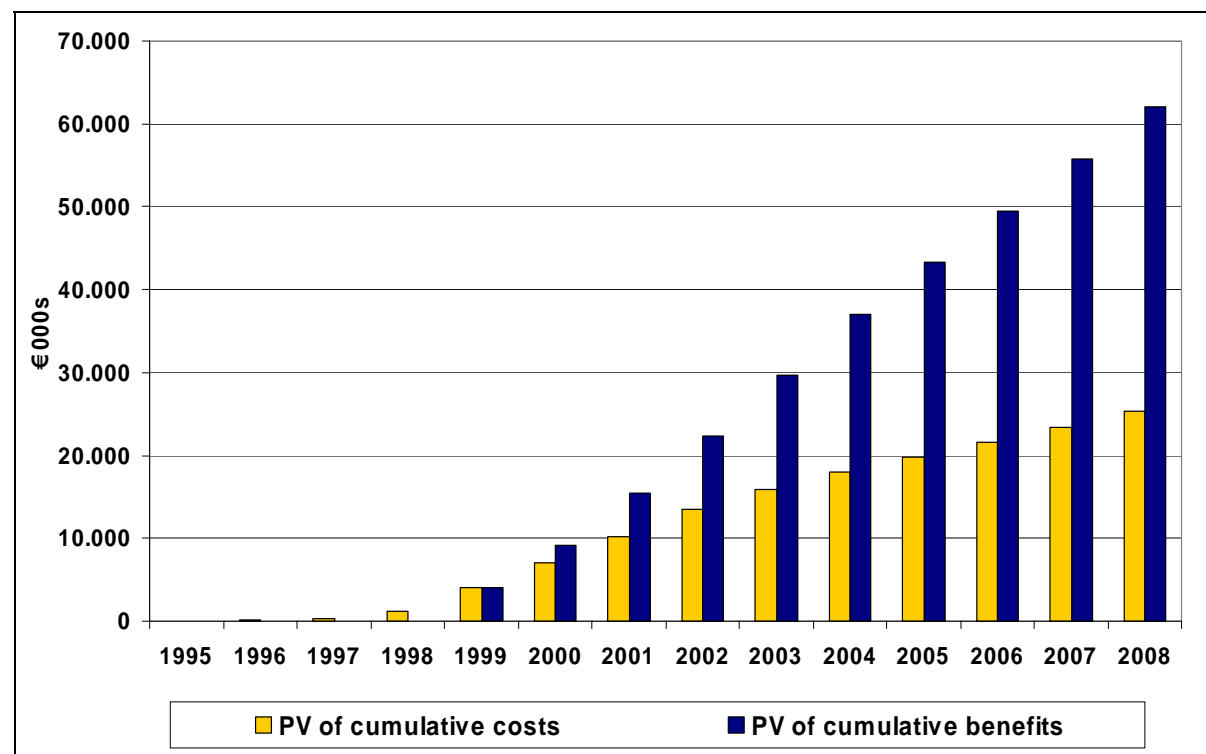
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First year of net benefits

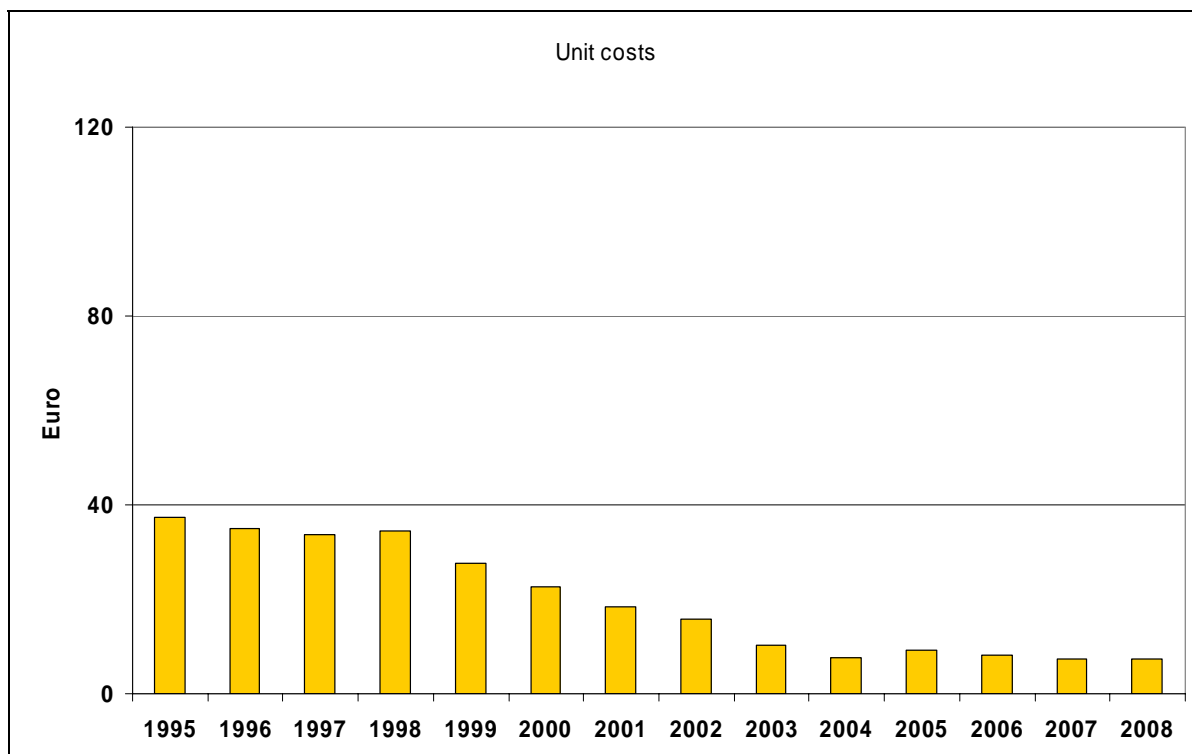**CHART 2: ESTIMATED PRESENT VALUE OF ANNUAL COTS AND BENEFITS**

First year of cumulative net benefits

CHART 3: ESTIMATED PRESENT VALUE OF CUMULATIVE COSTS AND BENEFITS

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Productivity

CHART 4: PRODUCTIVITY – UNIT COSTS

Distribution of benefits

CHART 5: DISTRIBUTION OF BENEFITS