

eHealth

Strategy

for Ireland



Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Tús Áite do
Shábháilteacht **1** Othar
Patient Safety **1** First

 **An Roinn Sláinte**
DEPARTMENT OF HEALTH

Bringing improved population wellbeing, health service efficiencies and economic opportunity through the use of technology enabled solutions.

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1 Executive Summary

“eHealth can benefit citizens, patients, health and care professionals but also health organisations and public authorities. eHealth - when applied effectively - delivers more personalised ‘citizen-centric’ healthcare, which is more targeted, effective and efficient and helps reduce errors, as well as the length of hospitalisation. It facilitates socio-economic inclusion and equality, quality of life and patient empowerment through greater transparency, access to services and information and the use of social media for health”. . . European Union eHealth Action Plan 2012-2020.

An eHealth Strategy for Ireland

The purpose of the strategy is to provide an outline of eHealth and demonstrate how the individual citizen, the Irish healthcare delivery systems - both public and private - and the economy as a whole will benefit from eHealth. It shows how the proper introduction and utilisation of eHealth will ensure;

- » The patient is placed at the centre of the healthcare delivery system and becomes an empowered participant in the provision and pursuit of their health and wellbeing.
- » The successful delivery of health systems reform and the associate structural, financial and service changes planned.
- » The realisation of health service efficiencies including optimum resource utilisation.
- » Ireland’s healthcare system can respond to the challenge defined by the EU task force report - *Redesigning health in Europe for 2020* - to ensure that in the future all EU citizens have access to a high level of healthcare, anywhere in the Union, and at a reasonable cost to our healthcare systems.
- » The potential of eHealth as a driver for economic growth and development can be realised.

The strategy identifies a set of objectives to be achieved and proposes a roadmap for their implementation within an outcomes-based delivery model. It outlines a proposed governance and delivery structure and defines a specific set of actions that address areas such as funding, resources, stakeholder engagement among others, and also looks at an initial set of priority eHealth projects.

Background and Challenges

Healthcare in Ireland is changing radically as a result of various demographic, organisational and resourcing factors, the increasing proliferation of technology and in particular the internet. These factors mean that future healthcare systems will need to be radically different in order to respond efficiently and equitably to forecasted demand. Demographic changes are occurring mainly as a result of ageing populations, rise of chronic diseases and increased demand and complexity of healthcare services. Organisational factors include the restructuring of Irish healthcare delivery systems outlined in the policy documents *Future Health - A Strategic Framework for Reform of the Irish Health Service 2012-2015*, *Money Follows the Patient – Policy Paper on Hospital Financing*, *The Path to Universal Healthcare – Preliminary Paper on Universal Health Insurance* and the overarching strategy document “*Healthy Ireland*” published in 2013. These changes will bring many challenges to an already-strained system and will require the utilisation of innovative information-based eHealth solutions funded through a **re-alignment of the national healthcare budget** (Ireland’s national healthcare ICT spend is 0.85% of the total healthcare budget relative to the EU range of 2-3%) and increased investment in eHealth systems and change management, process re-engineering and implementation support infrastructure.

Demographic changes are occurring mainly as a result of ageing populations, rise of chronic diseases and increased demand and complexity of healthcare services.



eHealth (Electronic Health) involves the integration of all information and knowledge sources involved in the delivery of healthcare via information technology-based systems. This includes patients and their records, caregivers and their systems, monitoring devices and sensors, management and administrative functions. It is a fully integrated digital 'supply chain' and involves high levels of automation and information sharing.

Introduction to eHealth

While the concept of eHealth (Electronic Health) may be quite new to many in healthcare, the principles and practices which underpin it have been well documented over many years. In essence it involves the integration of all information and knowledge sources involved in the delivery of healthcare via information technology-based systems. This includes patients and their records, caregivers and their systems, monitoring devices and sensors, management and administrative functions. It is a fully integrated digital 'supply chain' and involves high levels of automation and information sharing.

Examples of standard eHealth systems include electronic prescribing (ePrescribing) whereby patients can order repeat prescriptions online, online patient scheduling and referral systems and telehealthcare systems whereby patients with for example, diabetes or heart failure, can manage their own healthcare from the home environment. eHealth systems also include newer technologies such as ambient assistive living (AAL) systems, robotic surgical systems and body-worn sensor devices.

The healthcare delivery sector has traditionally lagged other industry domains where powerful information-based systems have been embedded for well over 30 years or more. Reasons for this include failure to adapt and change operational and management processes, lack of technical standards and reimbursement solutions among others. However it is generally acknowledged that the integration of health systems and processes via information technology will be a critical enabler in the transformation of healthcare service delivery, the promotion of population health and wellbeing, and the creation of significant economic development potential.

eHealth systems also include newer technologies such as ambient assistive living (AAL) systems, robotic surgical systems and body-worn sensor devices.

What eHealth Delivers

- 1 eHealth ensures that an empowered patient is at the centre of the healthcare delivery system.
- 2 Facilitates a greater focus on the care process from diagnosis and treatment to prevention and the maintenance of a healthy lifestyle.
- 3 Provides higher quality, more efficient and safer systems that are easier to access and allow greater transparency in their operation.
- 4 Ensures patients can receive safe, secure healthcare within a high quality service environment.
- 5 Care professionals are allowed more face-time with patients and can adapt care provision to individual needs.
- 6 Provides strategic management tools at all levels to ensure health care resources as a whole can be utilised more efficiently and effectively.
- 7 A critical enabler to deliver the change and transformation required to introduce new models of care, such as those articulated in the Irish Government publication *Healthy Ireland* covering among others chronic diseases, ageing and mental health.
- 8 Business models that are a fundamental enabler to the structural reorganisation of healthcare delivery systems as outlined in the policy documents *Universal Healthcare Insurance* and *Money Follows the Patient*.
- 9 Significant returns of investment where eHealth is properly implemented, involving all stakeholders with strong clinical engagement and a willingness to embrace process re-organisation.
- 10 An infrastructural investment in Ireland's future, not only for the transformation of the Irish health delivery sector, but also for the economy as a whole.
- 11 Provides the opportunity for significant potential economic benefits through:
 - » Developing new business models that give rise to entrepreneurship and start-up opportunities.
 - » Creating new systems, technologies and skills that are exportable.
 - » Supports Ireland's potential to capitalise on the emerging eHealth markets due to its already-strong base of key pillar industry's such as Medical Devices, ICT, Pharma/Bio and Financial Services.

Development of the Strategy

The strategy was developed through a process of;

- » Review of publications and literature from various academic and policy organisations.
- » Review of industrial literature and case studies including an assessment of methodologies.
- » An analysis of international eHealth strategies, deployment and implementation experiences.
- » An analysis of the potential economic benefits of eHealth.

From these sources a set of best-practice guidelines were developed. Input was obtained from specific domain specialists and the initial drafts and final strategy were subject to peer review and an iterative consultation process.

Findings

eHealth is a critical enabler of best-practice health systems and optimum healthcare delivery. Embedded in the management of delivery processes, eHealth is essential to ensure significant continuous improvements in efficiency, effectiveness, quality and safety of patient services and underpins organisational transformation and development. The availability of high quality, accurate and timely information is fundamental to enhanced provider-patient relationships with the resultant improvements in outcomes.

It is now accepted that successful reform of healthcare systems and delivery is highly dependent on realising the potential of eHealth as a change catalyst and enabler in addressing the challenges of new and existing models of healthcare. A properly executed strategy must involve all stakeholders and feature strong clinical engagement and a willingness to embrace process re-organisation from the outset. In Canada such an approach has been reported (Infoway, 2012) to have produced returns against initial investment spend of over 400% as a result of the roll out of ePrescribing while telehealth systems have demonstrated savings of around \$55 million per annum. Infoway has reported¹ that since its eHealth journey began ten years ago, "an estimated \$7.7 billion in benefits have accrued to Canadians and the healthcare system as a result of investments in telehealth, drug information systems and diagnostic imaging solutions" (All figures are in Canadian \$).

eHealth also introduces promising new business models that while still being developed have shown good potential. An example includes eMental Health where in Australia a classic 'Open Innovation' Ecosystem of collaborators have reported early findings indicating that this approach can be over 50 times more cost effective than traditional methods². Quite aside from the benefits to population wellbeing and improvements to healthcare system delivery, there are significant potential economic benefits

associated with investment in eHealth infrastructure. The creation of new 'eHealth markets' gives rise to entrepreneurship and start-up opportunities and much of this will be readily exportable. Ireland is in an ideal position to capitalise on these emerging markets due to its already-strong base within the key pillar industries of Medical Devices, ICT, Pharma/Bio and Financial Services. An economic impact analysis for Ireland estimates that a properly executed eHealth strategy, leading to the development of commercial and export-oriented opportunities, can add between 2 and 2.9% to National GDP and contribute a significant number of highly skilled jobs to the economy. Overall, eHealth needs to be seen as an *infrastructural investment* in Ireland's future, not only for the transformation of the Irish health delivery sector, but also for the economy as a whole.

Implementation

International experience has shown that eHealth deployments are complex undertakings and need specific focus. To realise this vision it is proposed that a new branded delivery structure *be* formed.

A new entity called "*eHealth Ireland*" will be established, initially on an administrative basis within the System Reform Group (SRG) of the HSE. Over time, as the HSE is dismantled, this new organisation will be formed as an independent entity within a new institutional framework for shared services for the health sector as a whole. *eHealth Ireland* will be headed up by a new Chief Information Officer (CIO) who will work closely with all of the key business organisations within the health service, in order to drive forward the eHealth strategy and ensure that key IT systems are implemented on time and to budget. A new IT strategy for the health system as a whole will be published in early 2014 by *eHealth Ireland* working closely with the SRG, the Department of Health and other relevant departments/organisations.

eHealth Ireland will operate in partnership with and build on work already underway by government and state agencies such as the Health Services Executive ICT Directorate and SRG, the Health Information and Quality Authority (HIQA) and Enterprise Ireland. It will have responsibility for overall governance around eHealth implementation including funding, legal enabling, public awareness, stakeholder engagement and building the eHealth Ecosystem. This entity will stage-gate manage projects with healthcare delivery groups based on overall national priorities. It will encourage local and regional innovation where possible and promote funding and project collaborations with private industry.

An *eHealth Ireland* Board, composed of senior representatives from the HSE and the Department of Health among others, will be created in order to ensure maximum integration and focus. Given the vital importance of establishing an eHealth ecosystem it is proposed that an *eHealth Ireland* Forum be established, composed of representatives of all main impacted government organisations

(including Health, Jobs and Innovation, Education and Skills and others), academia, industry, private healthcare delivery, healthcare insurance, voluntary sector and patients groups.

Fundamental Enablers

The successful execution of an eHealth strategy has been shown to be dependent on a number of fundamental enablers being present. These can be summarised as;

- » Willingness to reorganise and redesign existing work practices. eHealth deployments by their very nature are disruptive and successful implementation of an eHealth strategy is critically dependent on the willingness of the healthcare delivery system to reorganise itself and integrate new work practices and processes. International best-practice experience has shown that this process re-engineering is widely dependent on highly committed collaboration and buy-in from all stakeholders.
- » Effective and authoritative leadership and clinical champions.
- » The availability of healthcare informatics resources and the development of appropriate health informatics skills and/or staff training/re-training for all staff impacted by eHealth deployments.
- » A standards-based, multi-layered information and technical infrastructure needs to be in place to provide a common platform for eHealth deployments.
- » A national health identifier number for citizens, professionals and organisations.
- » Appropriate legislation around privacy and security and data protection.
- » Availability of security identity and management processes.
- » The presence of an 'Open', authoritative and internationally linked collaborative Innovation 'Ecosystem'. The development of such a collaborative Ecosystem will be an important mechanism for developing innovative solutions to classic eHealth proliferation issues such as procurement issues, technical interoperability and testing and legal enabling. Ireland should develop such an Ecosystem modeling itself on exemplars such as Catalonia Spain, and Oulu Finland.

Actions to Realise eHealth Strategy objectives

- 1** Ensure that eHealth is utilised to place the patient firmly at the centre of the new healthcare environment as outlined by the EU's eHealth Action Plan 2012-2020. This will include developing programmes to encourage and strengthen engagement, facilitate informed participation in the care process and increase health literacy.
- 2** Establish over time a dedicated, focused and strongly branded entity '*eHealth Ireland*' to oversee Ireland's eHealth journey and ensure maximum return for Ireland's population wellbeing and economy as a whole.
- 3** Potential priority projects:
 - » National Health Identifier Infrastructure.
 - » ePrescribing Systems.
 - » Online Referrals and Scheduling.
 - » Telehealthcare - particularly relating to the management of chronic diseases.
 - » Development of Patient Summary Records.
 - » Online Access to Health Information.
 - » National Patient Portal.
- 4** Establish specific functional workstreams involving all appropriate stakeholders to address the major deployment enablers including;
 - » Appropriate funding models for programs.
 - » Change management and adoption processes
 - » Healthcare informatics resources and the development of appropriate health informatics skills.
 - » A standards-based, multi-layered information and technical infrastructure to provide a common platform for eHealth deployments.
 - » Appropriate legislation around trust, privacy, security and data protection
 - » Public engagement, awareness and uptake.
- 5** Establish an eHealth Ecosystem involving the Departments of Health, Jobs Enterprise and Innovation, Education and Skills, Environment, the Healthcare Delivery system, Industry, Academia, the Research and Development communities and the voluntary sector.
- 6** Each government department and agency with a role in exploiting the potentiality of eHealth must develop strategies for actions to realise the economic benefits of eHealth.
- 7** A new IT strategy for the health system as a whole will be published in early 2014 by *eHealth Ireland* working closely with the SRG, the Department of Health and other relevant Departments and organisations.

Conclusions

It is widely accepted that the successful execution of an eHealth strategy has the potential to transform healthcare delivery systems into safer, higher quality, more efficient, easier to access systems that pay for themselves over time. The overall wellbeing of the population is enhanced through the adoption of information-based systems supporting patient empowerment and a shift in focus to prevention and wellness. Investment in eHealth also brings significant potential for economic development including job creation, entrepreneurial start-ups and further direct foreign investment. Innovative and collaborative Ecosystems have been proven to be a significant enabler and Ireland can play a lead role internationally in this regard. The establishment of *eHealth Ireland* and the successful implementation of the eHealth Strategy should be viewed as a national infrastructural investment for Ireland. While underpinning health system reform, it will ensure that Ireland can benefit from the potential of eHealth to improve the health and wellbeing of all its patient/citizens, the working environment of its health professionals/care providers, the efficiency and effectiveness of its delivery services and the realisation of significant economic development potential.

eHealth Ireland will achieve this through the development of outcome-focused implementation plans based on two phases within a seven year timescale.

Expected outcomes to be delivered in phase one – years 1- 4, include the following:

Stakeholder	Outcome of implementation of eHealth strategy
Patients/Citizens	<ul style="list-style-type: none">» The patient has all the relevant information needed to allow the management of their own health and their interaction with the health system. They are empowered to be proactive in their health maintenance.» Patients are recognised when they access the system and can quickly see relevant health details.» Patients can access their own health records and maintain a health diary.» Patients have high levels of trust in the security and confidentiality of the services they are using.» Patients can inform themselves on health information through accredited sources of information and use this information to construct their health plans.» Patients in remote and rural areas have equal accessibility to services as urban dwellers.» Patients have the ability to access services while traveling and on the move.
Care Providers	<ul style="list-style-type: none">» Care providers have more time for personalised interaction with patients.» Care plans can be better tailored to individuals.» Significant reduction in administrative activities.» Care providers have the ability to constantly monitor and interact with patients despite distance and mobility of either party.» The healthcare delivery environment is safer and more supportive of patient-care.» Staff initiative and innovation activities can be proactively supported.» Information and performance management services to support proactive and effective clinical leadership are established.» Through access to accurate management, process and cost data, healthcare service providers have the opportunity to develop innovative services based on new revenue models.» Continuing professional development, up-skilling and skills development programs have been developed and are incorporated into human resource management and planning.

Healthcare Management

- » National healthcare ICT spend re-aligned to the EU average of between 2-3% (from 0.85%).
- » Cost and performance information for healthcare systems is transparent and easily accessible supporting the reform process.
- » Accurate quality data is now available for forecasting, budget management and service planning and development.
- » Institutions are making patient data available securely as needed to better plan care pathways.
- » High quality data sets are available to indicate public health trends and inform regional and national policy.
- » The information and process management infrastructure has been developed and implemented to provide for integration of the information access and management requirements of the acute, primary and social care systems.

Business and Economic

- » The eHealth Ecosystem has been established.
 - » Relevant government departments and agencies have developed and implemented strategies to realise the potential of eHealth.
 - » Ireland is internationally recognised as a proactive developer of eHealth systems and services.
 - » The support for entrepreneurship in eHealth is embedded throughout the relevant government departments, state agencies, industry and academia.
 - » eHealth start-ups are acknowledged as a key element in the Enterprise Ireland High Potential Start Ups (HPSUs) initiatives.
 - » Specialised and focused eHealth start-up supports and incubators have been established by the relevant state agencies.
 - » Specialised funds (VC and others) are now available in Ireland.
 - » eHealth services markets are very active and are demonstrating strong export returns.
 - » More multinationals have based their eHealth R&D and product development in Ireland.
 - » Strong engagement with the EU in its Horizon 2020 program.
 - » Jobs related to eHealth have been created.
 - » Courses to develop and support the eHealth skills base are available in many third level institutions.
-



2 Methodology

The eHealth strategy for Ireland has been built up from many data sources and information repositories. In developing the Strategy three broad information sources were looked at in detail;

- » Industry and academic experiences
- » Previous international experiences
- » Current situation in Ireland in terms of policy direction and the healthcare system reorganisation already underway.

These three pillars are put in the context of global policy recommendations from bodies such as The World Health Organisation (WHO) and in particular its *National eHealth Strategy Toolkit*³ and the European Union's new *eHealth Action Plan 2012-2020*⁴. Through a process of international peer review and literature analysis, a specific aspect examined in detail has been the global trend towards the formation of Open Innovation-based eHealth 'Ecosystems' and the opportunity for Ireland to collaborate with international organisations within the European Union and the United States. Ireland's role within the European Union in particular and the opportunities for Ireland to be a significant lead player within its eHealth programmes have been reviewed. Through an economic impact analysis review, the potential economic opportunities to Ireland of an *eHealth-enabled economy* have been estimated and new emerging service and export driven markets have been identified. Through international best-practice review and key findings, an optimum organisational model for delivery of Ireland's eHealth strategy has been proposed including specific actions and timelines for implementation.

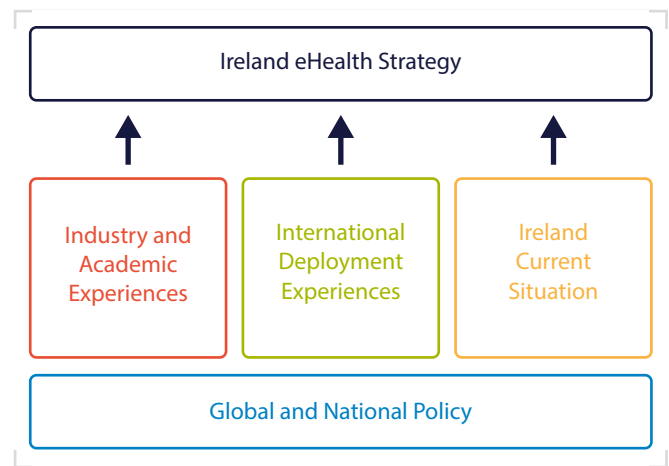


Figure 2.1. Sources on which Ireland's eHealth strategy is based.



3 System Challenges and Introduction to eHealth

3.1 Healthcare Delivery System Challenges

Demographic Factors

In common with healthcare systems globally, the Irish healthcare delivery system faces a set of increasingly significant challenges in continuing to efficiently and equitably deliver high standards of health outcomes while also facilitating the fundamental healthcare reorganisation to which Ireland has committed. Globally these challenges can be seen by the increasing amounts of national GDP being allocated to healthcare spending. Countries such as the USA are facing major challenges and forecasts indicate that by 2050 up to 70%⁵ of federal income taxes will be required to cover healthcare spending. Figure 3.1 details the OECD⁶ forecasted GDP allocations to healthcare spending to 2100 (assuming systems carry on in current mode).

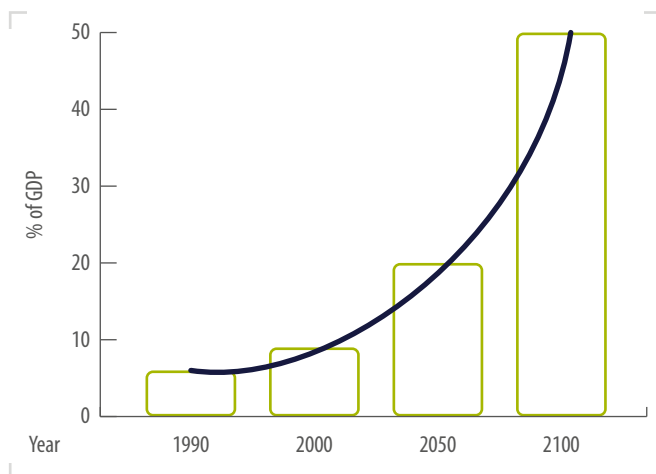


Figure 3.1. OECD Average Healthcare Spends % of GDP

Factors behind this exponential rise in the cost of service delivery include ageing populations and the rise of chronic disease as well as the increase in complexity and cost of healthcare services. The increase in ageing populations will start to significantly impact the availability of healthcare resources from around 2020 onwards. This combined with a decline in birth rates gives rise to an imbalance between people of working age i.e. those paying taxes to support the healthcare system and those older people requiring services from the system. This is generally termed the 'Dependency Ratio' and, as a world population trend, is falling globally including in Ireland. In 2011 Ireland had the highest number of young people and the lowest number of older people in the EU⁷. Based on the Irish Central Statistics Office (CSO) data in 2013⁸, the population aged 65 years and over is projected to increase from 532,000 in 2011 to between 850,000 and 860,700 by 2026, and to close to 1.4 million by 2046. At the same time the population of those aged 80 years of age and over is set to rise even more dramatically from 128,000 in 2011

to between 470,000 and 484,000 by 2046. As these age categories account for over 80% of healthcare spending, it is clear that there is a major supply-demand and cost of provision challenge looming.

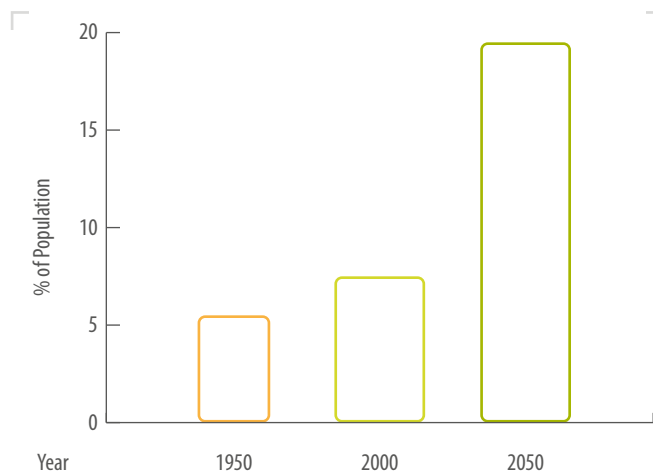


Figure 3.2. Worldwide Population Ageing for Age 65 Years and Over

Chronic Diseases

Chronic diseases such as Diabetes Mellitus Type 2, Heart Failure and Chronic Pulmonary Obstructive Disorder (COPD) are on the rise globally with Diabetes Type 2 being branded an 'epidemic'⁹ by all major global health organisations. A major contributor to the rise of chronic diseases is the problem of obesity. Figure 3.3 compares the Obesity situation in the EU and US¹⁰ and the forecasted increase in prevalence will place a major burden on future healthcare systems as chronic diseases rise. It should be noted that as people age, co-morbidities become more common and so treatment situations tend to get more complex and hence more expensive.

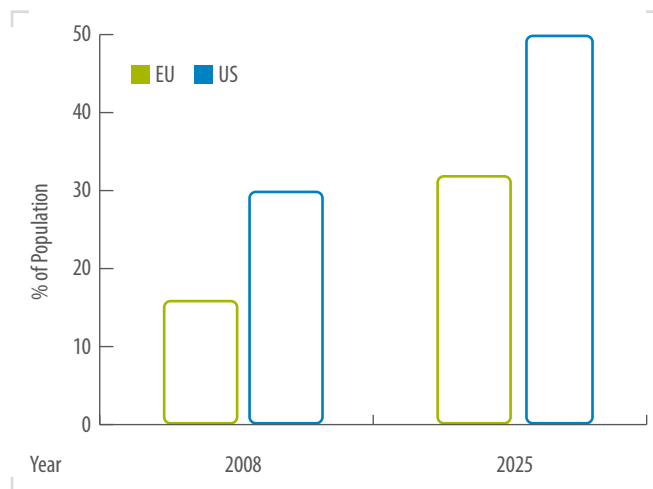


Figure 3.3. Obesity Forecasts for EU and US

Obesity is on the rise in Ireland also. Currently it is estimated that over 40% of the population are overweight and 25% of the population clinically obese¹¹. From 1990 to 2000 Ireland experienced

a 67% increase in obesity levels and this trend is expected to continue to 2020 and beyond. Ireland also now has the fourth highest obesity levels in adult men within the EU¹² and over 22% of Irish 5 to 12 year olds are considered to be overweight or obese¹³.

The consequence of these demographic factors coming together is a rapidly rising cost of healthcare delivery, both public and private. Current healthcare spending in Ireland is in the order of 9.2% of GDP¹⁴ however GDP has fallen sharply due to economic difficulties and so the gap between income and spending is getting wider.

Organisational Challenges

Some Ireland-specific organisational challenges include;

1 Healthcare Delivery System Reorganisation.

Ireland has committed to major healthcare reform outlined initially in the policy document *Future Health - A Strategic Framework for Reform of the Irish Health Service 2012-2015*¹⁵. This will see the country moving towards a Universal Healthcare model based on a Money Follows the Patient methodology. These have been outlined in the policy documents *The Path to Universal Healthcare – Preliminary Paper on Universal Health Insurance*¹⁷ and *Money Follows the Patient - Policy Paper on Hospital Financing*¹⁶ methodology. These changes are primarily intended to provide greater equity, access, efficiency and transparency through the introduction of a single-tier *Universal Healthcare Insurance*¹⁷ model. The new model will require healthcare providers, insurance organisations and consumers to be much more tightly bound together in a Business to Business (B2B) like arrangement where data is transferred electronically in a timely, accurate and automatic format between parties. Examples include the requirement for automated billing and claim systems, Diagnostic Related Group (DRG) pricing systems and performance indicator systems

2 Legacy under-investment in Healthcare ICT.

On average globally healthcare systems spend between 2% and 3% on ICT systems. This is compared with the financial services industry which as a whole spends 10-12% and the average non-healthcare related US institution which spends between 5% and 8%¹⁸. The EU average for spending on Healthcare IT and eHealth solutions ranges from around 2% to 3%¹⁹. In Ireland the investment in Healthcare ICT is approximately 0.85%.

3 Economic Difficulties.

The current economic difficulties within the Irish economy mean that there may be a reluctance to invest in infrastructural systems (such as eHealth) that may have medium to longer-term returns in favour of more short-term initiatives. eHealth needs to be seen very much as an infrastructural investment that will have benefits not only for population wellbeing but will also generate significant economic opportunities.

3.2 Introducing eHealth

Background

The emerging field of Electronic Healthcare or 'eHealth' has been written about for many years and has had many definitions. Oh et al²⁰ completed a systematic review of the definition of eHealth in 2005 from thousands of citations and identified the broad terminology of agreement. Building on this, the World Health Organisation defines eHealth quite simply as "the combined use of electronic communication and information technology in the health sector". As a generic term electronic healthcare has been described variously in formats such as e-Health, E-Health and e-health, however for the purposes of this document the term eHealth will be used. Note also that the term eHealth is used to distinguish it from 'standard' healthcare ICT functions within an organisation such as provision of computers, laptops, printers, payroll systems and other administrative functions.

eHealth specifically involves the integration of all information and knowledge sources involved in the delivery of healthcare via information technology-based systems for the purpose of exchange between cooperating parties. Or put differently, eHealth is the means of ensuring that the right health information is provided to the right person at the right place and time in a secure, electronic, accessible and meaningful format for the purpose of optimising the quality and efficiency of healthcare delivery. The emergence of eHealth is creating a new patient-centric approach to healthcare that is "wellness-based". This new approach also brings many new markets and business opportunities.

eHealth is now a fundamental component of best-practice, high performing health systems as it is;

- » Embedded in the delivery of patient diagnosis, treatment and care.
- » A prime driver of significant and continuous improvements in efficiency, effectiveness and quality/safety of patient services. eHealth is an essential tool on which performance management of the healthcare system is based.
- » Fundamental for business support and governance requirements at corporate functions level (Finance, HR etc.). eHealth is central to strategic, management & operational development, planning and control.
- » A critical & differentiating enabler of organisational transformation and development.
- » Critical to production of population health wellbeing and policy formulation at a national level.

3.3 What are eHealth Systems?

eHealth systems are 'patient-centric' and involve the use of modern information systems and technologies to integrate and coordinate the delivery of healthcare to ensure improved patient outcomes, greater efficiencies of delivery, higher levels of transparency and improved ease of access. eHealth places an increased emphasis on prevention and empowers consumers (patients) to proactively manage their own health often from remote settings such as the home while reducing costly hospitalisations. From the providers perspective it enables efficiencies through decreased hospitalisations and lengths of stay, avoidance of duplication of procedures and tests, reduced reliance on error-prone paper-based processes and up to date, accurate and timely patient record history.

Systems that fall into the general eHealth category include;

Electronic Health Records (EHRs).

Electronic Records are generally classified using a hierarchical structure. At the top level are *Electronic Health Records (EHRs)*. These are generally associated with an enterprise-wide record system within a hospital or hospital network and are 'hosted' by the institution. Beneath this are *Electronic Medical Records (EMRs)* and *Personal Health Records (PHRs)*. EMRs generally refer to smaller non-enterprise deployments of record systems, such as standalone hospitals or GP clinics. Personal Health Records (PHRs) such as Microsoft HealthVault²¹ are maintained and updated locally by the individual (patient).

Such record systems typically replace classic manual paper-based records to a greater or lesser extent. Key to the deployment of electronic records, in a national health service setting, is the existence of a national health identification number on which the records system is centred. Much is happening at European level at standardising the sharing of medical records between countries³⁶.

ePrescribing

ePrescribing typically refers to the process of fulfilling medical prescriptions outwards from clinician to patient via pharmacy. Sometimes referred to as *Drug Information Systems (DIS)*, these systems are concerned with the automation of the medication prescribing process including online repeat prescription ordering. In the USA the Centre for Medicare and Medicaid Services defines ePrescribing as²²...

"ePrescribing means the transmission, using electronic media, of prescription or prescription-related information between a prescriber, dispenser, pharmacy, benefit manager, or health plan, either directly or through an intermediary, including an e-prescribing network. ePrescribing includes, but is not limited to two-way transmissions between the point of care and the dispenser."

The goal of ePrescribing systems is to reduce errors due to manual prescribing and incorrect fulfillment and to speed up access for the consumer to necessary prescriptions. Osborne²³ has reported that in Ireland medication errors cost the state around €10-€15 million per annum. International experience has demonstrated that a phased approach to ePrescribing systems with initial efforts concentrating on dispensing medication within the community rather than hospital settings is best²⁴.

A significant enabler to ePrescribing in Ireland is the work already performed in Ireland by the Irish Medicines Board (IMB) in building a medicines formulary and products database.

Telehealthcare and Telemedicine Systems.

The terms telehealthcare and telemedicine are often used interchangeably. However strictly speaking telemedicine can be viewed as a higher level (parent) category covering many areas of which telehealthcare is one subset. Telemedicine systems include remote radiology (teleradiology) and reporting and teleconsultations between doctor and patient. Telehealthcare systems are concerned with the remote monitoring and management of personal healthcare usually from a remote location such as the home, with the aim being to proactively manage healthcare and avoid costly hospitalisations. Various technology devices such as blood pressure monitors, glucometers, lung capacity monitors and others are deployed to the remote setting (most often the home) and regular measurements are made using the devices deployed. The data is typically transmitted back to a monitoring base (often a hospital) where decision support systems featuring pre-set alarms, alerts and management care flows, assist attendant care personnel. Telehealthcare systems show significant potential for the proactive management of chronic diseases. Many trials and pilots have been implemented over the past ten years and full commercial deployments are now becoming more common.

Automated Pricing, Performance, Billing and Claims Management.

These fall into the general Business to Business (B2B) category and have been available for many years within other industry sectors such as financial services and retail (for example Electronic Data Interchange – EDI). These systems tightly bind provider and customer in terms of pricing, fulfillment, billing and claims management. They will also be core components of the Diagnostic Related Group (DRG) systems that are a central component of the health system reform currently underway.

3.4 Evolution of eHealth

eHealth systems have grown organically from the late 1990's as digital communications processing power has evolved in line with Moore's Law²⁵. There has been increasing interest in the use of digital technologies within the healthcare field as digital devices have become more powerful, more mobile and cheaper in cost. Cisco has reported²⁶ that the numbers of internet connected devices will reach 50 billion by 2020 and this will equate to an average of 6.5 internet connected devices for every person on the planet. Figure 3.4 plots this increase in connectivity and the consequential evolution of interest in eHealth systems. Considering the increase in personal internet-connected devices, the potential for utilising these devices for personal wellbeing programs and mobile healthcare delivery, is evident. This trend toward more connected devices per person is driving new business models such as Cloud Computing and the increasing requirements to process vast amounts of data is driving a new industry called 'Big Data'.

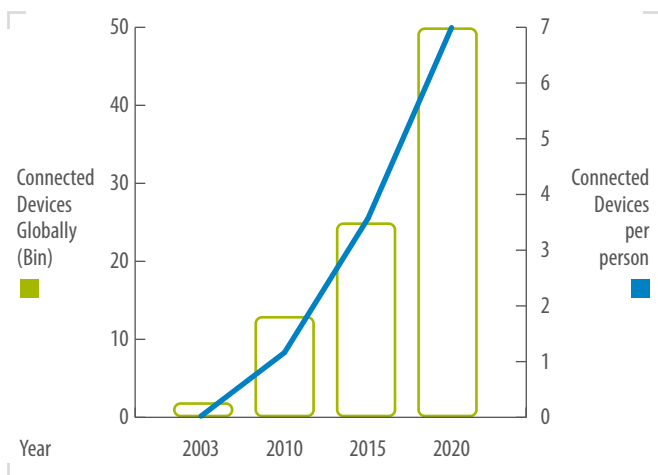


Figure 3.4. Evolution of Internet Connected Devices (Source: Cisco)

The potential of digital technologies to automate manual processes and remove errors has long been recognised. Complex industry sectors such as automotive manufacturing, pharmaceuticals, semiconductor manufacturing and retail are now critically dependent on digital technologies to underpin efficiencies and reduce inevitable human error from systems wherever possible. For example, the retail industry has operated Business to Business (B2B) systems for ordering, procurement, purchasing, claims, electronic payments and in-store management systems for many years. The financial services industry has also a long history of such process automation and it is interesting to consider that the first ATM (Automatic Teller Machine) was introduced in Ireland in 1980.

Within healthcare the progress of adopting such systems has been slow due to a number of factors including lack of technology standards, organisational behaviour factors such as an unwillingness

to change processes, insufficient legal and financing models to support change and a legacy under-investment in general Healthcare ICT systems. Removal of these obstacles will be key enablers to adoption and will be dealt with later in this strategy.

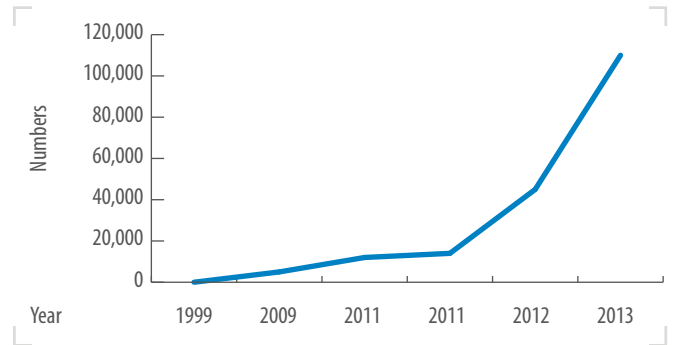


Figure 3.5. Telehealthcare Evolution by Number of People (Source: Dalton)

This is not to say that eHealth devices and systems have not been developing and innovating, however what has been slow in happening is the deployment of eHealth technologies in full commercial settings. An example of the evolution of eHealth systems is within the area of telehealthcare and remote monitoring systems. Figure 3.5 details the evolution of telehealthcare which is a microcosm of the evolution of eHealth systems in general. These systems started off initially with small pilots and eventually grew larger. The current largest fully commercial deployment in the world involves a 100,000 person deployment in China²⁷ which started in 2012/2013. What is now needed is that key enablers such as legal, privacy, security and technical standards are put in place so that the increasing innovation illustrated in figure 3.5 can result in full commercial deployments.

3.5 Redesigning Health in Europe for 2020

In 2012 an EU Task Force was convened to explore the potential of ICT in health innovation in the EU and make recommendations on what could be done to ensure that Europe reaps the full benefits of eHealth by 2020. The Task Force's report outlines its conclusions regarding the key issues faced by a fundamental re-organisation of healthcare to make use of already existing information technologies. These solutions are often not medical, but rather deal with how in the future areas such as data, privacy, and research as well as the physician/patient relationship will be treated. This report focuses on how to achieve a vision of affordable, less intrusive and more personalised care, ultimately increasing the quality of life as well as lowering mortality. Such a vision depends on the application of ICT and eHealth.

The first section of the report describes the five levers that can create the momentum for change in health, setting out the preconditions and benefits for different groups of stakeholders.

Summary Table of the levers for change

Stakeholder group	My data, my decisions	Liberate the data	Revolutionise health	Connect up everything	Include everyone
	Patients and institutions share their data, flexible consent mechanisms	Health outcomes and performance data freely published with full transparency	Technology and information management drives the pace of change	Link lifestyle data with health data, lots of new apps and tools from entrepreneurs	Contribution to and benefit from eHealth for all
Citizens and patients	High	High	High	High	High
Regulators and policy makers	Medium	High	Medium	Medium	Medium
Clinicians and care professionals	Medium	High	High	High	High
Payers and insurers	Medium	High	High	Medium	Low
Service providers and managers	Low	High	High	High	High
Researchers	High	High	Medium	High	High

High if the preconditions were met and this lever utilised, there would be a high-level impact on the stakeholder group.

Medium if the preconditions were met and this lever utilised, there would be a medium-level impact on the stakeholder group.

Low if the preconditions were met and this lever utilised, there would be a low-level impact on the stakeholder group.

The second section of the report highlights five recommendations for action in order to achieve the vision of eHealth by 2020. The recommendations for action are addressed primarily to policymakers at the European and national levels. All stakeholders benefit through the use of eHealth although the impact differs for each category of stakeholder and the benefits may be direct or indirect.

Recommendations	Suggested Actions
1: A new legal basis for health data in Europe	Move quickly to create legal clarity on the pan-European use of health data, establishing strong safeguards and providing a stable market environment to encourage innovation. This should set out the different uses of data and an updated framework approach to informed consent.
2: Create a 'beacon group' of Member States and regions committed to open data and eHealth	Public authorities (national or regional) that have advanced eHealth activities to create a 'beacon group' for rapid progress. This group can provide leadership and inspiration for other EU countries and third countries. The EU can facilitate learning and exchange of experience, promoting the uptake of proven technologies and sharing the results of new initiatives.
3: Support health literacy	Increase public understanding about the opportunities of eHealth to monitor, measure and manage their wellbeing. Raise awareness of what data is collected, the different ways that it can be used and the benefits for the individual and the health system. Provide mediators and skill building for vulnerable groups.
4: Use the power of data	Create a culture of transparency in health. Benchmarking and monitoring performance of the health system. Encourage the integration of data into large European data sets and enhance access for researchers. Closer integration between research and health practice.
5: Re-orient EU funding and policies	Require transparency from institutions in health systems through procurement and funding criteria. Earmark EU funds for user driver innovation, support for fast prototyping and low threshold to access

Responding to these levers for change and implementing the recommendations to achieve the vision for change by 2020 will provide a foundational guiding principle in the development of the various work programmes undertaken to implement this eHealth strategy (see section 10.2) and in realising the full potential of eHealth for Ireland.

Chapter 3: Summary

Healthcare systems are straining to meet current demand and will struggle to meet forecasted future service demand arising from ageing populations and chronic diseases in particular, unless information-based innovation is introduced. This innovation while disruptive in nature, is not entirely new and many other industry domains have been using similar systems for many years. eHealth technologies have been evolving steadily however, their adoption has been slow due to various factors that have acted as barriers. These barriers will need to be removed and will themselves become key enablers once this has happened. The EU has identified eHealth as critical not only for healthcare provision but also for social provision and as a means of bridging the 'Digital Divide'. eHealth needs to be seen as an infrastructural investment for Ireland that will bring benefits to the general wellness of the population, generate service efficiencies and also bring significant economic opportunity. eHealth will also be a significant enabler to the current reorganisation of the Irish healthcare service and its potential has been further recognised in the Irish Governments National Digital Strategy *Doing More With Digital, National Digital Strategy for Ireland*⁹¹.

4 Characteristics and Benefits of eHealth

The principal characteristics of eHealth are its potential to be a catalyst of change and its ability to democratise information understanding and access. This is due to the fact that eHealth addresses the challenges of new and existing models of healthcare. Specifically eHealth will;

- » Support patient-driven healthcare services to supplement and extend traditional healthcare delivery models and empower patient self-care.
- » Provide for increased level of information flow, transparency, customisation, patient choice and responsibility-taking, as well as quantitative, predictive and preventive aspects.
- » Support the partnering and collaboration between healthcare professionals, care providers and patients by facilitating transparency and co-operation in the care delivery process.
- » Enhance the potential to improve both traditional healthcare systems and expand the concept of healthcare through new services.

4.1 eHealth and the Patient

The new models of healthcare and improved access to knowledge for healthcare professionals which is enabled by eHealth will bring about changes in the traditional roles and functions of healthcare professionals providing more flexible development, utilisation and access of knowledge, skills and resources. Improved access to patient-related information across disciplines enables the shift from acute-based to community-based care and the introduction of home care technologies supports self-care through self-monitoring. These changes in healthcare delivery, together with access to powerful healthcare information resources, transform the patient/care provider relationship from a passive one to a more participative and patient-empowered role.

The acknowledgement that patients have an important role to play in their own healthcare requires that they be better supported and better informed to undertake this role effectively. eHealth facilitates improving the patient's health literacy to increase their understanding of available health information. It also promotes easy access to such information and facilitates collaboration with healthcare professionals to select appropriate treatments or management options (shared decision making). Feedback on outcomes and general treatment experiences is also a key feature of eHealth and is an important pillar on which continuous system improvement can be achieved.

4.2 Benefits of eHealth for Health Services Delivery

There is a growing amount of local and international research available to highlight the essential role eHealth can play in delivering a higher quality, safer, more equitable and more efficient health system. The World Health Organisation (WHO) have summarised the benefits of eHealth as shown in table 4.1.

Benefit area	Examples
Access to services	<ul style="list-style-type: none">» Ability to deliver basic and enhanced health services to rural and remote communities» Ability for patients to locate health-care providers that offer the services they require» Access to second medical opinion from remote specialists
Efficiency gains in health services delivery	<ul style="list-style-type: none">» Enhanced health workforce productivity due to greater efficiencies in obtaining patient information, record keeping, administration and referrals» Improved utilization of health workforce through remote health-care delivery models
Quality and safety of care	<ul style="list-style-type: none">» Increased adherence to best practice by health-care providers; reduced instances of medically avoidable adverse events» Improved ability to monitor compliance to medications and other treatment regimes
Health monitoring and reporting	<ul style="list-style-type: none">» Improved ability to support surveillance and management of public health interventions» Improved ability to analyse and report on population health outcomes

Access to health knowledge and education	<ul style="list-style-type: none"> » Improved access to health-care provider knowledge sources, including medical literature education, training and other resources » Improved access to consumer health knowledge sources, including health education and awareness, and prevention information for certain health conditions
Operations planning and management	<ul style="list-style-type: none"> » Improved access to quality data sources to inform health-care service and workforce planning and development
Empowering individuals	<ul style="list-style-type: none"> » Improved participation of individuals in self-monitoring and chronic disease management » Improved access to trusted health knowledge sources
Innovation and growth	<ul style="list-style-type: none"> » Increased standardization of information exchange and communication between different segments, agencies and organisations » Increase opportunity for market innovation through access to eHealth standards

4.3 eHealth Stakeholder Benefits Summary

The benefits of eHealth can be broken down by stakeholder type and summarised as shown in table 4.2.

Stakeholder	Impact of eHealth
Patients/Citizens	<ul style="list-style-type: none"> » Enables personalised, preventative and proactive care throughout the health system and across the lifespan. » Patient/Citizen is empowered to manage their own health journey. » When patients/citizens interact with the healthcare system, healthcare providers will know who they are and have access to relevant details of their health information. » Will have the ability to access their own health records and maintain a personal health diary. » Will have confidence that their health information is managed securely and confidentially. » Will have the ability to better manage their own health through access to reliable and accredited sources of health information. » Focuses on prevention, education and self-management through individual care plans. » Care can be brought to remote rural areas where distance to care may otherwise have been an issue. Mobility is supported.
Care Providers	<ul style="list-style-type: none"> » Gives access to current, specialised, accredited knowledge for clinical care, research and public health; and to research, publications and databases » Enables better communication between patients and providers regardless of physical distance between them. » Makes high-quality distance learning for basic and continuing professional education readily available. » Allows remote consultations with patients, for second opinions, and with professional networks.

Healthcare Management	<ul style="list-style-type: none"> » Establishes hospitals as a virtual network of providers, connecting all levels of the System. » Monitors quality and safety; improves care processes and reduces the possibility of medical errors. » Allows transparency of delivery system and enables budget, pricing, billing, claims and resource management systems. » Assists mobility of citizens and their medical records – providing patient information when and where needed. » Opens new opportunities in basic and applied research; from health knowledge to policy and action. » Delivers more reliable, responsive and timely reporting on public health; as health becomes increasingly central to economy, security, foreign affairs and international relationships. » Identifies disease and risk factor trends; analyses demographic, social and health data; models diseases in populations.
Business and Economic	<ul style="list-style-type: none"> » Investment in eHealth brings new markets and encourages business start-up and entrepreneurial activities. » Such eHealth services are imminently exportable once developed. » Development and innovation of eHealth services will lead to extensive research and development and product opportunities.

Table 4.2. Overall summary of benefits associated with eHealth by stakeholder group

4.4 eHealth Benefits to Ireland

Figure 4.1 summarises the benefits Ireland can expect to yield from investment in eHealth. These are broadly defined in terms of Population Wellbeing, Economic Development and Improved Health Services.

For each of these three areas, the associated benefits of eHealth can be summarised as follows;

Population Wellbeing

- » **Prevention Focused.** eHealth brings a change of focus from sickness-management to prevention and wellness-maintenance.
- » **Empowered Patients.** eHealth allows consumers to proactively manage their own health and to have oversight and input at all times to their medical information. Empowerment is further aided by improvements in health literacy.
- » **Improved Outcomes.** Working with high quality, relevant, accurate, timely and prevention-focused information brings improved patient outcomes.
- » **Access.** eHealth will allow online access to healthcare systems including scheduling, prescription ordering, referrals and telehealth monitoring from the home environment. Typically this is done via an easy-to-access Patient Portal.

- » **Transparency.** eHealth makes all relevant information readily available to the patient. All relevant information the patient needs to inform decision making is available to them.
- » **Public Health.** Public health is greatly enhanced by the availability of high quality and accurate data sets which can be readily accessed and mined. Trends in population data can be observed and if necessary interventions can be enacted. Valuable longitudinal studies can be performed from anonymised data sets which can be used to inform national policy.

Improved Health Services

- » **Efficiencies.** eHealth brings efficiencies within health delivery services through the use of information systems. Availability of high quality, timely and accurate data contributes to reduction of duplication of services, reduced adverse events and more efficient use of resources.
- » **Safer.** eHealth reduces the opportunities for error within health delivery services through information based workflows and automated processes. Adverse events such as medical errors (prescription errors for example) are reduced.
- » **Health Service Reform.** The current Irish health service reorganisation will improve the quality of health service delivery. eHealth is a fundamental enabler of this reform process.

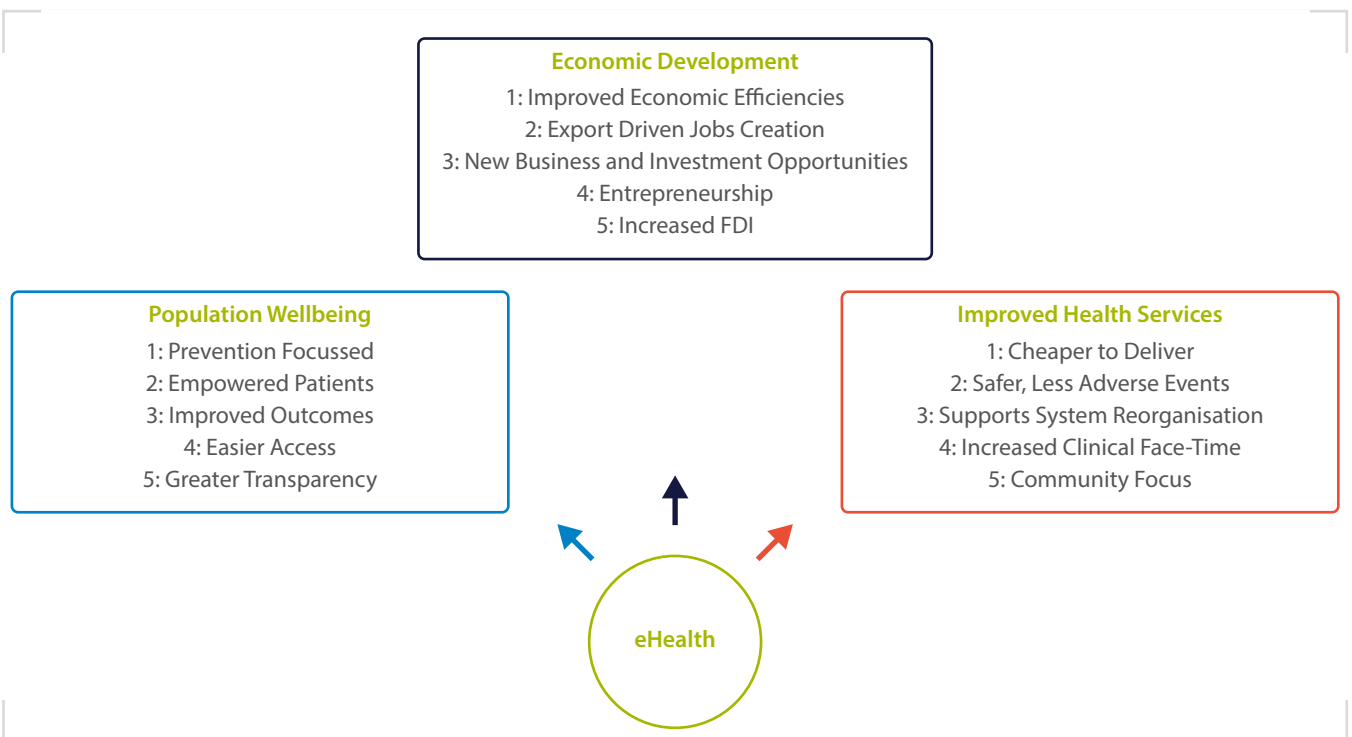


Figure 4.1. eHealth will deliver benefits to Ireland across three broad areas as shown.

- » **Increased Clinical Face Time.** By freeing up resources on typical administrative roles, clinical staff can devote more face time to patients allowing them to optimise individual care plans.
- » **Community Focus.** The focus of healthcare delivery is increasingly moving to a community-based model. eHealth allows remote monitoring and management of patients from settings such as the home and allow consultations to be conducted regardless of distance between patient and doctor. Travel time is reduced for the patient and general convenience is improved.

Economic Development

In May 2013, the *Economy and Jobs Initiative Task and Finish Group of Northern Ireland* published a report on the link between health, healthcare technologies and jobs and the economy. They concluded²⁸...

“Currently the Health and Social Care (HSC) budget is not viewed as an annual investment in the Northern Ireland economy. It is critical that the HSC should be acknowledged as an economic contributor in the same way as many of our other economic sectors (i.e. advanced materials, aerospace etc.) If the DHSSPS and HSC are to become a major driver for both innovation and economic growth it is essential that this potential be harnessed urgently to exploit opportunities and develop a supply chain at a local, national and international level”...

This represents the current mind-set shift as seeing eHealth spending not as a cost burden but rather as an investment. The emergence of eHealth with its associated potential for jobs creation reinforces this view which is being widely held internationally and in particular at EU level. Specifically an ‘eHealth Economy’ will offer the following economic opportunities (covered later in the strategy).

- » **Improved Economic Efficiencies.** eHealth systems will drive efficiencies and improved productivity which allows more to be done more with existing resources.
- » **Export-Driven Jobs Creation.** eHealth services once developed are imminently exportable. Therefore investment locally in eHealth infrastructure and services can open up markets beyond the boundaries of where they were developed.
- » **Entrepreneurship and Start-Ups.** There is significant start-up and SME growth potential within the eHealth sector (see section 9.5) particularly at the heart of Europe and Ireland is well positioned to capitalise.
- » **Increased Foreign Direct Investment (FDI).** The eHealth industry cuts across many domains including ICT, Medical devices, Pharma/Bio and Financial Services. These industry sectors are investing heavily in eHealth and a supportive ‘eHealth-friendly’ economy within Ireland will be helpful in securing significant amounts of this investment.

(Note: Chapter 9 deals with these in detail)

4.5 Re-designing Work Practices

eHealth deployments by their very nature are disruptive and international experience has shown that their success can be measured by an organisation's ability to adapt work practices and processes. eHealth needs to be viewed as a process re-engineering activity facilitated through the use of information systems rather than a 'pure' ICT project per se. The distinction here is important, because the decision to utilise eHealth solutions and the consequent planning and execution needs to be based on the recognition of a business need, the understanding and acceptance of any potential change management implications, the identification and provision of the required resources and the establishment of an authoritative governance and project management structure. In addition, the importance of stakeholder engagement and in particular clinical engagement is obvious in order to achieve a successful eHealth project in which full benefits are realised by all parties. Figure 4.2 outlines the key elements in such an eHealth project.

The importance of process reorganisation and adaptation of work practices must be re-emphasised as failure to do so will result in an even more confused and costly system than before. Hal Wolf of Kaiser Permanente²⁹ in the USA (one of the earliest and most successful adapters of eHealth technologies) summarises this as follows;

$$\begin{array}{rccccccc}
 \mathbf{NT} & & + & & \mathbf{OO} & & = & & \mathbf{COO} \\
 \text{New} & & & & \text{Old} & & & & \text{Costly Old} \\
 \text{Technology} & + & & & \text{Organisation} & = & & & \text{Organisation}
 \end{array}$$

Issues such as skills and training of staff therefore are as important as pure technical competency when it comes to integrating eHealth technologies and redesigning work practices and processes.

4.6 eHealth and the Health Services Reform Programme

The Irish health system is currently undergoing "the most fundamental reform of our health services in the history of the state"¹⁵. This reform programme has been outlined in the policy document *Future Health – A Strategic Framework for Reform of the Health Service 2012-2015*¹⁵. This policy document has identified four major pillars of reform mainly;

- » **Health & Wellbeing.** This has been termed "Keeping People Healthy". This principle is very much about prevention and the promotion of wellness among the population (as opposed to just treating sickness). This focus on prevention is articulated in the *Healthy Ireland*³⁰ framework document. eHealth is a key enabler in the delivery of the vision articulated in this framework.

- » **Service Reform.** This pillar is concerned with moving the delivery services away from a hospital-centric model of care to more efficient primary and preventative-based model. The focus is on treating patients at the lowest level of complexity and focuses on integrating care across the care settings. eHealth by its very nature supports community-based care and enables integration of systems across the care spectrum.
- » **Structural Reform.** The health services system will move from a centralised model to a more devolved model based on granting healthcare professionals greater operational freedom provided budgetary, quality and access outcomes are met. This will involve major structural reform of both the delivery systems in the current HSE structures and also the Department of Health.
- » **Financial Reform.** The current block-grant funding model will be replaced with a Money Follows the Patient model initially outlined in the policy document *Money Follows the Patient – Policy Paper on Hospital Financing*¹⁶. Money Follows the Patient will introduce payment based on outcomes and quantity and quality of the services delivered. Local autonomy and innovation will be encouraged in order to improve key operational performance metrics.

Healthcare providers will also need to comply with the *National Standards for Safer Better Healthcare*³¹ and which will form the basis for future licensing.

Extensive information processing systems will need to be in place in order to enable this reform programme and this has been recognised previously in the various policy documents including;

"The Success of all these reforms will depend on significant improvements in information and in the IT infrastructure to support the integrated and effective utilisation of that information..." - Future Health – A Strategic Framework for Reform of the Health Service 2012-2015¹⁵

"High calibre health information will be the lifeblood of quality, safety, payment and other regulatory processes within the future health landscape... Having good quality health information and effective ICT systems that facilitate the efficient collection, analysis and use of such information is therefore, critical for enhancing the overall capacity and performance of the health system and facilitating implementation of the reform programme" - The Path to Universal Healthcare – Preliminary Paper on Universal Health Insurance¹⁷

eHealth will play a critical enabling role in the delivery of these major reforms and the success of the reform program will be contingent on successful eHealth implementations based on process reform and ICT enablement. Without successful implementation and utilisation of eHealth systems and processes, the governance and structural re-organisation and consequent

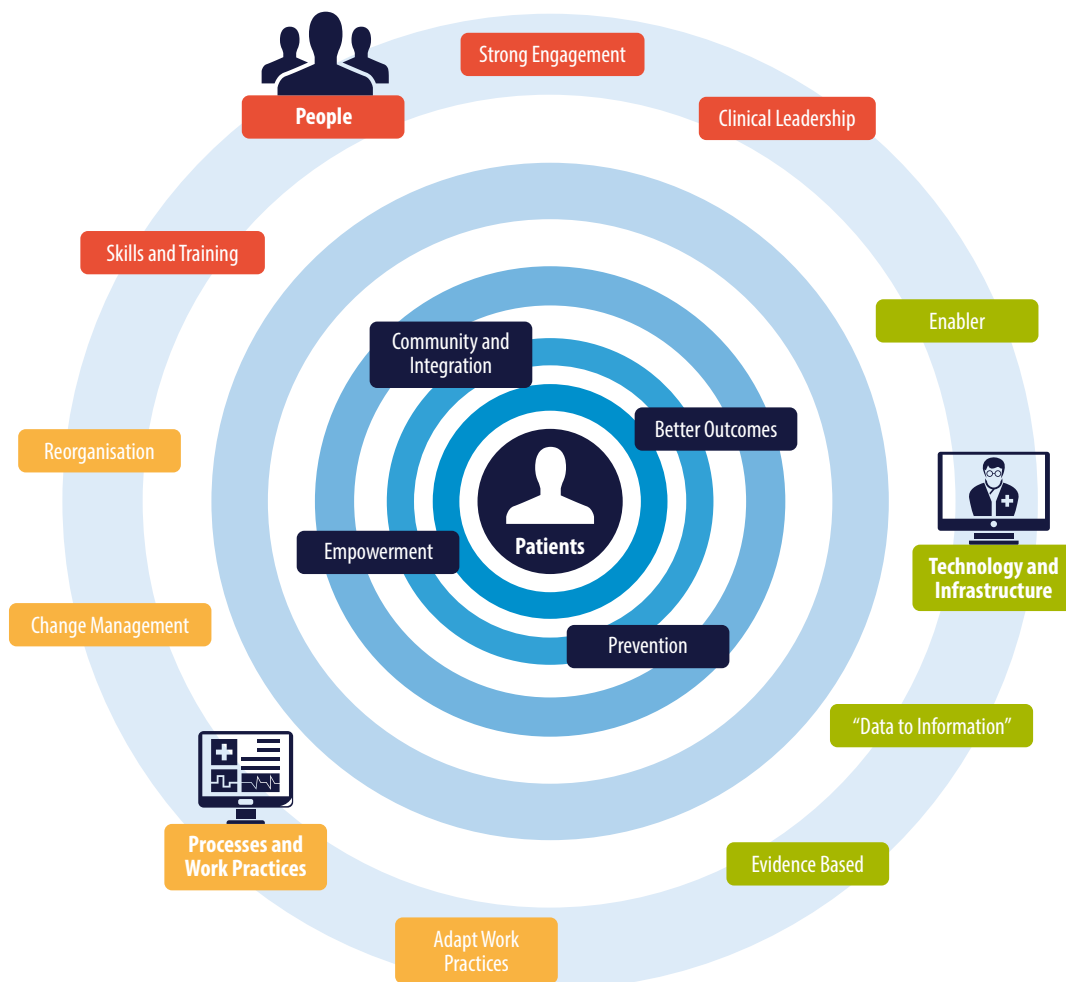


Figure 4.2. The key players in a successful eHealth deployment are shown here. It is critical that all of the players are actively engaged from the outset of an eHealth project

The decision to utilise eHealth solutions and the consequent planning and execution needs to be based on the recognition of a business need, the understanding and acceptance of any potential change management implications, the identification and provision of the required resources and the establishment of an authoritative governance and project management structure

ongoing management and service delivery objectives will not be achieved. The achievement of aspirations for health and wellbeing defined in *Healthy Ireland*³⁰ are underpinned by the high quality and accurate data and information to monitor lifestyle and environment which can only be generated through eHealth.

This fundamental dependence on eHealth is illustrated by the *Money Follows The Patient* reform which indicates the creation of functions that will be heavily reliant on the existence of powerful information systems. These include;

- 1 Pricing Systems
- 2 Billing systems.
- 3 Claims Management systems.
- 4 Patient Level Costing (PLC) systems.
- 5 Contracts commissioning systems.
- 6 Auditing Systems
- 7 Grouper Systems for Diagnostic Related Group (DRG) categories
- 8 Performance Indicator Systems. These will be visible to the consumer/patient and include;
 - Price (per procedure or DRG).
 - Performance ranking system indicators by DRG.
 - Waiting times.
 - Average Length of Stay (ALOS) information.
 - Plus other criteria for assessing the performance of the healthcare delivery system.

eHealth enabled information systems also enable the integration of the Primary, Social and Community Care settings.

Figure 4.3 outlines the various modules that are central to the current services reform programme and indicate how eHealth information systems will be central components.

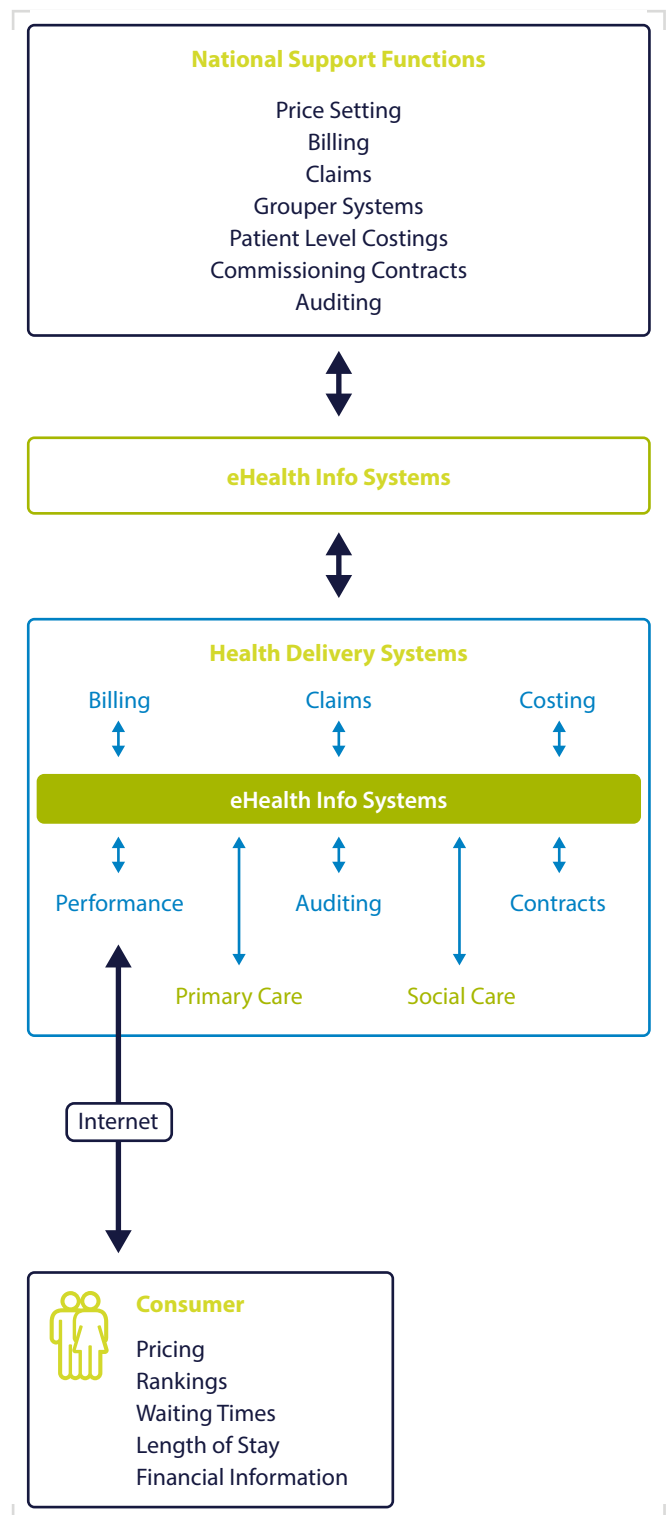


Figure 4.3. eHealth information systems will act as fundamental enablers to the health services reform programme currently underway.

Chapter 4: Summary

eHealth systems enable a safer, more efficient, higher quality of delivery, easier to access and more transparent health service. Individual empowerment and a focus on prevention are key outputs of eHealth systems. Investment in eHealth systems will not just benefit the delivery systems but will catalyse economic development through export-led job creation. eHealth deployments are disruptive in nature and should be viewed as process re-design projects enabled by information systems rather than technology projects per se. Clinical engagement and leadership is therefore critical to a successful strategy implementation. Successful eHealth delivery will be a fundamental enabler of the current healthcare reform program and the realisation of the vision set out in the *Healthy Ireland* framework.

All major healthcare policy organisations have recognised the increasing value proposition of eHealth systems and its role in bridging the ‘Digital Divide’. These organisations have also implemented programs and initiatives to aid its development.

World Health Organisation (WHO)

The fifty-eight World Health Assembly in May 2005 adopted a resolution setting up a ‘Global eHealth Strategy’ within the World Health Organisation. The same year the WHO set up the ‘Global Observatory for eHealth (GOe)’ with the remit of studying, monitoring and promoting the role of eHealth in health services and systems globally. The GOe has published many documents³² looking at areas such as telemedicine, internet safety and security, mobility, legal issues and patient records. The WHO has stated...

“eHealth is changing health-care delivery today and is at the core of responsive health systems. The daily business of health relies on information and communication and, increasingly, on the technologies that enable it, at every level and in every country. This is equally so in delivering care, deploying personnel, managing programmes or conducting research. The case for adopting these technologies has been evident for over a decade. However, it has taken a crisis in the health sector in many countries to move eHealth from the periphery to the centre of strategic health planning. In an increasingly digital world, spurred by technological advances, economic investment, and social and cultural changes, there is growing recognition that inevitably the health sector must integrate ICT into its way of doing business. This applies whether the goal is to reach all citizens with high-quality, equitable and safe care, or to meet obligations for public health research, reporting and humanitarian action.”

In support of this the WHO have published an *eHealth Strategy Development Toolkit* to help countries along the path to eHealth maturity. The document outlines a recommended approach to development and includes considerations such as stakeholder engagement, policy and governance models.

European Union

The European Union has embraced the concept of eHealth and sees it as a core activity for healthcare systems of the future. It has stated³³ that eHealth will;

- » *Improve citizens’ health by making life-saving information available – between countries when necessary – using eHealth tools.*
- » *Increase healthcare quality and access by making eHealth part of health policy and coordinating EU countries’ political, financial and technical strategies.*
- » *Make eHealth tools more effective, user-friendly and widely accepted by involving professionals and patients in strategy, design and implementation.*

The EU’s eHealth policy evolution can be traced from around 2004 with its first *eHealth Action Plan*³⁴. This plan called on member states to develop an eHealth roadmap to 2010. Part of achieving the Lisbon Strategy - an EU plan to create a dynamic and competitive knowledge-based economy - the *eHealth Action Plan* set out the creation of a European ‘eHealth area’, with free patient mobility and empowerment of the citizen through eHealth services. Various other initiatives including *Renewing Health*³⁵ in 2008 progressed the eHealth agenda and addressed topics such as medical record interoperability and standards across the region and resulted in the epSOS³⁶ project in which 23 countries are working together to pilot cross-border medical record patient summaries and ePrescribing solutions. The most recent major publication from the EU has been the *e-Health Action Plan 2012-2020 – Innovative Healthcare for the 21st Century* in which the Commission reaffirms the vision and impact of eHealth systems and identifies some of the barriers to adoption and strategies for removal of these barriers. It affirms that...

“eHealth can benefit citizens, patients, health and care professionals but also health organisations and public authorities. eHealth, when applied effectively, delivers more personalised ‘citizen-centric’ healthcare, which is more targeted, effective and efficient and helps reduce errors, as well as the length of hospitalisation. It facilitates socio-economic inclusion and equality, quality of life and patient empowerment through greater transparency, access to services and information and the use of social media for health.”

Within the EU there is also recognition that the deployment of eHealth solutions could be crucial to tackling the *integration* of health and social care. This is evidenced by the Assembly of European Regions (AER) recently launched Smartcare³⁷ project.

The EU's identification of the importance of eHealth is demonstrated by the allocation of over €6 Billion to healthcare system innovation in the Framework Seven Program (FP7)³⁸. *Horizon 2020*³⁹ the replacement for FP7, to commence in January 2014, has indicated a budget in the order of €8 Billion will be allocated to healthcare, demographic change and wellbeing. Importantly, a priority under Horizon 2020 will be the commercialisation of technologies or 'Lab to Market' as it is called. Other initiatives included will be availability of finance for innovative companies including start-ups and the twinning of centres of excellence, both emerging and existing, across Europe. This can be important in the development of an 'eHealth Ecosystem' which will be dealt with in section 9.2. Administration and bureaucracy will also be reduced from FP7 with a commitment of a 100 day turnaround on results for funding applications.

Commercialisation of technologies including healthcare technologies has been weak to date and it is hoped this extra focus will help stimulate economic development and SME growth across the EU region. There is a significant opportunity for academic, industry and public institutions to get involved. Note: of all FP7 funding to Irish institutions to date, approximately 13% has been to public sector organisations and research performing organisations⁴⁰. Horizon 2020 represents an opportunity to correct this and ensure that this substantial support for innovation is fully exploited.

Chapter 5: Summary

eHealth is viewed by the WHO and the EU as not just a methodology whereby safer and higher quality care can be delivered but also as a means of bridging the so called 'Digital Divide'. These policy organisations have put significant funding and supports in place for adoption and proliferation of eHealth systems. Ireland can benefit from access to European Union funding programs and in particular the upcoming Horizon 2020 program.





The principal characteristics of eHealth are its potential to be a catalyst of change and its ability to democratise information understanding and access. This is due to the fact that eHealth addresses the challenges of new and existing models of healthcare.

6 International Experiences

To ensure that Ireland realises the potential from eHealth, it is important to establish an effective governance, management and implementation structure. To support the identification of such a structure and help define its essential characteristics, a review of international eHealth experiences has been undertaken to examine best-practice criteria for success. This review included England, Scotland, Northern Ireland, The Netherlands, Germany, Denmark, Australia and Canada. These were selected as they represent various approaches to eHealth implementation and have shown varying degrees of success and therefore key factors of both success and failure can be examined. The major output of this review was the definition of best-practice guidelines and criteria to identify the optimum governance and operational structure required for implementation. These criteria are listed and are used to identify an optimum model for Ireland in section 10.2 of this strategy.

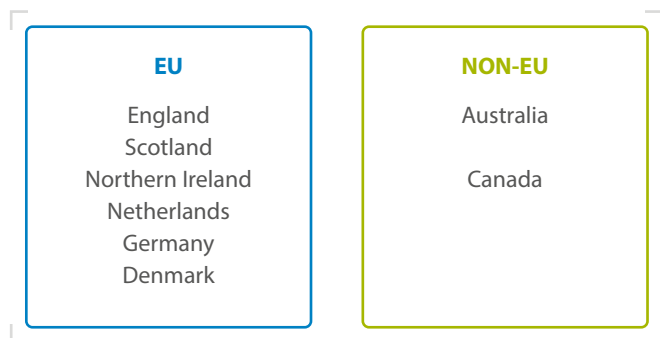


Figure 6.1. National Health systems with eHealth experiences relevant to Ireland.

6.1 Key Points from International Experiences

Summary of Key Points from International Experiences

- 1 Focus and Scope.** Deployment of eHealth Systems is a complex task and needs to be planned properly. Best-practice recommends that a dedicated implementation entity can work best. eHealth is increasingly being viewed as having impact to more than just health delivery services alone. The economic development potential of eHealth investment and execution is now also widely accepted. An implementation strategy needs to take ownership for all aspects of eHealth programs and work with stakeholders as appropriate to maximise the return of investment across *all* areas (patient wellbeing, health services, economy, R&D etc).
- 2 Governance.** Strong governance and leadership is required and clear operational models/roadmaps need to be agreed by all early on in the execution phases. The delivery entity should have overall governance for implementation and manage funding allocations. The funding should be allocated on a milestone/deliverable stage-gate basis, held centrally and awarded to local delivery organisations as an innovation incentive.
- 3 Deploy in Phases.** Using a phased approach to implementation based on national priorities and building up to scale makes more sense than larger 'big bang' deployments.
- 4 Standards.** Deployments should be based where possible on proven international standards such as HL7, CEN and ISO which have been successfully implemented.
- 5 Infrastructure.** Development of a secure network infrastructure is important and this should be shared across public and private healthcare systems. Public investment in these 'building blocks' is warranted and is a key 'enabler' to the applications that will be deployed on top.
- 6 Process Re-Engineering.** eHealth deployments should be viewed as process re-engineering and change management enabling through the use of information systems rather than ICT projects per se. Much up front effort needs to be directed at organisational impact analysis and change management aspects.

-
- 7** **National Oversight, Local Innovation.** A national oversight approach for key aspects such as standards and interoperability combined with local innovation and incentivisation should be adopted.

 - 8** **Stakeholder Engagement.** Front line and clinical engagement is critical and these stakeholders should be 'champions' of eHealth solutions. Engagement with further stakeholders including patient groups, advocacy organisations and standards bodies should be factored in early in the process.

 - 9** **Health Identifier.** A unique identifier is a cornerstone of most eHealth systems. What needs to be decided is the format this takes. Smart cards have proven to be troublesome to date in terms of privacy and security. Ideally re-use of existing public infrastructure is advisable. Proper legislation needs to account for privacy and security issues.

 - 10** **Leverage existing investments.** Leverage existing investments wherever possible. For example in Ireland the Integrated Services Framework (ISF).

 - 11** **Branding and Awareness.** The delivery entity should be strongly branded and there should be strong and early engagement with the public. Campaigns of public awareness, education and benefits should be launched.

 - 12** **Skills.** The deficit of adequate health informatics skills needs to be addressed. Skills development and training are therefore necessary parts of an implementation program.

Table 6.1. Summary of international eHealth experiences, best-practices and lessons-learned. These can be used as the basis for an action plan for Ireland's eHealth implementation.

Chapter 6: Summary

In terms of international experiences of eHealth, it has been noted that the trend is towards establishing a strongly branded national entity to oversee the eHealth journey and many countries have already done this. A central component is the existence of a national health identifier number from which unique patient identification can be based. Europe has seen the widespread use of healthcare insurance cards and so called smart-cards have proven problematic for issues of privacy, security and trust. Innovative funding models and collaborative 'Ecosystems' are increasingly being recognised as fundamental enablers as are the availability of suitably qualified resources and skills. eHealth systems by their nature need to be viewed as process reorganisation programs and experience emphasises the need for strong leadership and governance models combined with strong stakeholder engagement and clinical leadership. The economic development opportunities inherent to eHealth investment are being increasingly emphasised also and this is very evident in the case of Northern Ireland.

A full country by country treatment of international experiences is given in Appendix A.

7 Healthcare ICT in Ireland

Within Healthcare ICT in Ireland, the Department of Health is responsible for setting overall policy. The Health Service Executive (HSE), has operational responsibility for planning, delivering and operating the Healthcare ICT infrastructure, and the Health Information and Quality Authority (HIQA) is responsible for developing standards for information structures and assessing compliance with those standards. Funding for all Healthcare ICT activities in the public sector needs to be ultimately approved by the Government's Department of Public Expenditure and Reforms Office of the Government Chief Information Officer (OGCIO). In regards to capital expenditure, such approval is required prior to procurement and depending on the extent of investment required, is subject to external peer review.

The Health Service Executive (HSE) Information and Communications Technology (ICT) Directorate is responsible for supporting the ICT function within Ireland's current public healthcare delivery sector. The Directorate has just under 300 active projects and initiatives in place at present (2013) and supports approximately 95,000 staff and over 45,000 devices. The annual budget is in the order of 0.85% of total healthcare expenditure compared against an EU average of between 2% and 3%.

Public confidence in the healthcare services ability to deliver healthcare ICT projects has been quite low due to negative past experiences and many lessons can be learned, however past experience should not inhibit the realisation of the potential of eHealth. Most important is the need for proper planning and governance and organisational engagement in any major disruptive undertaking such as eHealth. This needs to be supported by efficient and agile procurement processes which to date have been cumbersome and inefficient and in the context of a successful eHealth implementation would be a barrier to implementation. The public image of major eHealth projects needs to be proactively managed and governance mechanisms, funding models and benefits realisation need to be transparent.

7.1 Healthcare ICT Activities in Ireland – A Snapshot

There are many examples of innovation and initiatives that have been developed both from within the public health system at national level and also from around the country at local and regional level. The following is a brief snapshot of some of these.

(Note: these examples were not chosen in any particular order of priority, they are merely an indication of the range and scope of the activities that are on-going. The BioBusiness Report "*Connected Health in Ireland – An All Island Review*"⁴¹ completed in 2010 provides a more comprehensive review of eHealth (Connected Health) activities happening on the Island).

Case Study 1. The HSE's ICT National Integrated Services Framework

As noted earlier, a national approach to interoperability is vital to Ireland's eHealth agenda as it drives toward more electronic interconnectivity and contributes to delivering anticipated cost savings, enhanced health delivery opportunities including *Money Follows the Patient and Universal Health Insurance*. Within the Irish healthcare setting there exists an increasing demand for greater healthcare information exchange between individual practitioners, provider organisations and government agencies. As demonstrated internationally, in order for interoperability to succeed it is necessary to establish and apply a suite of nationally-defined standards, and in recognition of this need the Health Services Executive (HSE) has established the *National ICT Integrated Services Framework (ISF)*.

The ISF is an Interoperability Framework offering a shared standards-based tool and language for defining and aligning the business and interoperability context for Ireland's eHealth systems. Most importantly, it provides a services architecture which is independent of technology. eHealth does not only apply to a healthcare organisation in isolation but also to the exchange of clinical information on an industry-wide basis. The ISF will enable the HSE to overcome data silos and facilitate systems and services to grow in an aligned and evolutionary manner. The ISF embraces all of the core ICT systems, technologies and associated business processes. It aligns with mandatory national and European standards and associated initiatives including requirements for record portability across jurisdictional boundaries.

The Framework itself is comprised of 12 workstreams and is being developed through a formal tendered arrangement for the acquisition of specialist skills and services. In addition, a collaborative Sharepoint Portal has been established for the sharing of information amongst all stakeholders at both a national and international level.

The focus to date has been on the Information Architecture aspects of the Framework, and 2013 will see the establishment of a number of core components including;

- » The HSE's Standards Based Information Architecture Reference Model (IA-RM)
- » The determination and validation of the HSE's (Standards Based) Master Data Dictionary
- » Terminology Assurance for the IA-RM model based upon SNOMED-CT
- » Determination of the toolsets and management processes required to facilitate integrated governance of the data model, data dictionary and terminology service.

The ISF Framework also has collaborative input from academia and other national agencies. When complete it will ensure key systems

and components can share data in a timely and organised fashion. The Framework has both a technical and a business orientation, and is based upon proven international best practices.

Case Study 2. Healthlink

In operation since 1995, Healthlink is a web-based messaging service which allows secure transmission of clinical patient information between hospitals, healthcare agencies and general practitioners (GPs) in real time. It is now the national messaging broker system and acts as a communications gateway between the healthcare delivery organisations using HL7 as its messaging standard. It interfaces with the local hospital or GP record system and transfers data via a secure network to its messaging servers. The various stakeholders interacting with Healthlink are assigned unique identification numbers which allows them access the system. The main messages transferred include laboratory and radiology information; however others are supported including discharge summaries, referrals and waiting list updates. Healthlink currently operates with 32 live hospitals and 2,877 GPs in its network. Healthlink is an example of a 'micro eHealth' system. Healthlink demonstrates the variation of legacy healthcare ICT systems around the country and the complexity of integrating systems on a national level.

Case Study 3. St. James' Hospital Blood Product Traceability

Infected blood clotting factor was introduced to the international supply chain from the late 1970's right up to around 1985 causing thousands of haemophiliacs to become infected with HIV and Hepatitis C. The Irish Lindsay Tribunal⁴² concluded in 1999 that a minimal figure of 250 people became infected (out of around 400) as a result of this infected product within the supply chain. The tribunal concluded that a major issue was the lack of any real traceability within the supply chain and the inability to locate or recall infected product. In fact infected product continued to be used even *after* a recall was made. A team at St. James' Hospital's National Centre for Hereditary Coagulation Disorders (NCHCD) designed a system in collaboration with industry partners including a global standards organisation (GS1) whereby a 2-dimensional barcode was placed on all blood products it handled and dispensed to its patients. Information about the product collected included batch numbers, expiry dates and other important traceability information. The product barcode was linked to the patient via a customised medical record system. The product was continuously traced through the supply chain as it journeyed to the patient's home via cold chain transport and to the point of use by the patient. At point of use, the patient scanned the product barcode just as he/she used it and the record system back at St. James' hospital was automatically updated. In effect the team introduced a closed loop 'Digital Supply Chain' to its operations. Reported benefits (source: GS1) include⁴³:

- » 100% visibility of all stock, product wastage reduced from €90,000 to €0 in year one.
- » Documentation errors reduced from 12 to 0 the year post implementation.
- » €5 million of medication stock removed from the supply chain.
- » An inventory mock-recall located 100% of stock within 10 minutes.
- » Patients reported 100% satisfaction with convenience.
- » Patients reported 99% satisfaction with privacy and confidentiality.

The system has been very successful to date and is a good example of local collaborative innovation based on established international standards. In addition to this the same care delivery model has been used in the roll out of the HSE National OPAT (Outpatient Parenteral Antimicrobial Therapy)⁴⁴ programme launched in January 2013.

Case Study 4. iheed

iheed⁴⁵ is a social enterprise dedicated to innovation in global health worker training and education. Located in Mitchelstown Co. Cork, its focus is on helping to accelerate the training of millions of new health workers needed to reach the billion people on the planet that still have no access to any health worker and to reduce the 8 million children and 350,000 mothers that still die from simple preventable and treatable conditions in sub Saharan Africa and beyond. iheed approaches this by crowdsourcing global animation expertise from a network of animators to create short 2 minute health training and education lessons. These lessons can be shown on cheap tablets and mobile phones that can be overdubbed in multiple languages. The approach is geared at overcoming literacy and education challenges in the field. The animations address diverse areas from water sanitation, malnutrition, pneumonia to smoking cessation and depression. The model of content creation is equally applicable to reach all citizens with engaging and creative health education messages that resonate with young people and can be viewed on all mobile phone platforms. iheed is a good example of eHealth entrepreneurship for societal benefit. It also demonstrates the potential of the opportunity brought about by the skills shortages (discussed later in section 9.4), mobile technologies and how these can lead to export-related business opportunities.

Case Study 5. Caredoc

Founded in 1999 in Carlow, Caredoc is a not-for-profit remote services organisation led by GPs. The remote services offered include Doctor-on-Call, Telephone Nurse Triage and Community Intervention Team (CIT) support. Over the past 14 years' Caredoc has managed over 3 million patient episodes of care with a 98% patient satisfaction rate and no medical-legal issues. The GP 'out of

hours' service provides coverage to the South East area from 6pm to 8am, 365 days per year and handle over 220,000 patient episodes of care per year. The Caredoc Nurse Telephone Triage service provides coverage to around 1.4 million population (including the Dublin area) and handles around 410,000 episodes of care annually. Services include remote management of COPD and Diabetes. The Caredoc Community Intervention Team (CIT) is a GP-led acute nursing service for patients in their homes designed to reduce hospital admissions (bed/night episodes) and covering the Carlow/Kilkenny area. The CIT service involves community nurses remotely (via rugged tablet devices) monitoring and managing patients healthcare from the home or care setting. Via the tablet device, the patient records (held by GPs and other carers) are updated electronically in real time and ensures that the health record information is always current.

Case Study 6. Miscellaneous Initiatives within the Public Delivery System

Some notable projects from within the public healthcare system include

- » **NIMIS** – The National Integrated Medical Imaging System (NIMIS) is a Picture Archiving and Communications System (PACS) and Radiology Information System (RIS) solution designed to be available in every radiology department in the country. This is one of the largest IT projects ever undertaken within the Irish Health system. The first roll outs started in late 2010 and the project will complete in 2014.
- » **GP Mail**. This is an internal GP 'whitelist' messaging system.
- » **MedLis** is a Laboratory Information System portal that allows traceability and access to post/view results.
- » **Diabetes Shared Care** is a patient-centric diabetes database connecting hospitals and patients.
- » **Online Single Assessment Tool** for assessing and classifying elder frailty and identifying appropriate services.

7.2 eHealth Innovation and Development Activities

There is growing recognition among the Government and its agencies of the increasing importance of eHealth and its potential for the transformation of the health service as well as the associated economic benefits. These have been previously documented in the 2010 report from BioBusiness⁴¹. This recognition has been supported by the work undertaken by the Research Prioritisation Steering Group⁸⁸ and built upon by the Governments Action Plan for Jobs – 2013 Action Plan for Jobs⁴⁶ and further supported by the *Doing More with Digital - National Digital Strategy for Ireland*⁶⁶. It should be noted also that a priority or 'Disruptive Reform' area under this action plan

also includes positioning Ireland as a leader in the data analytics or 'Big Data' area. This will act as a further support to the development of Ireland's eHealth agenda.

State agencies such as Enterprise Ireland (EI) and the Industrial Development Agency (IDA) have been increasingly active in their support of eHealth innovation. Notable initiatives include;

- » **CASALA** (Centre for Affective Solutions for Ambient Living Awareness)⁴⁷. CASALA was established in 2009 under Enterprise Ireland's Applied Research Enhancement (ARE) programme. Its aim is to promote development of Ambient Assisted Living (AAL) solutions for healthy ageing through collaborative research and commercialisation activities.
- » **TRIL**. The IDA has supported the collaborative research program entitled TRIL (Technology Research for Independent Living)⁸¹ which is an applied research centre involving academia, industry, clinical and end-users. TRIL has been concerned with the physical, social and cognitive consequences of ageing and the development and commercialisation of relevant solutions (e.g. Shimmer⁴⁸).
- » **ARCH** (Applied Research for Connected Health)⁴⁹. This is the first of Enterprise Ireland's 'Technology Centre' programs in the eHealth area and was launched in 2013. ARCH is a collaborative innovation centre with the stated aim of conducting "*innovative and applied research to support the deployment, adoption and reimbursement of Connected Health solutions*".
- » **The Insight Centre**⁵⁰. National Centre for Data Analytics. The INSIGHT Centre for Big Data Analytics is a joint initiative between researchers at University College Dublin, NUI Galway, University College Cork, and Dublin City University, as well as other partner institutions. It will bring together a critical mass of more than 200 researchers from Ireland's leading ICT centres to develop a new generation of data analytics technologies in a number of key application areas. The €70m centre is funded by Science Foundation Ireland and a wide range of industry partners. INSIGHT's research focus encompasses a broad range of data analytics technologies and challenges, from machine learning, decision analytics and social network analysis to linked data, recommender systems and the sensor web. Together with more than 30 partner companies INSIGHT researchers are solving critical challenges in the areas of Connected Health and the Discovery Economy.
- » **National Digital Research Centre**⁹³. The National Digital Research Centre (NDRC) sponsors research between research bodies and commercial enterprises. It assists in translating late-stage research into commercial outcomes and has a three month accelerator programme for small digital start-up projects. The NDRC is focused on transforming ideas into viable, investment-friendly entrepreneurial ventures.

» [Health Innovation Hub](#). The Action Plan for Jobs specifically identified eHealth (Connected Health) as a priority area and called for the creation of a National Health Innovation Hub (NHIH) via a Cork 'Demonstrator' Project in 2013 (actions 47, 48 and 49). The intention is that experience gained from the Demonstrator project will inform the development of a National Health Innovation Hub which is a key Disruptive Reform initiative contained in the 2013 Action Plan for Jobs.

Other state agencies such as the Health Research Board (HRB) while traditionally associated with support of pure research, have stated their desire to become increasingly involved in translational research based on outcomes (best for patient, best for Ireland) which includes eHealth.

Chapter 7 Summary

Ireland has a very strong base in the ICT and Life Sciences sector and significant expertise exists within these sectors. Despite being under resourced and often contrary to public opinion, the public health system delivers ICT services nationally and has had some notable successes. There are also many examples of innovative products and solutions that have happened as a result of collaboration between public and private sectors and demonstrate that there are many excellent innovation-focused personnel whose contributions need to be harnessed and supported. The Government has recognised the importance of eHealth and included it as a pillar of its 2013 policy document *Action Plan for Jobs*. The various state agencies have also been relatively active in supporting eHealth initiatives and it is essential that these activities increase to realise stated Government policy objectives.

8 Economic Impact Analysis Summary

The following represents a summary of an economic impact analysis carried out by Dr. Constantin Gurdgiev. The full text can be found in Appendix B.

Changing Patterns of Healthcare Systems

eHealth is widely seen as one of the core tools for addressing some of the financial constraints imposed by demand-led growth. eHealth can also be seen as an effective tool for increasing the economic and financial viability of public health systems during economic downturns.

Some key drivers behind the required efficiency improvements in health systems include;

- » Ireland's shift toward a knowledge and innovation economy heavily dependent on internationalised and highly skilled workforce (Dirks et al, 2010)⁵¹ and;
- » Pressures of an ageing European population (CSO, 2013⁵²).

As the EU Commission (2007) stated⁵³, eHealth can act as a new transformational input to the overall healthcare system by being;

- » A substitute for other resources, such as personnel time.
- » A source of greater efficiencies in delivery of services.
- » A platform for development and provision of new services (such as Telemedicine, data analytics, remote diagnostic and treatment, and resources management systems) (EU Commission, 2006⁵⁴ and 2007).

Return on Investment

A RAND report⁵⁵ noted that very small percentage increases in efficiency as a result of eHealth can have significant knock on to overall healthcare spending, see figure 8.1.

When considering return of investment of an eHealth strategy, there are five main benefit areas to be considered;

1 eHealth Brings Efficiency to Legacy Healthcare Systems.

eHealth systems bring lower costs of operations, and helps to reduce demand pressures on core resources while increasing productivity. The associated returns can be expected to start accruing from year 1 and rising through year 5. In size, these short- to medium-term gains can amount up to 7% of the current operational (ex-capital investment) budget of the HSE (EU Commission, 2008⁵⁶ and UK Department of Health, 2010⁵⁷). This stage of development of an eHealth strategy is also associated with higher risks relating to failure (EU Commission, 2007 and 2008) and skills shortages in healthcare ICT.

2 eHealth Brings Efficiency to New Healthcare Investments.

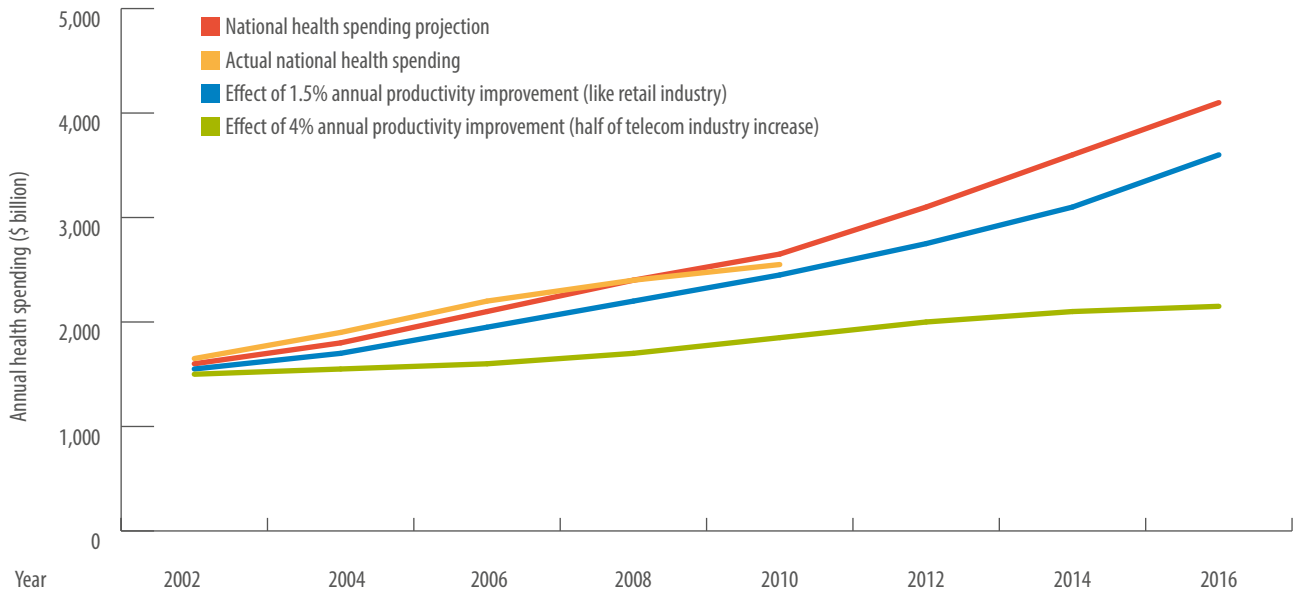
This relates to new eHealth investments within existing systems. Efficiencies occur as a result of the inherent efficiency brought by the eHealth solutions themselves plus the benefits from tighter integration of the newer systems with legacy systems. The opening up of additional services, enabled by eHealth, further enhances returns. In scope, these gains are dependent on overall capital investment and expenditure projections, however estimates suggest that gains margins can range between 5%-7% per annum for capital programmes (DH,2010), to 50%-80% for some operational and administrative programmes (Ingenico, 2012⁵⁸).

3 eHealth Opens Up New Internal Markets. These are internal services markets (see section 9.5) brought about as a result of a strong eHealth-enabled economy. Gurdgiev (2010⁵⁹) forecasts the internal market size for eHealth-related services in Ireland to be €42-€88 million by 2025. Additional positive returns can arise from a more open market for health services in the EU over time, and greater re-orientation of future EU healthcare systems to a 'Money Follows the Patient' model.

4 eHealth Opens Up New Export Markets. Due to the nature of eHealth, once services have been developed, many are ultimately exportable (section 9.5). Benefits can be expected to accrue in years following full deployment of the eHealth platform, with returns scaling up thereafter. Gurdgiev (2010⁶⁰) estimated the size of the market potential for direct eHealth linked exports from Ireland at €559-€573 million per annum through 2020, with employment potential in the order of 2,360 new full-time jobs added and exchequer impact (based on 2010 taxation rates) of approximately €135 million.

5 Increased Wellbeing and Better Patient Outcomes. The economy at large benefits as a result of extended life expectancy, improved quality of life, productivity during treatment and shorter treatment period disruptions to labour supply. Extending the active life of an average employee in Ireland by 1 year can lead to a 1.5% rise in the GDP without taking into the account the savings that can be delivered by reducing demand for healthcare during that period of time (based on CSO, 2013c⁶¹). Based on CSO (2010⁶²) comparatives relative to CBC (2012⁶³), the net effect of deploying a fully operational eHealth platform on time savings and labour market impact (excluding the effect of increased work life duration) in Ireland can be estimated at 0.40%-0.56% of GDP

Possible Improved Productivity Effects of Health Information Technology on Future National Health Spending, 2012-2016



Sources: (1) Hillestad R, et al. Can electronic medical record systems transform healthcare? (Note in text). (2) CMS. National Health Expenditure Accounts [Internet]. Baltimore (MD): CMS: 2010 [cite 6 Dec 2012]. Available from: <http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/tables.pdf>

Figure 8.1. A RAND report forecasted effects of small Healthcare ICT improvements on overall budget spending in the USA.





eHealth is widely seen as one of the core tools for addressing some of the financial constraints imposed by demand-led growth. eHealth can also be seen as an effective tool for increasing the economic and financial viability of public health systems during economic downturns.

9 Capitalising on the eHealth Opportunity

9.1 Background

The healthcare economy is by far the largest economic sector in Ireland with over 120,000 people employed in direct healthcare provision and over 50,000 involved in the medical devices, pharmaceutical and biotechnology sectors. In 2010 the Life Sciences industry in Ireland accounted for over €56 billion of Ireland's exports (over 63% of total exports), and represented 35.5% of national GDP⁶⁴. Ireland is currently home to 15 of the top 20 medical technology companies in the world, 9 of the top 10 global pharmaceutical companies and 9 out of 10 global ICT companies. The Information and Communications Technology (ICT) sector in Ireland employs over 74,000 people (2010) and 9 out of the top 10 global ICT companies have a base in Ireland⁶⁵. The Government Strategy document *Doing More with Digital - National Digital Strategy for Ireland Phase 1 Digital Engagement*⁶⁶ published in July 2013 identified the "digital part of Ireland's economy is growing at 16% per year, more than 10 times the growth rate of the rest of the economy".

In Europe there are almost 15 million people employed in healthcare delivery which accounts for around 9-11% of Europe's GDP. This GDP figure is forecasted to rise as has been noted earlier due to increasing demand (mainly due to ageing populations and rise of chronic diseases). This has been recognised at EU level and in its eHealth Action Plan 2012-2020 states;

"Despite the economic crisis, the market potential of eHealth is strong. The global telemedicine market has grown from \$9.8 billion in 2010 to \$11.6 billion in 2011, and is expected to continue to expand to \$27.3 billion in 2016, representing a compound annual growth rate of 18.6%."

Various initiatives have been launched to respond to increasing healthcare delivery challenges and the opportunities that these challenges present. Examples include the Innovative Medicines Initiative⁶⁷, the European Personalised Medicine Association⁶⁸ and the epSOS⁶⁹ project.

The EU has supported its belief about the potential of healthcare technologies and has invested over €6 billion through the EU Seventh Framework Programme (FP7) to date and will potentially allocate over €8 billion in funding the new Horizon 2020 for 'healthcare, demographic change and wellbeing'⁷⁰.

Within other non-eHealth early-stage growth industries, Ireland has demonstrated a unique capacity to spot opportunities and rapidly install the essential human and physical infrastructure to capture a significant share of the global markets. This is most evident in ICT, Pharmaceutical, Medical Devices and more recently in Social Media and Games/Media Development. In each of these cases, government-led initiatives drove the concentration of educational, R&D and industrial resources to create a development platform for these new sectors.

The eHealth sector has all the hallmarks of many of these domains with respect to significant economic benefits, FDI, quality job creation, workforce up-skilling, and intellectual property development opportunities.

9.2 Building a World Class eHealth Ecosystem

"eHealth ecosystems could be the answer to the strain our social security systems are undergoing. If we work together and we use the enormous potential technology has to offer us, we can ensure top healthcare for all in Europe". Neelie Kroes, European Commission Vice-President for the Digital Agenda speaking in Dublin, May 2013.

It is increasingly being recognised that a fundamental enabler to a successful eHealth strategy is the formation of what is termed an "eHealth Ecosystem". The concept of eHealth 'Ecosystems' is not new and has been around for many years. As early as the 1990s, there were regional efforts in the United States to create 'Health Information Exchanges' (HIEs) that allowed electronic sharing of health information across disparate systems.

An eHealth 'Ecosystem' is a network that encompasses the key stakeholders involved in delivering eHealth deployments providing a common platform for interfacing and rapid access to information and transactions between them. Such a network brings together diverse players who would otherwise be disjointed by facilitating seamless digital flows among them for exchange and reuse of health information.

International experience has shown that the closer the connection between all stakeholders within the eHealth implementation journey in terms of information flow, governance, technology etc, the more likely it is that a successful strategy will be deployed. An example includes innovative procurement models (eProcurement) between Ecosystem members.

The Booz organisation has stated...

"To succeed, e-health initiatives must be considered as ecosystems with many interconnected parts, rather than just technology infrastructures". it is a mistake to conceive of an e-health initiative as merely a technology infrastructure. Instead, it is more properly envisioned as an ecosystem with a variety of essential, interlinked elements: governance policies and regulations, financing model, technology infrastructure, services, and stakeholders. An implementation strategy that takes into account these five aspects of a successful e-health ecosystem will lead to not only improved quality of care, but also financial savings. . ." Booz and Co⁷¹.

The development of an eHealth Ecosystem is consistent with the current global trend toward what is termed 'Open Innovation'. This 'Open Innovation' model is being termed "Open Innovation

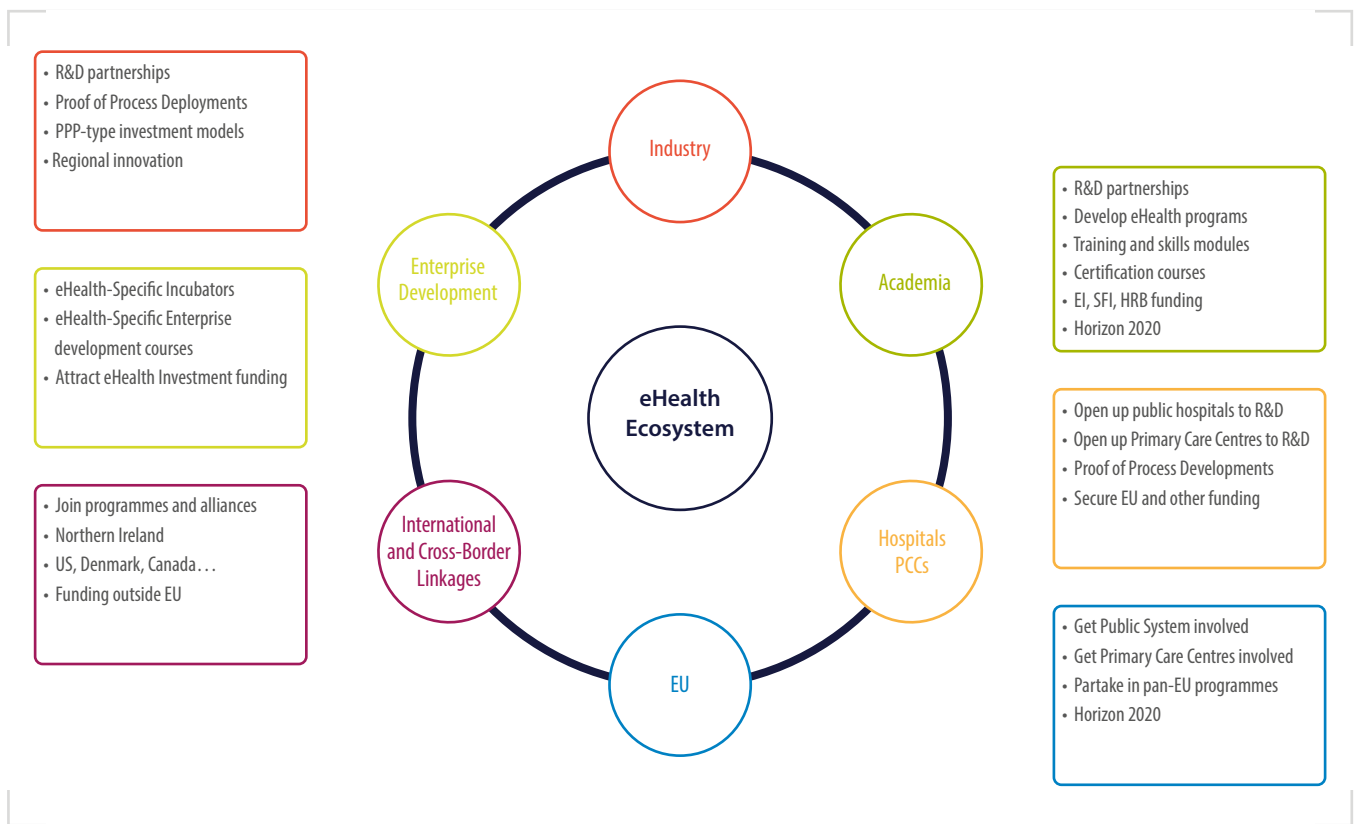


Figure 9.1. A strong eHealth Ireland Collaborative ecosystem is a key enabler to realising eHealth opportunities

2.0⁷² and is essentially an innovation model based on extensive networking and co-creative collaboration between all stakeholders (users, manufacturers, academics and others). A key focus of Open Innovation 2.0 is the focus on customer adoption. The approach is based on partnership and collaborative working techniques. The product development process is very focused on rapid prototyping with iterative and continuous development through to success. It is based on developing systems, solutions and products to meet identified customer needs. Ireland can benefit from the creation of such an Innovation Ecosystem within the eHealth area.

In May 2013 a declaration by the Irish Presidency of the Council of the EU promoted the development of eHealth Ecosystems among member states. It acknowledged that eHealth Ecosystems would contribute to the health and social care agendas in Europe while promoting economic development by;

- » Strengthening coordination of all policies related to eHealth, from support to research and deployment, to developing a legal framework in specific areas like medical devices, patient safety, information security and interoperability.
- » Promoting mutual learning and sharing of good experiences inside ecosystems between purchasers and providers, academia, citizens, industry and throughout the public and private sector health industry.

- » Allowing innovative concepts, products and services to create new markets by applying new sets of rules, values and models, and
- » Accelerating the implementation of existing and proven devices and processes through intensive innovation techniques and innovative procurement tools to ensure that citizens receive the benefits in a shorter timeframe.

It is proposed that within Ireland such an eHealth Ecosystem comprising of academia, industry, hospital groups, primary care and social care centres with strong international and cross-border linkages be set up with a specific remit of advancing the eHealth agenda. International exemplars on which Ireland's Ecosystem can be built include Catalonia Spain (TicSalut)⁷³, Northern Ireland, Oulu in Finland⁷⁴ and the New York eHealth Collaborative⁷⁵.

There is precedence in Ireland for the creation of networks similar in nature to Ecosystems. These include collaborative Research and Development networks (such as 'CSETs', 'Clusters' and 'Technology Centres'). Some notable examples of collaborative research centres in Ireland include the International Energy Research Centre (IERC)⁷⁶, the Irish Centre for Manufacturing Research (ICMR)⁷⁷ and the Microelectronics Circuits Centre Ireland (MCCI)⁷⁸, the Clarity Centre⁷⁹ for Sensor Web Technologies, the Digital Enterprise Research Institute (DERI)⁸⁰ and the Technology Research for Independent

Living (Tril) Centre⁸¹. An eHealth Ecosystem however would be wider in scope and membership and have a commercial focus.

European Union/US Cooperation

The potential for international cooperation on the advancement of eHealth (or Health ICT as it is referred to in the United States) has been recognised for some time. In 2010 the European Union and the United States signed a memorandum of understanding on *Cooperation Surrounding Health Related Information and Communication Technologies*⁸². This understanding was further built on in October 2012 at a conference in Boston and again reiterated in Dublin in May 2013 as part of Ireland's EU Presidency⁸³. This memorandum defines a range of specific areas of cooperation with priority in the first instance agreed as;

- 1 "Development of Internationally recognized and utilized interoperability standards and interoperability implementation specifications for electronic health record systems that meet high standards for security and privacy protection".
- 2 Strategies for development of a skilled health IT workforce and of eHealth/health IT proficiencies in the health professional workforce such that these clinicians can fully utilize the technology's potential to enhance their professional experience and performance".

The roadmap for the coming years will see international demonstrators within the areas of interoperability of systems across international borders (such as personal health records) and will involve large scale pilots and evaluations. There will be significant collaborative work also in identifying the skills gaps within the eHealth domain and development of plans to bridge these gaps and develop innovative training and skills resource competencies.

All-Island Collaboration

Northern Ireland has been very active in the areas of eHealth (or Connected Health) for some time now. The Northern Ireland government has recognised the potential of eHealth beyond the benefits to health services alone but also has recognised the commercial and economic benefits of this emerging industry. The European Connected Health Alliance⁸⁴ (ECHAlliance) was set up to advance, in a not-for-profit manner, the following objectives;

- » *The need to transform Healthcare Delivery, thus enhancing the quality and effectiveness of care.*
- » *The need to develop the 'Connected and MHealth (Mobile Health) Economy', thus enabling innovation and sustainable investment in the expansion of healthcare.*



Figure 9.2. Some examples of eHealth Ecosystems and their supporting infrastructures.

The ECH Alliance has been very successful in setting up an 'Ecosystem' and in fact has attracted other Ecosystems to within its membership including the New York eHealth Collaborative (NYeC)⁸⁵ and the Manchester mHealth Ecosystem⁸⁶. The ECH Alliance industry members include Astra Zeneca, Intel, Bosch, Janssen Healthcare, Care Innovations and others along with many SMEs and micro enterprises. Development of an all-island collaborative Ecosystem would be of major benefit to both jurisdictions and in line with the European Union Directive 2011/EU on Cross Border Healthcare⁸⁷.

9.3 Support for eHealth Innovation

In 2010 the Government established a *Research Prioritisation Steering Group*⁸⁸ to make recommendations on areas of focus for the next phase of Ireland's science, technology and innovation strategy to enable the targeting of the majority budget the state spends on scientific research to areas with the greatest potential for economic return. The groups findings regarding the importance of eHealth (Connected Health) were later reiterated by the 2013 Action Plan For Jobs⁴⁶. The Group's report published in November 2011 was mandated to;

"Recommend areas around which future investment in research with a direct economic motive should be focused and position these in a wider context that recognises the need for investment in underpinning research and platform science and technology, the need for integrating infrastructure, the need for research to support Government policy and the need for some level of untargeted research to address new and unanticipated areas"

The report specifically included eHealth (Connected Health) among the priority areas as having major potential for public health cost-savings, and enterprise development opportunities. It identified the following five objectives to be achieved in the development of technology and enterprise capability and focused research;

- » In conjunction with key stakeholders, including the healthcare system, identify actions required to position Ireland as a test bed for trial, validation and implementation of new connected health technologies and silver technologies, identifying barriers and enabling infrastructure improvements.
- » Identify discrete areas of need within this sector where Ireland can develop technology and enterprise capability and focus research on supporting these opportunities.
- » Fund public health research in areas of patient behaviour, product usability and benefits and barriers to the uptake of new technology in healthcare.
- » Identify and promote convergence opportunities in connected health and silver technologies.
- » Investigate business models and channels to market for connected health technology, products and services where Ireland could become a world leader.

Arising from this report, the Prioritisation Action Group was established to drive implementation of research prioritisation. Working groups were set up to develop action plans for each of the 14 priority areas. The Action Plan for eHealth (Connected Health) and Independent Living contains the following vision and objectives;

Vision/opportunity:

- 1 Ireland as a unique environment for the development, validation and implementation of connected health solutions
- 2 Building on research strengths in ICT, Medical Devices and Life sciences.
- 3 With engagement of all relevant stakeholders (healthcare professionals, patients, enterprise, academia, Government, etc)

Objectives

- 1 Identify areas of overlap between multidisciplinary research strengths and health system needs where pilot eHealth solutions might be developed
- 2 To ensure effective mechanisms for industry engagement with the health system for exchange of ideas and trialling products
- 3 To ensure clinical infrastructure is in place to facilitate development, trial and validation of eHealth solutions
- 4 To ensure a strong supportive regulatory environment for development of eHealth technologies, products and services
- 5 To ensure any skills gaps in supporting development of eHealth solutions in Ireland are addressed

9.4 eHealth Skills Development

The rapid development of eHealth internationally is beginning to transform healthcare provision and stimulate a new economic sector at the intersection of ICT, Healthcare and closely related industries such as Med-Tech and Diagnostics. While Ireland has many of the ingredients to become a global player in this field, the shortage of eHealth skills is a major impediment to active participation in this rapidly developing economic sector. The lack of appropriate eHealth skills will constrain Ireland's front-line adoption of health informatics and will cause healthcare provision to lag behind Europe and the US in delivering better clinical outcomes and delivery efficiencies.

The fact that the eHealth skills shortage is a global phenomenon has been recognised by the EU and the US and plans are now being developed to take collaborative action to address these deficiencies. This presents Ireland with an immediate opportunity as the EU/USA Memorandum of Understanding on eHealth can provide Ireland with access to leading-edge collaborative efforts being undertaken internationally. In order to capture this opportunity there is an immediate need to address Ireland's skills deficit in:

- » The use and application of health information systems and technology in delivering better and more cost-effective healthcare.

- » The innovation, development and support of new eHealth systems and technologies, creating an opportunity for significant foreign direct investment by leading industries as well as a base of new product development for Irish companies.
- » National and international shortages of health informatics specialists.

Scale of the Skills-Related Opportunity

The following brief extracts provide a sense of the skills-related opportunity brought about by eHealth:

"IT jobs in healthcare are expected to grow 20 percent annually through 2018. Competition for skilled IT staff members will only continue to increase." U.S. Bureau of Labor Statistics, August 2011.

"From 2013, starting with the Competitiveness and Innovation Programme and continuing under Horizon 2020, the Commission will support activities aiming at increasing citizens' digital health literacy. For professionals (health and scientific communities) the focus will be on developing evidence-based clinical practice guidelines for telemedicine services with particular emphasis on nursing and social care workers". eHealth Action Plan 2012-2020 - Innovative healthcare for the 21st century - EU Commission, June 2012

Addressing the Skills Shortage

While the scale and scope of the opportunity for Ireland to grow employment in the eHealth economy is significant, the current skills base for eHealth is not encouraging in 2 respects: (i) the "installed base" of active professionals with eHealth skills is very small; and (ii) the relevant capacity within the 3rd level education and research sector is limited.

The current and anticipated skills deficit exists at different levels, ranging from entry-level technicians and support staff to cross-trained clinicians (nurses and doctors), eHealth management and ICT professionals, eHealth researchers and product development specialists. An underlying problem is the low number of eHealth academic specialists who are an essential resource in both: (1) the provision of Health Informatics training across the country, and (2) the establishment of an R&D base and source of eHealth innovation.

In the European context, there are already a range of programmes and directives supporting the development of skills in this sector. These include: the *Digital Agenda for Europe - eCompetence Framework*; the *EU Horizon 2020 R&D Framework*; and various targeted eHealth initiatives. These provide the collaborative environment and the opportunities for funding to address some of the skills needs while working in partnership with colleagues in the Northern Ireland and other European countries.

To respond to the challenge it is now necessary to expedite the training and skills development needs of the eHealth sector by co-ordinating activities to;

- » Identify and address any competency and knowledge deficiencies among healthcare professionals and staff involved in healthcare delivery, management, administration and support in essential ICT skills. As has been noted, lack of such skills can severely hamper eHealth implementations.
- » Build capacity within the health service to address these gaps and skills deficits. There needs to be a deliberate strategy to address these skills and knowledge deficits. Ideally this should be based on *The European e-Competence Framework*, a component of the long term e-skills agenda (e-skills for the 21st Century) of the European Union supported by the European Commission and The Council of Ministers.
- » Approaches should include the development of structured career paths for healthcare ICT and health informatics staff development from entry level through to senior positions. Currently these roles are not recognised as professions within the health sector.

9.5 Building an eHealth 'Services' Industry for Ireland

eHealth should be viewed as an infrastructural investment which brings many benefits not just in relation to improved wellbeing and service efficiencies but as has been noted, to the economy as a whole. eHealth brings about the possibility of new 'Service' models many of which can be performed remotely and over the internet. These new 'Services' models once developed are imminently exportable and thus there is a major incentive to invest/develop these models in Ireland. These 'Services' models can include;

- » **Patient-Centred Healthcare 'Services'**: This category includes provision of direct healthcare support and expertise remotely from a base in Ireland. Examples include teleradiology, telehealthcare (for example monitoring diabetics in Europe from a base in Ireland), call centre triage support and mobile learning development services.
- » **Ancillary 'Services' Provision** – These include traditional 'back-end' office administration functions such as IT systems, Supply Chain, Procurement, Planning and Claims/Billing and other functions that are often treated as 'ancillary' in nature. As healthcare systems look to cut cost, these ancillary functions will be seen as cost burdens and will come under increased scrutiny as areas of cost savings. As healthcare systems globally struggle to cut these costs, opportunities will emerge for these 'ancillary' healthcare functions to be outsourced i.e. be offered

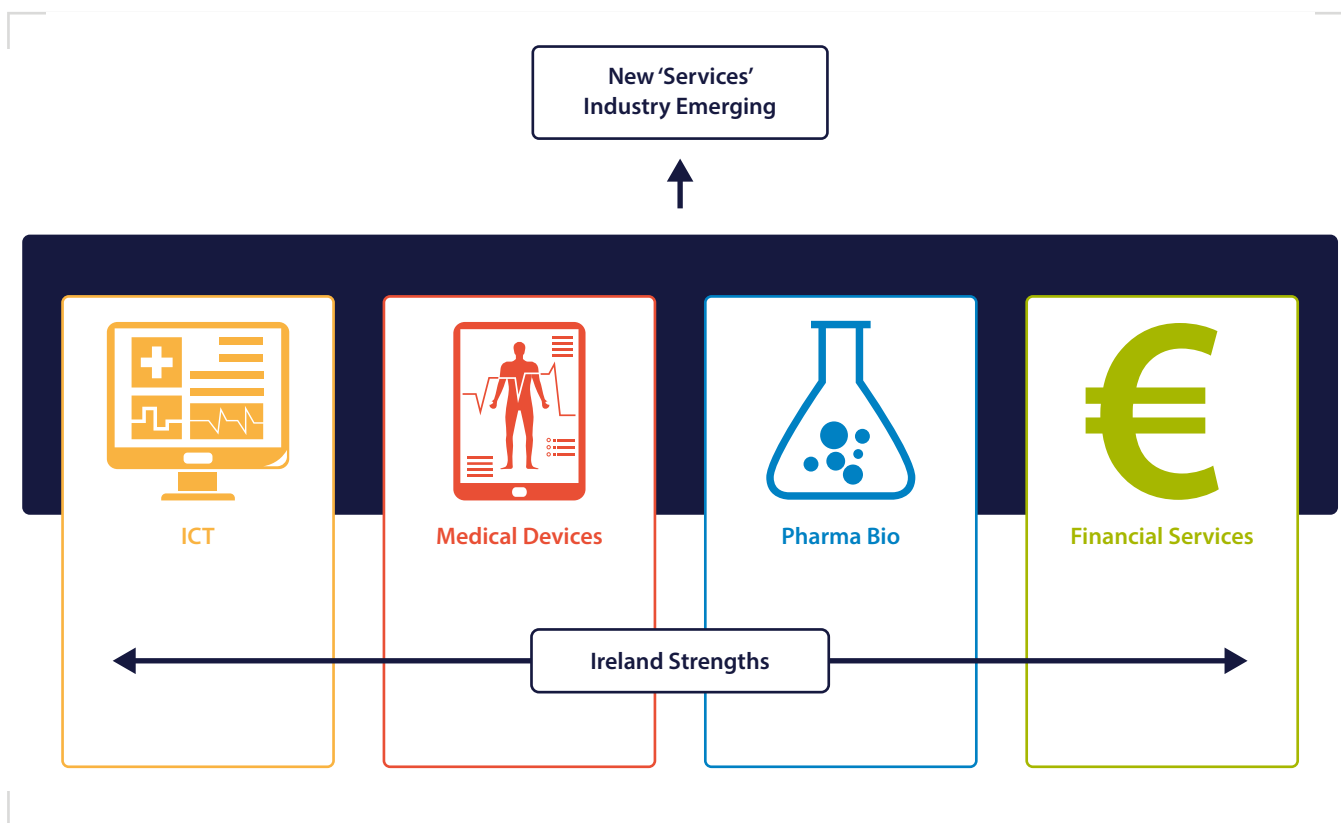


Figure 9.3. Foundational building blocks the emerging eHealth 'services' Industry. Ireland is perfectly positioned to capitalise as these are areas in which Ireland is already strong

as a 'Service' in a classic outsourced customer/provider model. These functions can be offered as 'Services' offerings from a base in Ireland using Cloud Computing-based models.

The potential of Cloud Computing and Social Networking in particular will be important in the move to a more 'Services' type domain and this is an area in which Ireland can excel.

Foundational Pillars Already in Place

Ireland is in a perfect position to avail of the opportunities presented by the growth of this newly emerging eHealth 'Services' industry. This is due to its already strong base in the areas of Medical Devices, ICT, Pharma and Biotechnology and Financial services. It is entirely feasible based on this for Ireland to build an IFSC-like centre for eHealth services that can act as a national centre for export of such services. This IFSC-like centre would be set up for almost no cost and would act as a national centre for eHealth investment. This was described previously in a detailed report entitled *The International Healthcare Services Centre (IHSC)*⁸⁹ and re-iterated by the BioBusiness report of 2010⁴¹

Entrepreneurship

The eHealth start-up area is very active at present. Healthcare IT incubators, accelerators and new ventures are springing up, and the healthcare IT venture capital market is on the rise to support this activity. The Mercom Capital Group reported⁹⁰ that in the USA, venture capital funding totalled nearly \$1.2 billion from 163 deals in 2012 compared to \$480 million from 49 deals in 2011 and \$211 million in 22 deals in 2010. Much of this has been sparked by the US government policy 'Health Information Technology for Economic and Clinical Health' Act (HITECH) of 2009, which allocated \$19.2 billion towards the development of Health IT and as noted by the Mercom Group "... kick-started the entire sector in the United States...". Interestingly, the most sought after investment area was in information management systems focused on providing transparency to DRG/Casemix type systems, including visibility to doctors, hospitals, procedures, pricing and quality. Therefore it is apparent that the current service reorganisation in itself represents an opportunity for enterprise development and entrepreneurship. The Government strategy document *Doing More with Digital - National Digital Strategy for Ireland Phase 1 Digital Engagement*⁹¹ published in July 2013 identified online entrepreneurship and start-

ups as a priority for Ireland and advocated incentive schemes such as “trade-on-line voucher” schemes. The strategy also highlighted the role of agencies such as the Digital Hub Development Agency⁹² and the National Digital Research Centre⁹³ in assisting such online-based start-ups.

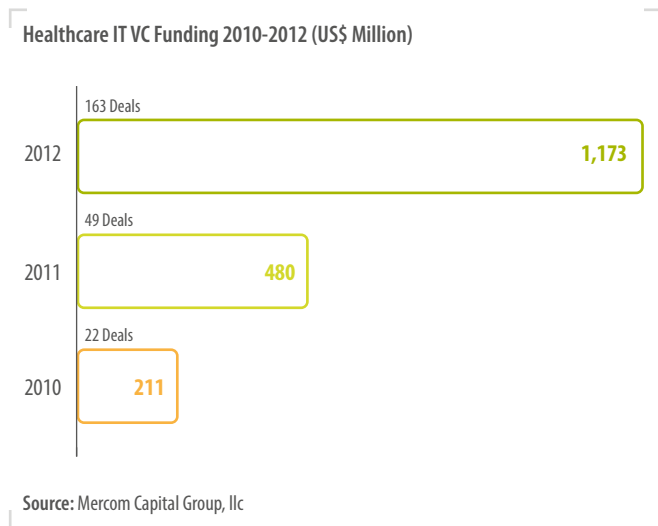


Figure 9.4. eHealth start-ups are ‘hot’ right now as evidenced by venture capital investments.

eHealth start-ups are Different

eHealth start-ups however are very different to other industry domain start-ups and need to be recognised as such. Developing products for the healthcare market requires expertise in healthcare and experience of the regulatory and legal environments. Developing sustainable revenue models and sales and distribution techniques are very different to other industry domains. Time to market also tends to be longer. Specific enterprise development courses tailored to healthcare start-up needs to be developed (similar to the ‘New Frontiers’ programme being run nationally in many Irish third level institutes). These should be developed in partnership with private organisations and specific incubator centres created. These centres will prepare entrepreneurs for the healthcare start-up journey, mentor and guide companies through all stages of development and provide clinical access for products and solutions as they evolve. Specific development funds including angel and venture capital funds need to be attracted (from abroad if necessary) to these centres as there is currently a deficit in health technology-related funds for start-up activities.

Chapter 9: Summary

The Government's *Research Prioritisation Steering Group* has already identified eHealth (Connected Health) as a priority for Ireland and as an investment likely to result in economic gain. These findings were further reinforced by the Government's *Action Plan for Jobs* and the *National Digital Strategy* both published in 2013. Due to its already strong base in key pillar industries, Ireland is in a perfect position to capitalise on the emerging markets related to eHealth. Export led jobs creation will increase through inward investment and indigenous entrepreneur led start-ups. Ireland can benefit from the creation of a strong commercially driven, open and collaborative Innovation Ecosystem that is connected nationally and internationally. An all-island approach makes imminent sense in this regard. To ensure a robust supply of suitably qualified eHealth personnel, there needs to be development of appropriate skills and training modules at all levels including vocational and third level. Ireland needs to take a more active role in European and other international collaborative initiatives in this regard and where appropriate, assume leadership roles. The start-up opportunities of eHealth are substantial and specifically tailored courses and supports including angel and venture capital funds for budding entrepreneurs need to be developed.

10 Implementation - Enabling eHealth in Ireland

In order to realise the full eHealth potential for Ireland a number of key points are critical;

- 1 eHealth must be viewed as a Infrastructural Investment in Ireland's future. There are also precedents for this type of implementation as evidenced by the the work of the National Roads Authority (NRA)⁹⁴ in implementing Ireland's national motorway network.
- 2 In order for eHealth to realise its potential, it is important that it is not reduced to a series of piece-meal pilots and trials. International evidence suggests that such an uncoordinated fragmented approach has no real long term value, is not a good use of public money and certainly will not unlock the potential inherent in a properly executed eHealth Strategy.
- 3 To achieve the maximum impact, a dedicated, fully focused and centrally managed entity to oversee the eHealth implementation journey should be established.

10.1 Generic Enablers of eHealth Systems – Seven Key Pillars

The World Health Organisation has identified²⁷ seven major components that need to be addressed in order to enable a successful eHealth experience as follows;

- 1 Leadership, governance and multi-sector engagement.
- 2 Strategy and investment.
- 3 Legislation, policy and compliance.
- 4 Workforce.
- 5 Standards and interoperability.
- 6 Infrastructure.
- 7 ICT services and applications.

The review of international eHealth experiences has also re-enforced these components as critical enablers and identified that the extent to which they were addressed was reflected in the relative successes of various eHealth implementations.

10.2 Identifying an Optimum Model for eHealth Delivery in Ireland

International best practice experience has indicated that a dedicated entity with full authority and responsibility may be the optimal delivery model. However, each country will have different requirements and objectives and so to properly assess the correct model for Ireland it is useful to define a set of criteria that builds on the WHO criteria shown in section 10.1 and also takes into account the Irish context.

Delivery Model Essential Criteria

The essential criteria that Ireland's delivery model must fulfill are as follows;

- 1 Defined, agreed and acknowledged authority and responsibility.
- 2 Strong and effective leadership and governance structures with stakeholder support and governance input.
- 3 Clear alignment with policy/strategies.
- 4 Agreed strategic direction aligned with agreed funding for development and implementation.
- 5 Administrative/legislative base relative to achievement of strategy objectives.
- 6 Cross government (and its agencies), multi-sectoral support and participation.
- 7 Collaborative focus and working relationships.
- 8 Capability to develop and implement innovative implementation, funding and resourcing strategies.
- 9 Availability of appropriate resources with domain and skills knowledge.
- 10 Unique and strong branding and promotional presence.

Using these criteria as a means of assessing their suitability, four different models for delivering Ireland's eHealth strategy have been considered. The models reflect four different approaches to formation and governance, how the delivery entity would operate, and its level of accountability and support.

Review of Delivery Models

The delivery entity to be formed from within;

1 Within the Health Services Executive (HSE)

Entity formed from within the Health Services Executive's governance and organisational structure. E.g. an eHealth Unit or office.

Pros:

- » Relatively headcount neutral

Cons:

- » HSE ICT function already stretched in terms of resources and budget.
- » Lack of public confidence in HSE to deliver major ICT initiatives.
- » Current plans are for the HSE to be dissolved
- » Centrally-managed and rigorous procurement process.

2 Within an existing Government Department

Entity formed within the Department of Health's governance and organisational structure.

Pros:

- » Established relationships between departments.
- » Can be relatively headcount neutral.

Cons:

- » Government departments in general are focused on policy making and not on implementation.
- » Input from multiple Government Departments can make the governance structure complex.
- » Centrally-managed and rigorous procurement process.
- » Lack of public confidence in the Government Departments to deliver major ICT initiatives.

3 Outsource the delivery entity

Outsourcing (through a tender process) of the entire eHealth delivery function to a third party with previous successful experience of implementation.

Pros:

- » Decoupled from perceived public scepticism of the Health Services ability to deliver major eHealth initiatives.
- » Single supplier facilitates simplified governance and reporting relationships.
- » Experience, expertise and access to skilled resources.
- » Potential for an agile procurement processes.
- » Headcount Neutral.

Cons:

- » Deployments may be driven by the successful bidders own commercial agenda with potential impact on the achievement of eHealth strategy objectives.
- » A single source of supply can also be a single point of failure (SPOF).
- » Potential lack of incentives to innovate locally or to attain cost efficiencies.
- » Potential lack of incentives to pursue the economic imperatives of eHealth (start-ups, R&D etc).
- » Potential lack of collaborative approach.

4 Establish a dedicated statutory agency

An independent and focused agency having full ownership, governance and responsibility for the delivery of Ireland's eHealth strategy.

Pros:

- » Dedicated and focused.
- » Much of the commissioning work can be outsourced but centrally controlled.
- » Allows the flexibility of agile and rapid procurement.
- » Facilitates the development of unique and strong branding.
- » Decoupled from perceived public scepticism on the Health Services ability to deliver major ICT initiatives.
- » Facilitates collaborative cross government, multi-sectoral relationships.
- » Much International experience points to this model as being best practice.
- » There are precedents within Ireland for such infrastructural investment projects being delivered by dedicated and focused agencies working in collaboration with existing agencies and suppliers.
- » Facilitates innovative funding models and public-private partnerships.

Cons:

- » Public perception of the formation of agencies can often be negative.
- » May require legislation to establish *eHealth Ireland* which may impede implementation progress. However an interim organisation could be established within existing structures.
- » Centrally-managed and rigorous procurement process.

A scoring matrix was developed to aid in determining the optimum eHealth delivery model. The four models considered were ranked against the ten criteria listed above using a scoring system of 0-5 with 0 indicating a 0% ability to fulfill the criteria and 5 representing a 100% ability to fulfill the criteria. This is shown in table 10.1.

Criteria for Successful Delivery	HSE	Govt. Dept	Outsourced	Dedicated Agency
1 Acknowledged authority and responsibility	4	4	2	5
2 Leadership and governance structures and stakeholder support and input	3	3	3	4
3 Alignment with policy/strategy	4	4	3	4
4 Administrative and legislative base relative to achievement of strategy objectives	3	4	2	4
5 Strategic direction aligned with agreed funding for development and implementation	3	4	3	4
6 Cross government (and its agencies), multi-sectoral support and participation.	3	4	2	4
7 Collaborative focus and working relationships	3	3	2	4
8 Capability to develop and implement innovative implementation, funding and resourcing strategies.	2	2	4	4
9 Availability of appropriate resources with domain and skills knowledge	2	2	4	4
10 Strong branding and promotional presence	2	3	4	5
Total Score	29	33	29	42

Table 10.1. In determining the optimum model for delivery of Ireland's eHealth strategy four models were considered and ranked as shown.

Therefore based on the options considered and the ranking matrix applied above it is proposed that the optimum model for delivery of Ireland's eHealth strategy is a dedicated and focused entity with specific oversight and responsibility for Ireland's eHealth implementation.

10.3 A Focused Delivery Group - "eHealth Ireland"

"National Oversight with Local Innovation"

The critical challenge of any eHealth strategy is delivery and implementation. Delivery of eHealth systems have proven internationally to be complex undertakings involving many stakeholders and diverse interests. Collaboration among the many stakeholders is very important and the EU in its *eHealth Action Plan 2012-2020* encourages local and regional collaboration. Leadership, coordination and oversight function is critical to the successful

implementation of a successful eHealth strategy. A leadership function should set overall direction for the country and be the keeper of the overall eHealth vision.

A new entity called "eHealth Ireland" will be established, initially on an administrative basis within the System Reform Group (SRG) of the HSE. Over time, as the HSE is dismantled, this new organisation will be formed as an independent entity within a new institutional framework for shared services for the health system as a whole. *eHealth Ireland* will be headed up by a new Chief Information Officer (CIO) who will work closely with all of the key business organisations within the health service, in order to drive forward the eHealth strategy and ensure that key IT systems are implemented on time and to budget.

A positive branding strategy is very important for the success of Ireland's eHealth efforts as there needs to be strong public buy-in and uptake for the strategy to realise its promised returns. International experience points to the importance of a 'dedicated

branded entity' and there are many examples including Denmark, Canada, Australia, Latvia, Estonia etc. The branded *eHealth Ireland* entity will provide the overall leadership and governance for the eHealth strategy implementation. It will operate in the mode of "National Oversight with Local Innovation".

eHealth Ireland will operate in partnership with and build on work already underway by government and state agencies such as the Health Services Executive ICT Directorate and SRG, the Health Information and Quality Authority (HIQA) and Enterprise Ireland. It will have responsibility for overall governance around eHealth implementation including funding, legal enabling, public awareness, stakeholder engagement and building the eHealth Ecosystem. This entity will stage-gate manage projects with healthcare delivery groups based on overall national priorities. It will encourage local and regional innovation where possible and promote funding and project collaborations with private industry. Early priority projects to be considered include community-based ePrescribing, Online Scheduling and Referrals, Telehealthcare services, a National Patient Portal and Summary Health Record deployments.

An *eHealth Ireland* Board, composed of senior representatives from the HSE and the Department of Health among others, will be created in order to ensure maximum integration and focus. Given the vital importance of establishing an eHealth ecosystem it is proposed that an *eHealth Ireland* Forum be established, composed of representatives of all main impacted government organisations (including Health, Jobs and Innovation, Education and Skills and others), academia, industry, private healthcare delivery, healthcare insurance, voluntary sector and patients groups.

10.4 Creating *eHealth Ireland* – Structure and Governance

eHealth Ireland Mission Statement

"To ensure that eHealth is properly implemented in Ireland as a National Infrastructural Investment and that the benefits to the Irish people and the state are maximised"

Coordinated Leadership

This strategy identifies the significant opportunities for Ireland including improved population health and wellbeing, improved health delivery services and substantial economic benefits in the form of jobs creation and export market development. Therefore, eHealth as a **National Infrastructure Investment**, casts a much wider net than simply healthcare delivery alone. Impacted stakeholders include those concerned with health delivery services, population health, economic growth and jobs creation, research and development among others.

Government Departments such as Jobs Enterprise and Innovation have recognised the importance of eHealth and innovation and have included it as a priority in the national Action Plan For Jobs 2013⁴⁶. Key Government agencies such as Enterprise Ireland have also recognised the importance of developing the eHealth potential within Ireland and this is evidenced by the introduction of initiatives such as the ARCH Technology Centre⁴⁹. Despite these initiatives however, efforts to develop the potential of eHealth within Ireland are currently fragmented and uncoordinated and happen in a piece-meal fashion.

eHealth Ireland will act as the coordination body for eHealth in Ireland using input from all the various impacted stakeholders in order to maximise the potential and opportunities of eHealth for Ireland. It will do this by drawing on support from the various groups, government departments, agencies, industry, academia and others. It will have full focus, responsibility and authority for eHealth delivery in Ireland and realisation of its maximum potential.

Much of the work performed by *eHealth Ireland* will be Project/ Program Management and Commissioning.

10.5 *eHealth Ireland* – Common Enablers

Table 10.3 represents the main 'enabling' actions to be undertaken by the *eHealth Ireland* team. These actions are crucial to enabling the successful deployment of the various eHealth Programs and ensuring maximum public engagement and associated benefit. They are termed 'Common' as they span the work of the proposed function. To a large extent the success of the programs carried out by the functions will depend on the 'Enabling' actions being in place.

<i>eHealth Ireland Common Enabling Activities</i>	<i>eHealth Ireland's Role</i>
Stakeholder Engagement	<ul style="list-style-type: none"> » Ensure public engagement and uptake is strong from the outset. » Ensure strong clinical engagement and leadership in all deployment and programs. » Ensure the main impacted stakeholder groups are represented in the various eHealth programs. Examples include mental health, ageing and disability groups.
Technical Interoperability	<ul style="list-style-type: none"> » To ensure that technical programs are deployed to recognised interoperability standards. » To introduce (with HIQA and others) an 'eHealth Compliance' function that certifies developed solutions as fully interoperable. » To build on the work already underway by the HSE ICT Directorate, HIQA, Irish Medicines Board and others in order to proliferate technical interoperability of eHealth systems.
Legal and Regulatory	<ul style="list-style-type: none"> » Bring legal clarity on issues such as personal identity, digital rights and signatures, trust and privacy. » To define a framework for data ownership and data protection within an eHealth environment. » Develop innovative solutions to issues of insurance reimbursement for eHealth programs particularly in the context of citizens traveling around the EU and US.
Human Resources and Change Management	<ul style="list-style-type: none"> » Proactively work with public and private organisations to minimise the disruption of eHealth deployments on organisations. » Promote proactive involvement from public and private delivery groups in national eHealth deployments.
Brand Identity and Promotion	<ul style="list-style-type: none"> » Ensure <i>eHealth Ireland</i> has a strong recognised brand identity. » Develop suite of promotional print and online material to build trust, increase awareness and ensure strong public uptake.
Individual Health Identifier	<ul style="list-style-type: none"> » Work with the various responsible groups to ensure the Individual Health Identifier is deployed as a priority eHealth enabler.
Training and Skills Development	<ul style="list-style-type: none"> » Support the development of eHealth-feeder courses such as Healthcare Informatics within the third level sector. » Work with healthcare delivery groups and others to develop series of up-skilling programmes for existing staff. » Work with medical training institutes to develop eHealth specific training modules and ensure eHealth is a core course requirement for medical training. » Collaborate with EU/US on building eHealth training and skills modules involving student placements, online and mobile learning modules.
<i>eHealth Ireland Observatory</i>	<ul style="list-style-type: none"> » To develop an eHealth Observatory to assess overall return of investment and benefits analysis. » To partner with existing academic funding streams to implement.

Table 10.3. Common Enabling Activities to be worked on by *eHealth Ireland*. These activities are critical to the successful deployment of the various eHealth programs.

Chapter 10: Summary

eHealth needs to be seen as a national infrastructural investment for Ireland. Best-practice international experience identifies the need for a fully focused, dedicated and authoritative entity to successfully deliver the potential inherent in a properly executed national eHealth strategy. This strongly branded entity called '*eHealth Ireland*' will be formed, initially on an administrative basis within the System Reform Group (SRG) of the HSE. Over time, as the HSE is dismantled, this new organisation will be formed as an independent entity within a new institutional framework for shared services for the health system as a whole. *eHealth Ireland* will be headed up by a new Chief Information Officer (CIO) who will work closely with all of the key business organisations within the health service, in order to drive forward the eHealth strategy and ensure that key IT systems are implemented on time and to budget.

1 Patient Centric Focus.

Ensure that eHealth is utilised to place the patient firmly at the centre of the new healthcare environment as outlined by the EU's eHealth Action Plan 2012-2020.

Priority Actions

Develop programmes to:

- » Encourage and strengthen engagement.
- » Facilitate informed participation in the care process.
- » Promote trusted collaboration.
- » Increase health literacy.

2 Delivery.

A dedicated, focused and strongly branded entity '*eHealth Ireland*' will be created to oversee Ireland's eHealth journey. eHealth needs to be viewed as a **National Infrastructure Investment** that benefits Ireland's overall population wellbeing and its economy as a whole. It will operate in a mode of "*National Oversight with Local Innovation*" and have specific responsibility for eHealth delivery.

3 Priority Programs

To be delivered by *eHealth Ireland* and its operational functions will be:

- » National Identifier Infrastructure, individual, professional and organisational.
- » ePrescribing Systems.
- » Online Referrals and Scheduling.
- » Telehealthcare - particularly relating to the management of chronic diseases.
- » Development of Patient Summary Records.
- » Online Access to Health Information.
- » A National Patient Portal.

4 Enabling Actions.

Establish specific workstreams involving all appropriate stakeholders to address the major deployment enablers including;

- » Appropriate funding models for programs.
- » Clinical engagement and leadership in place from the outset.
- » Healthcare individual and organisation identifiers.
- » Digital signature technologies need to be in place to enable automated transfer of data.
- » Change management and adoption processes.
- » Healthcare informatics resources and the development of appropriate health informatics skills.
- » A standards-based, multi-layered information and technical infrastructure to provide a common platform for eHealth deployments. This should build on work already underway by organisations such as the Health Information and Quality Authority (HIQA), The National Standards Authority of Ireland (NSAI), The Health Services Executive (HSE) and the Irish Medicines Board (IMB).
- » Advise on appropriate legislation around privacy, security and data protection.
- » Brand identity, and promotional activities.
- » Patient empowerment.
- » Public engagement, awareness and uptake Including engendering trust among citizens.

The *eHealth Ireland* entity will work with local hospital groups, the primary care and social and community care communities to encourage local innovation and initiative regarding the roll out of eHealth solutions nationally and will appropriate funding according to a stage-gate process.

5 Establish an eHealth Forum

Involving the Departments of Health, Jobs Enterprise and Innovation, Education and Skills, Environment, the Healthcare Delivery system, Industry, Academia, the Research and Development communities and the voluntary sector. Ideally based on an 'Open Innovation' model of operation, the network will develop eHealth-enabling solutions (such as procurement, technical and legal enabling) that will allow the full benefits of eHealth systems to be realised in Ireland. An all-Island approach to this Ecosystem should be pursued as should strong collaborations within Europe and the United states.

6 Realise the Economic Benefits.

Each government department and agency with a role in exploiting the potentiality of eHealth must develop strategies for actions to realise the economic benefits of eHealth. Ireland needs to become much more active and take leadership roles within international collaborative efforts particularly EU and US joint initiatives.

7 Health Identifier:

A national health Identifier for individual, professional and organisation identification needs to be deployed in Ireland. While not directly within the remit of *eHealth Ireland* (responsibility of the Department of Health) to ensure cost effectiveness and adherence to highest international standards, it is recommended that the health identifier number should reuse existing infrastructure investment already underway for the roll out of the Public Services Card.

8 National IT Strategy for Health:

A new IT strategy for the health system as a whole will be published in early 2014 by *eHealth Ireland* working closely with the SRG, the Department of Health and other relevant Departments and organisations.

Table 11.1. Recommendations and suggested next steps for implementing the eHealth Strategy.



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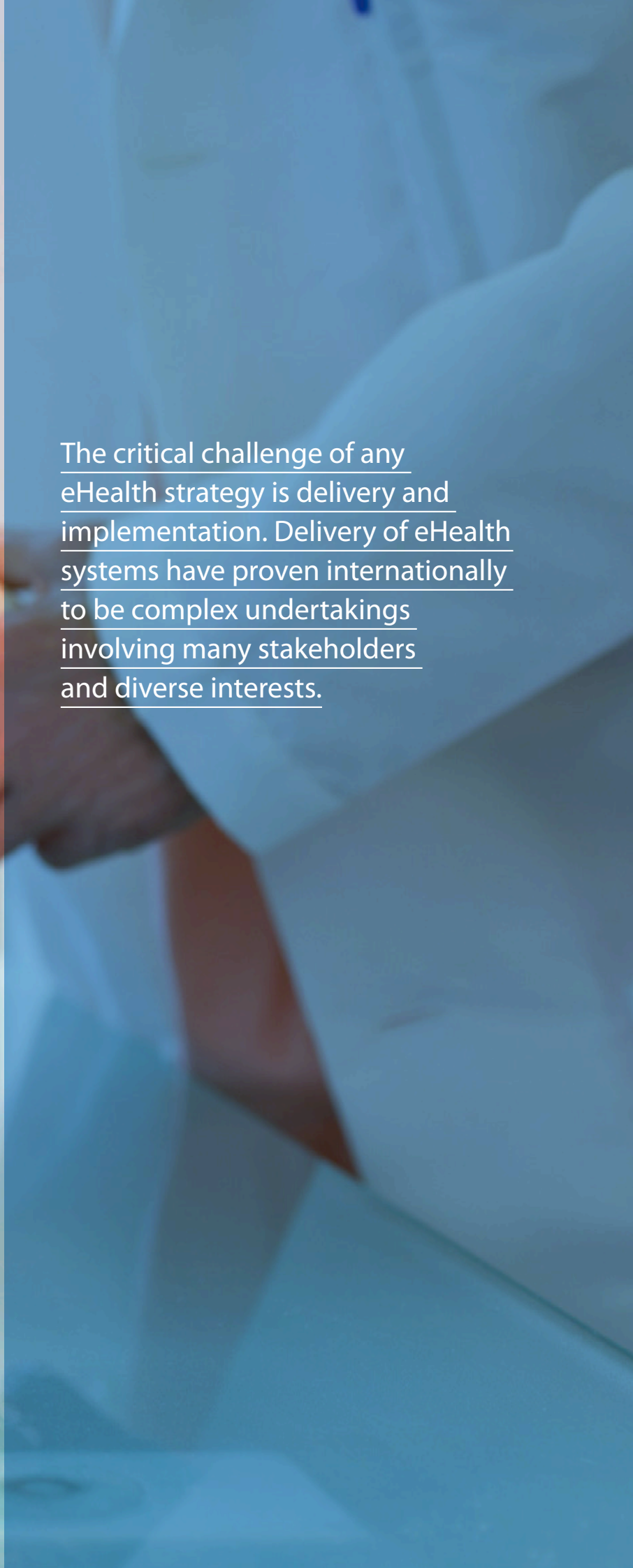
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The critical challenge of any eHealth strategy is delivery and implementation. Delivery of eHealth systems have proven internationally to be complex undertakings involving many stakeholders and diverse interests.



Appendix A - eHealth Experiences Internationally

The following is a summary review of eHealth experiences internationally on a country by country basis. The summary of lessons learned given in chapter 6 have been drawn from this treatment.

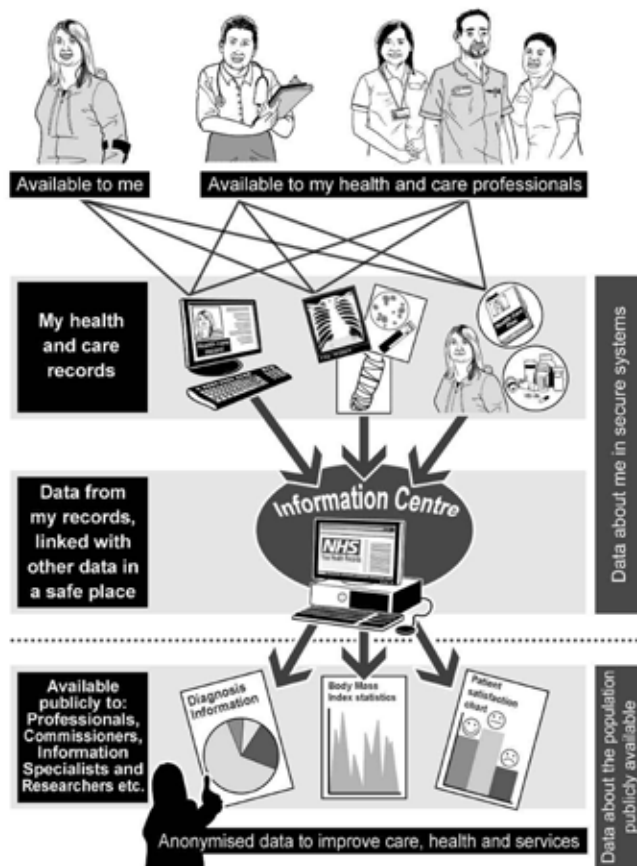
England

England has a long history with eHealth. As far back as 1998, specific policy was developed. The *National Programme for IT (NPFIT)* in England had already begun in 2002 and acted as the basis for eHealth deployments. It was coordinated by a newly created body *NHS Connecting For Health (CFH)* from the old *NHS Information Authority*. A 2002 policy paper - *Delivering 21st century IT support for the NHS: national strategic programme*⁹⁵ - was created outlining the goals of the new eHealth system including a single centrally mandated electronic record system for each citizen, connecting 30,000 General Practitioners, 300 hospitals and secure access for providers, suppliers and other stakeholders. Patients would have access to their records via a portal called *Healthspace*. In all over €11 billion was invested over a 10 year period starting around 2002. The CFH organisation termed the NPFIT as “the world’s biggest civil information technology programme”. The programme originally divided England in to five areas or ‘clusters’, Southern, London, East & East Midlands, North West and West Midlands and North East. For each ‘cluster’ different Local Service Providers (LSPs) were contracted to deliver the services. These ‘clusters’ were intended to use a common backbone of communication and security standards called ‘The Spine’ which was a central capital investment. Some notable progress includes;

- » A patient summary programme known as the *Summary Care Record Programme* has been nationally implemented in England since 2008. Over 90% of GPs have Electronic Health Records as part of their practice.
- » As of 2009 the Department of Health confirmed that over 500,000 prescriptions had been transmitted electronically in England.
- » The largest Telehealthcare trial in the world (at that time) was completed between 2009 and 2011 involving remote monitoring and management of chronic diseases among a population of 6,000 people.

However the NPFIT programme has proved troublesome and two of the selected service suppliers to the ‘clusters’ withdrew from the program. The current government which came into office in 2010 have set about dismantling large aspects of the programme. They have set out a fresh strategy in their publication of May 2012 entitled *The power of information: Putting all of us in control of the health and care information we need*⁹⁶ following a major public consultation exercise. This strategy document reaffirms that

information technology is absolutely critical to putting the patient at the centre of the healthcare system. It also recommends a less centrally-controlled, and more regionally managed and funded model of delivery. Specific commitments it makes include;



Appendix A. Figure 1. England's eHealth vision showing how it views information technology being used to innovate healthcare systems. Source: UK Department of Health

- » Making all GP records available online to patients by 2015 with all other records going online over time.
- » Patients will be able to book appointments, order repeat prescriptions online and have electronic communications with their healthcare professionals.
- » A unique NHS identifier by 2015 will allow information to travel with the patient and access to summary records will be available online.
- » It also has committed to setting up a *Health and Social Care Information Centre* which will be a central database of all information for secondary uses such as public health policy and research.

- » Funding will be provided for innovative ‘trailblazer’ type initiatives as an incentive for private and public bodies to collaborate. Examples include medication barcoding, telehealthcare and error reduction systems.

Many lessons can be learned from England’s experience including the importance of proper planning and a phased approach to implementation i.e. not taking on too much too soon. Also important is the use of local and regional authorities and partnerships and development of procurement, funding and governance models. Of critical importance is the engagement of stakeholders and in particular the public. Information should be communicated in non-technical and easy to understand format for all stakeholders.

Scotland

The concept of eHealth is well established in Scotland where an eHealth Directorate was established to provide leadership. The first strategy document was published in 2008 entitled *eHealth Strategy 2008-2011*⁹⁷. This document outlined a commitment to working to a full electronic patient record in phases. These phases included;

- » Establishing an information and organisational governance structure.
- » Establishing appropriate funding systems for primary and community care to allow these sectors to partake in the eHealth programs.
- » Focus on standards and interoperability across the entire system.
- » Stage-gated funding based on performance and benefit realisation.

This strategy was superseded in 2011 by the new eHealth Strategy 2011-2017 in which the progress of the previous strategy was reaffirmed. The newer strategy however changes the focus away from a technology, products and services approach toward a stakeholder benefits driven approach. It stresses the importance of clinical engagement and leadership.

Scotland is well advanced on its eHealth journey with implementation of such systems as *Patient Management System (PMS)*, a new national GP IT solution, emergency care summaries, ePrescribing and telehealthcare. Boards are also making progress with other shared clinical solutions, such as those supporting chemotherapy prescribing, the National Sexual Health System, and the National Picture Archiving and Communication System (PACS). These systems are being implemented as devolved work streams or programmes within the overall strategy by working groups. An example is the *Scottish Centre for Telehealthcare (SCT)* which is responsible for delivering the telehealthcare strategy.

Through collaboration with the Academy of Medical Royal Colleges, the Scottish Government has developed a joint eHealth Competency Framework for practising clinicians who have a role in eHealth at local, regional or national level. It is anticipated that this Framework will inform the eHealth component for undergraduate and postgraduate training in Scotland and continuous professional development across NHS Scotland.

Northern Ireland

Northern Ireland has a highly integrated health and social care system, serving a population of 1.8 million. The development of a Connected Health agenda has been a Ministerial priority in Northern Ireland. This is largely based on the belief within Northern Ireland of the potential of eHealth to not only transform healthcare, but also of its potential to catalyse economic development.

This belief has been outlined in the review of Northern Ireland’s provision of health and social care entitled *Transforming Your Care*⁹⁸ which was produced in December 2011. The review proposed a new framework for the delivery of health and social care which would put the patient and client at the centre of the system. The imaginative use of innovative technologies was recognised as one of the key enablers to the delivery of such a service model. In the same year the Department of Health, Social Services and Public Safety began work with Northern Ireland’s economic development agency, Invest NI, to develop a joint *Connected Health and Prosperity* agenda. The aim was to contribute to improved health and well-being and patient care, while also supporting the economic development strategy. In December 2011 a Memorandum of Understanding (MOU) on Connected Health and Prosperity was signed by the Northern Ireland Health and Economy Ministers.

The development of Northern Ireland’s *Connected Health and Prosperity* agenda has been progressed through:

- » The establishment of a Connected Health Ecosystem⁹⁴ to promote collaborative working across the health, academic and industry sectors. The initial focus of the Ecosystem has been to identify opportunities for using technology to support the implementation of *Transforming Your Care*;
- » Promotion of Connected Health Research and Development (R&D) and Innovation. This has included targeted investment in Life and Health Sciences R&D, with a focus on pharmacology, medical devices and diagnostics sub-sectors.
- » The development of links with European regions with a view to identifying future areas of collaboration and maximising opportunities for drawing down EU funding support. Memoranda of Understanding have been agreed with the Basque Region and the City of Oulu in Finland, and there are plans to formalise further such agreements with other EU partners.

- » Committing to and achieving 'Three Star Reference Site' status within the terms of the *European Innovation Partnership on Active and Healthy Ageing*⁹⁹.
- » The establishment of the *Economy and Jobs Initiative Task and Finish Group* to identify potential opportunities for job creation and economic growth through Northern Ireland's health and social care sector. The Group reported in May 2013 and its recommendations include the creation of a new health innovation infrastructure to take forward the development of a number of economic attractors including a Connected Health Integration Platform and an International Health Analytics Centre; and the creation of a Smart Connected Residential Community.

These measures indicate a wide commitment to eHealth and recognition of its potential for Northern Ireland. There are also a number of current 'classic' eHealth programs which are ongoing in Northern Ireland and include;

- » A major regional telemonitoring service came into operation in 2011 through a contract with a private sector consortium. This innovative service provides remote monitoring for patients with long term conditions and is to be rolled out to some 20,000 patients over a six year period.
- » Northern Ireland is also implementing a region-wide Electronic Care Record (NIECR). This will connect 18 acute and community hospitals as well as all GP practices and community and mental health units across the region in terms of having access to patient data extracted from local information systems and will lead to better, safer and more rapid patient care. It is anticipated that by the end of 2013 the NIECR will have been rolled out across Northern Ireland.

Netherlands

The Netherlands is a decentralised unitary state. Policy making takes place at national, regional (12 provinces) and local (around 500 municipalities) level. Policy implementation is decentralised to the lower levels wherever possible. Overall GDP per head is above the EU15 average with healthcare spending as a percentage of GDP at 12.0% (OECD 2010¹⁰⁰). The Netherlands has a long history of using Information Technology in the healthcare setting and IT and office computerisation have been in place for many years.

The healthcare system comprises a mix of public and privately funded systems and most hospitals operate privately in a not-for-profit mode. In the Netherlands there is no single dedicated eHealth authority or eHealth Strategy document. eHealth policy is developed by various organisations that make submissions to parliament at national level. Implementation is often left to regional and local level bodies with some state level help. For example the Dutch national competency centre for IT in healthcare called the

National IT Institute for Healthcare IT (Nictiz) have published strategy documents on standards, infrastructure and applications¹⁰¹. The *Healthcare Innovation Platform (Zorginnovatieplatform, ZIP)* have published a vision for eHealthcare in the treatment of chronically ill¹⁰² and the *Royal Dutch Medical Association (KNMG (Koninklijke Nederlandse Maatschappij tot bevordering van de Geneeskunst))* have published on the use of electronic health records in conjunction with a national identifier Citizen Service Number (BSN) which has been in place since 2009. The Citizen Service Number is contained in an insurance card. A national registry of healthcare professionals and service providers is also maintained by a public body. This 'BIG' registry contains over 390,000 entries and is made up of doctors, pharmacists, insurers and other professionals. Providers are issued with an 'UZI' card containing identifier information and an electronic signature.

Similar to the English NHS who developed the 'Spine' as a core backbone IT infrastructure, the Dutch have developed 'AORTA'. The AORTA infrastructure provides a national registration system for identification and authentication and a reference indexing system 'National Switch Point'. Instead of implementing a nationwide Electronic Health Record (EHR) as a single comprehensive project, the Dutch decided to take a phased approach. The Patient Summary Record including medication summary, consultation details, disease status etc has become the standard in the Netherlands. With a large focus on chronic diseases such as Diabetes, the plan is to eventually to progress to a full Electronic Health Record. However significant issues still need to be addressed to realise this objective.

It is reported that over 90% of Dutch GP practices are computerised with 84% of these receiving analytic lab results electronically and around 26% actually exchanging information electronically between providers (for instance GP to hospital to insurer). It is also reported that around 71% of GP practices use ePrescribing systems as standard. Telemedicine and telehealth (including eMental health) are widely used in the Netherlands and include teleconsultations for elderly, teleradiology and teledermatology. A consortium of stakeholders called eHealthNu¹⁰³ came together in 2009 consisting of insurers, industry and local authorities to promote the use of eHealth and in particular telehealthcare.

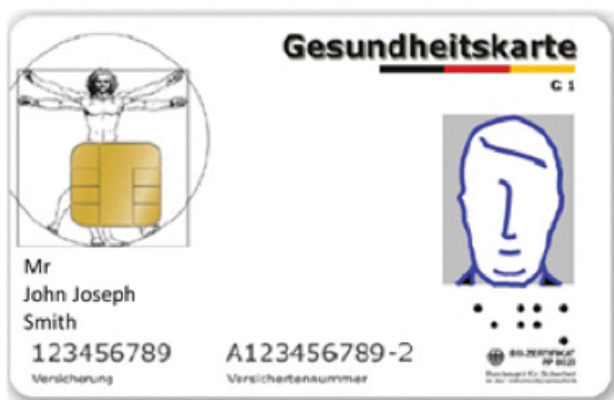
The Dutch experience is relevant to Ireland as it aligns itself with a healthcare system of similar structure. The setting up of supplier/provider/consumer identifiers with means of automatic identification, registering and exchanging information, both medical and financial, have been very important. The provision of an IT backbone infrastructure with a phased approach to program deployment (e.g. patient summaries to full Electronic Health Records) has been very positive. The setting up of an 'eHealthNu-like' consortium in Ireland composing public/private organisations to catalyse progress would be a significant enabler (Ecosystem).

Germany

Germany has the world's oldest national social health insurance system dating back to 1883. The system is financed by a mix of public and private insurance schemes. The public statutory health insurance system is mandatory for all salaried employees (with some exceptions). This is a wage-based scheme with contributions equally split by employers and employees and free coverage of dependants (spouse and children). The public system covers around 85% of the population. The private Health system covers about 15% of the population and is based on an individual agreement between consumer and insurer. Germany spends in the region of 11.6% of GDP (OECD 2010¹⁰⁴) on healthcare per annum.

In July 2005 the Federal Ministry of Health and Social Security published *The German eHealth Strategy* with its goal of: "... modernising the German healthcare system using information and communications technology..." Two building blocks identified were the

- » Building of a basic IT infrastructure with defined standards for access, registration etc and
- » The development of an electronic patient record sitting atop the infrastructure.



Appendix A Figure 2. Germany's Electronic health Card. Source: Mentzins

An updated strategy for the digital future of Germany called "*Deutschland Digital 2015*" (Germany Digital 2015) was published in 2010. It stipulates that telehealthcare and other eHealth applications should be available virtually everywhere in Germany by 2015.

In 2006 the largest healthcare IT project in Europe was started in Germany called the *Electronic Health Card*. Germany has had a long history of general 'healthcare cards' and at one stage had over sixteen such cards in existence (Oncology, Diabetes etc). The new eHealthcare 'Smart Card' involved a coordination of many existing data sources and the introduction of a 'smart chip' on the plastic. Many deployment issues were encountered and the project

was suspended after much public and service provider disquiet. The effective circulation start date of the card has in fact been October 2011 and then only in limited trial areas. The main issues encountered related to privacy and security concerns particularly relating to potential 'profiling' of citizens and general 'big brother' scenarios.

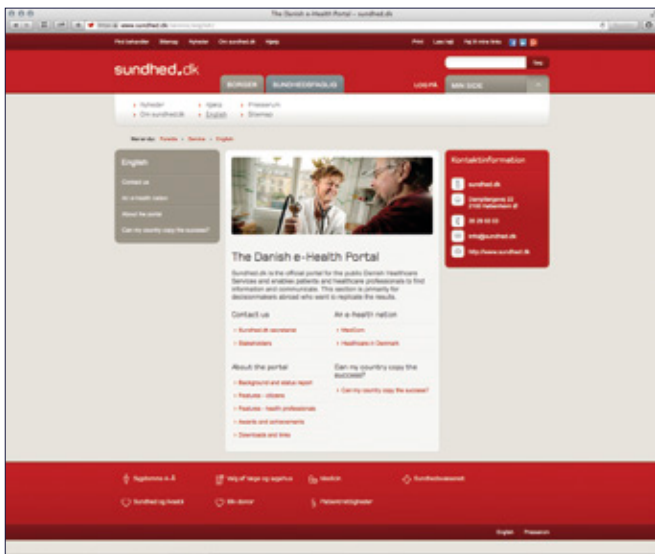
The card contains an identifier plus some basic patient information. Plans are in place that the card will store basic summary patient record information on the card for life-threatening situations where no connectivity is available. The electronic card will link patients, doctors, pharmacists, insurer and providers and act as the central spine for all communications medical, non-medical and administrative including claims and billing. The card is planned to be deployed to around 50 million people by end of 2013 and many of Germany's eHealth plans such as ePrescribing and Telehealthcare are linked to its successful roll out. It is difficult to gauge the overall impact of eHealth within Germany at present as so much focus has been directed towards the electronic card. The German situation is reflective of the general concern that is inherent with 'Smart Cards' and the heightened sense of public mistrust that often prevails. Putting data on to a card, even when limited in scope, can be controversial and needs to be dealt with very sensitively.

Denmark

Denmark is generally recognised as being a 'shining light' in terms of eHealth and has a history of being at the forefront of using ICT within the healthcare setting. Its healthcare system provides universal coverage to all citizens based on mandatory deduction of around 7% of salary. Around 84% of the population is covered with the remainder covered by self-funded private insurance. General practice occupies a central role within the Danish system and GPs act as a locus for primary healthcare interactions (similar to Ireland's primary care strategy). Denmark's healthcare GDP as a percentage of overall spending is around 11.1% (OECD 2010¹⁰⁵) (against an OECD average of around 9.6%). Administratively the country is broken in to five regions funded through a state block-grant, activity-related subsidies and local municipal contributions. The purpose of activity-based subsidies is to encourage and incentivise local innovation and leadership. Each region within Denmark has an Electronic Health Record (EHR) system adopting the slogan '*One patient - One EHR*'. At a lower level the local regions contain Electronic Patient Records (EPRs) that feed up to the regional EHR system. These in turn feed up to the national portal's *Sundhed.dk e-Journalen* ("e-record") system.

Between 2010 and 2020 Denmark will invest over €5 billion in its hospital network building 16 new hospitals and upgrading and expanding existing hospitals. This capital expansion programme will see major investment in eHealth systems. Specific eHealth initiatives within Denmark include;

1 **MedCom Messages.** MedCom was formed in 1994 to establish interoperability standards that would allow the most common electronic messages to pass between various stakeholders in the healthcare system. Examples included discharge letters, referrals, lab test orders, ePrescriptions and reimbursement from public health insurance. In 2011 it was reported that the system was almost now fully electronic (approx. 98%) with all frequent documentation being transferred electronically.



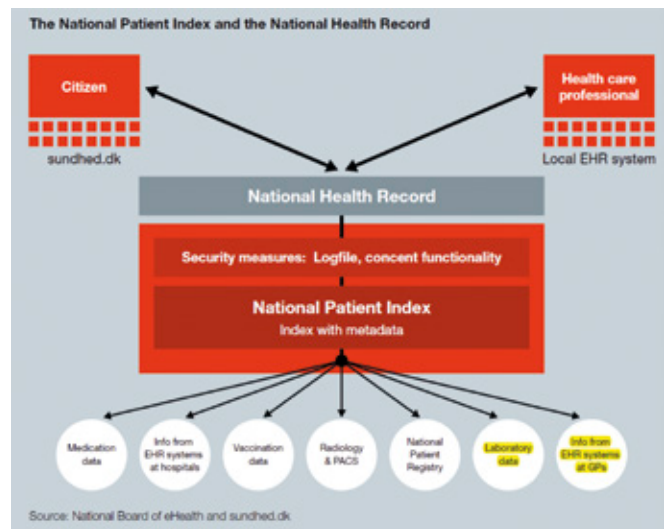
Appendix A Figure 3. Sundhed - Denmark's eHealth portal used by both patients and providers as the central access point to records and other information. Source: Danish Ministry of Health.

2 **Sundhed.dk** – The official web portal of the public health services. Sundhed means “health” and the portal is the central access point for all patients and healthcare professionals. Patients can view their medical information (from their record), schedule appointments, repeat prescriptions, view waiting time information for hospitals and view hospital ‘rankings’ in order to help choose where they attend. Patient’s networks also exist where they can interact with other patients with similar conditions in a social media-like manner. Healthcare professionals can also access the portal and communicate with the patient. Access to a large library of academic and general information is available to all. The e-Journalen (“e-record”) system gives patients and healthcare professionals digital access to information on diagnoses, treatments and notes from EHR systems in all public hospitals. 30–40% of the hospitals also provide access to information on medicine and sample results from laboratories. By the end of 2011, the system contained health data on more than 85 per cent of the Danish population. Clinicians at hospitals have access to e-Journalen directly through the hospital’s EHR system, while GPs can access the

system through sundhed.dk. In 2011 there was almost 6 million citizens registered with over 6 million hospital transactions through the portal. The Danish Ministry of Health has stated the benefits¹⁰⁶ of the system as;

“Increased patient safety and improved patient treatment by providing a more solid ground for decision making as doctors have better access to existing patient data. Connection of various EHR systems used at the Danish public hospitals in a cost-effective and pragmatic way supported the exchange of patient data between hospital departments more cost-effectively. Prior to the e-Journalen system, information was often delivered by ordinary mail or fax”. Furthermore, the e-Journalen has contributed to openness in the health sector by providing the patient with easy access to own health data. This has created a stronger base for involving and activating the patient in relation to his or her treatment as well as increased patient empowerment”.

3 **The Shared Medication Record.** A current project underway in Denmark is the Shared Medication Record. This is a central database of medication information of citizens spanning the previous two years. It is fed from the local EHR system and access is either through the EHR system or the Sundhed.dk interface. The target date for full implementation was set as end of 2012.



Appendix A Figure 4. Denmark's National Patient Index and National Health Record architecture

4 Two larger and very much connected projects currently are called the **National Patient Index** and the **National Health Record**. The National Patient Index is essentially an infrastructure project aimed at integrating all the various databases that exist throughout the healthcare system including medication data from the Shared Medication record,

hospital EHRs, labs, radiology (imaging), labs and hospital admission/discharge. The National Health Record is building on the e-Journalen facility of the Sundhed.dk site and will display the data from the National Patient Index via a coherent and intelligent user interface. The public will have access through Sundhed.dk. Full implementation is planned for end of 2013.

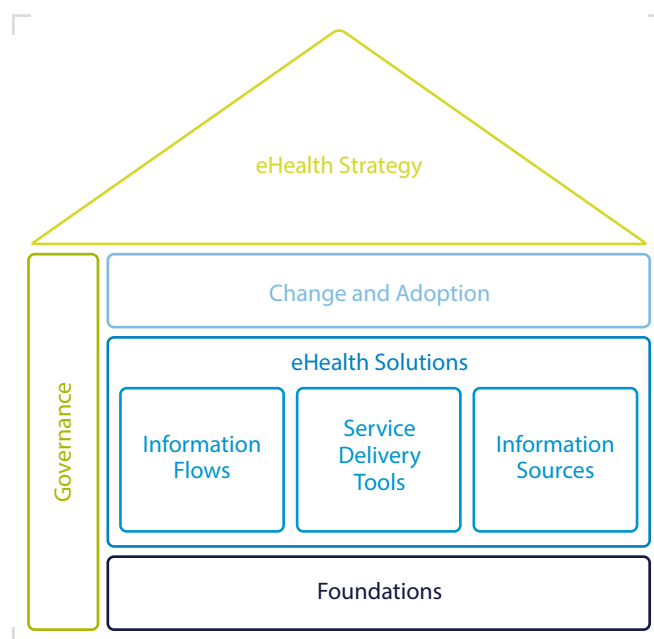
5 Telemedicine and Telehealth. Denmark is recognised as one of the leaders in Europe at taking telehealthcare and telemedicine projects beyond pilot and trials stage. Remote monitoring of diseases such as COPD and video-consultations around diabetic ulcers are commonplace in Denmark. Reasons for the success for these programmes come down largely to the legacy investment in standards and interoperable systems (i.e MedCom’s work), strong governance and active engagement of all stakeholders across all regions and incentive-led funding models. Denmark is also implementing DRG-based processes for Telehealthcare services and this will facilitate further development of the core competencies.

In summary the Danish eHealth experience shows the benefit from investment in basic infrastructure building blocks such as standards and systems that allow interoperability. Once these have been put in place, there are major possibilities to build on the infrastructure and realise the benefits of fully digital systems. The benefits of a phased approach to full EHR systems are also apparent and use of summary record systems can be a good half-way step to this end. The governance model of central administration and overall direction setting (Ministry of Health) combined with regional and local autonomy and incentive-led funding has also been shown to be effective. Overall the Danish experience shows the value of strong engagement with stakeholders and the creation of a collaborative ecosystem.

Australia

Healthcare in Australia is provided by a complex of largely autonomous public and private care providers working across over 1,000 public and private hospitals and many tens of thousands of general practice and allied community care teams. As of 2010, healthcare spending is around 9.1% of GDP (OECD 2012¹⁰⁷). The system however as with many other healthcare systems globally has faced the challenges of ageing populations, increased cost and demand, rise of chronic diseases and shortage of skilled staff. Within the ICT environment there has also exists significant classic challenges such as the existence of many ‘silos’ of information from many disparate local ICT initiatives and the over reliance on error-prone manual processes. Error-prone manual processes were estimated to cost the Australian health system in the region of €3 billion annually or around 3% of total costs. The National E-Health Transition Authority Limited (known as NEHTA) was established in

2005 by the Australian, State and Territory governments to develop better ways of electronically collecting and securely exchanging health information. It essentially has the brief of developing the underlying interoperability standards that will allow systems to communicate effectively.



Appendix A Figure 5. Australia’s eHealth Strategy major work streams. Source: Australian health Ministers.

In early 2008 Australian Health Ministers commissioned the development of a National E-Health Strategy¹⁰⁸ to support health reform. This strategy plots a 10 year roadmap for Australian eHealth, leading up to full *Personally Controlled Electronic Health Records* (PCEHRs). According to the strategy Australia’s eHealth journey is based on 4 strategic work streams (figure 6.6) namely;

- » **Foundations** – Establishing the core foundations for electronic information exchange across the health sector. This largely builds on the work performed by NEHTA and includes standards, definitions, terminology, privacy and security. It also includes expanding broadband access across the country and encouraging private investment in local computing infrastructure.
- » **E-Health Solutions** – This effort aims to coordinate local efforts and identify national priorities. It involves stimulating the delivery of eHealth solutions to the key users of health information. A detailed table of solution priorities has been published but includes classic eHealth solutions such as referrals, patient summaries, medications, telehealth and full electronic health records. In practice Australia has taken

a market-driven approach to this solutions development and is encouraging local investment and initiative. There are two exceptions however and these have been deemed national priority to be funded centrally. They include a health knowledge portal simply called *eHealth* (similar to Sundhed.dk in Denmark) and a national ePrescribing service. This activity is building towards what was originally called a full Individual Electronic Healthcare Record (IEHR) now termed a *Personally Controlled Electronic Health Record (PCEHR)*. NEHTA has forecasted net annual benefits from the PCEHR system of the order of €5.5 billion once roll out is complete. Australia is driving solutions deployment through a central *National Investment Fund* that is available to interested parties based on rules and regulations, criteria etc. It also is implementing a National Compliance Function to test and certify systems as being *'eHealth compliant'* within the Australian system. The *National Authentication Service for Health (NASH)* was set up in 2008 from NEHTA to specify and deliver a national digital identity mechanism for access to health service records. This initiative has been troublesome and security and privacy issues were to the fore. Eventually a contract was awarded in March 2011 to deliver the service.

- » **Change and Adoption** – Fostering consumer, care provider and health care manager adoption of eHealth. The aim of this work stream is to focus effort on achieving a 'tipping point' of stakeholder adoption of eHealth solutions as quickly as possible. This work stream involves such items as national awareness programs (such as the *Model Healthcare Community*¹⁰⁹), financial incentive programs for care provider involvement (e.g. GPs), vocational and third level training and ensuring people gain the appropriate eHealth skills and training (and accreditation).
- » **Governance** – Ensuring the effective leadership, coordination and oversight of the national eHealth work program. This work stream focuses on the establishment of appropriate national eHealth governance structures and mechanisms. The strategy will see NEHTA over time transitioning to a 'National eHealth Entity' where overall responsibility for ongoing eHealth development will lie.

Australia has been relatively successful in implementing their national health identifier service. The 16 digit number identifier system is administered by Medicare Australia who historically have had access to a large existing infrastructure. Medicare Australia allocate three main types of identifiers for individuals, providers (individuals) and providers (organisations). The identifier is linked to the PCEHR.



Appendix A Figure 6. In the background is Australia's eHealth Strategy awareness portal. In foreground is NEHTA's access portal for PCEHRs (Personally Controlled Electronic Health Records).

The system allows the consumer to track who has access to their identifier number information in a log format and also allows them to make changes. The system does not allow 'browsing' of information relating to the consumer (patient) and for any provider to access the identifier information of a consumer, there must be an exact security match (i.e. a key/token type) between consumer and provider.

Progress has been quite slow to date with a PCEHR uptake of around 85,000 people as of February 2013 with more than 1,470 provider organisations registered. In May 2013 over 187 pharmacies will go online on the National Prescription and Dispense Repository, featuring a detailed medication history, medications brand and prescribed strength, dosage and dates for prescription and expiration. Telehealthcare activity was quite strong however. As of the end of 2012, there had been 61,000 telehealth consultations, involving 7,200 practitioners and 28,000 patients. There has been strident criticism of Australia's eHealth policies with privacy and security being at the forefront of concerns.

A paper¹¹⁰ by Rhonda Jolly in Nov 2011 on eHealth progress in Australia concluded...

“...it is generally accepted that eHealth has great potential to revolutionise health care. But not only is eHealth revolutionary, it is complicated... in order to achieve reasonably satisfactory - let alone revolutionary - eHealth progress, the backing of health professionals and patient's needs to be secured. eHealth experiences in Australia and elsewhere in fact suggest that unless there is an alignment of expectations and agreement on directions and priorities, eHealth results are frustratingly difficult to achieve.”

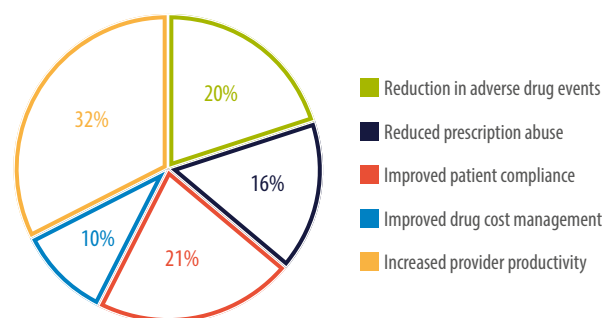
Canada

Healthcare in Canada is delivered through an income tax based publicly funded system which is mostly free to the consumer. Most services are provided through private entities which are regulated through federal standards. Private insurance is a very small part of the overall system. Geographically Canada is divided into ten provinces and three territories with provinces and territories differing only in historical foundation. The local territory or province Ministry of Health issues a health card to all enrolled persons and everyone receives the same level of care i.e. there is no, or very little, variation in 'coverage plans'. Coverage is also not dependent on job security and cannot be denied based on pre-existing conditions. Public opinion in Canada is very supportive of the health system and surveys¹¹¹ consistently report over 70% of citizens saying that the system is working “well” or “very well”.

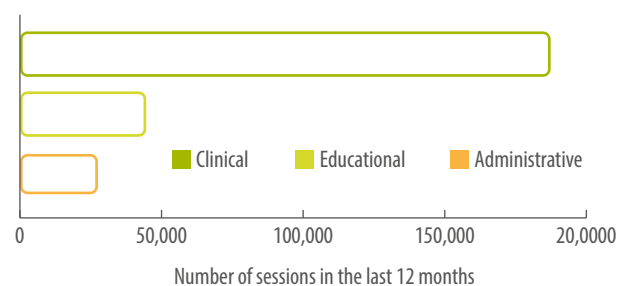
The government of Canada through the health ministry 'Health Canada' has been investing in eHealthcare technologies and systems since around 1997. Health Canada has invested around \$2.1 billion from 2001 to 2010. It set up the not-for-profit organisation *Canada Health Infoway*¹¹² in 2001 to accelerate the use of EHRs in Canada. This new body was made up from federal, provincial and territorial governments and has a mandate of coordinating the implementation of EHRs across Canada. According to their website “*Infoway acts as a strategic investor of funds provided by federal government, in collaboration with the provinces and territories*”. It provides overall strategic leadership on items such as standards and security via an EHR Blueprint. It encourages regional co-investment and acts as the overseer and gate-keeper of federal investments. Infoway works to encourage leadership support and adoption of eHealth technologies from the clinical community and has a full range of programs in this regard. To date Infoway has been involved in over 371 projects focussing on EHRs, EMRs, telehealth solutions, public health solutions and consumer health solutions. A total of \$2.1 billion of funding has been approved based on a milestones/deliverables type model (stage-gate). A distinguishing factor of Infoway is its concentration on benefits realisation and its ongoing data gathering and monitoring of progress indicators. It works in collaboration with the University of Victoria's eHealth Observatory¹¹³ to apply rigorous methodologies to benefits and return of investment (ROI) analysis.

Reported Progress: Almost all x-Rays, MRIs, CTs and other imaging solutions in Canada's public hospitals are now filmless. Infoway reports this as the equivalent of adding over 500 radiologists and enabling around 11 million more exams annually. ePrescribing systems (or Drug Information Systems as they are called in Canada) are being used in half of Canada's hospital ERs and in around one third of community pharmacies. ePrescribing take-up is still limited, however Infoway has reported¹¹⁴ that even at this stage annual savings of \$436 million are being registered, with the figure expected to approach \$1 billion once roll out is complete. Due to the remote locations involved in Canada, telehealth has been a priority. Infoway has reported that in 2010 some 47 million travel miles were saved as a result of telehealth initiatives as a result of over 200,000 individual telehealth sessions and cost avoidance figures to the state of around \$55 million. Infoway has reported¹¹⁵ that since its eHealth journey began ten years ago, “*an estimated \$7.7 billion in benefits have accrued to Canadians and the healthcare system as a result of investments in telehealth, drug information systems and diagnostic imaging solutions*” (All figures are in Canadian\$).

Breakdown of Generation 2 DIS Benefits to March 2010



Total Number of Telehealth Sessions in 2010



Sources: 2010 CTF Pan-Canadian Telehealth Survey. Quebec data were collected from key informant interviews. Alberta administrative numbers were provided from interview. The data do not include PEI.

Appendix A Figure 7. Canada's Infoway group places a large focus on benefit and ROI analysis and publicises data regularly. Shown left is benefits data relating to ePrescribing and right is data relating to telehealthcare adoption.

B Appendix B - Economic Impact Analysis (C. Gurdgiev)

Changing Patterns of Healthcare Systems

Decreases in personal disposable income and wealth during recessions are generally associated with a reduced funding for provision of public and private health and a demand shift away from privately provided health services toward publicly provided ones. Thus, the ongoing recession and the underlying longer-term Irish debt crisis will have a twin adverse impact on financial viability of Irish public health services via:

- » Reduced willingness and ability to pay for private services with associated increase in demand for public services.
- » Reduced supply of funds for financing investment and existent services commitments in public and private healthcare.

eHealth is widely seen as one of the core tools for addressing some of the financial constraints imposed by demand growth. In the same way, over the medium-term, e-health can also be seen as an effective tool for increasing economic and financial viability of public health systems during economic downturns.

Operational and management logic suggests significant economic returns to eHealth in public health systems. However, as EU Commission (2007) research notes, the task of assessing such returns is highly problematic due to the limitations on data. Lack of methodologies consistent with commercial accounting standards characterise many capital investment programmes in the public health services.

In the case of Ireland, this task is further complicated by the shifting nature of demand. In the 1990s and early 2000s the trend was toward a rising contribution of private health services relative to public health demand which grew at a slower pace. This trend has reversed toward a more rapidly expanding demand for public health services since the onset of the current economic crisis.

Changing Demographics

The structural and long-term nature of the current economic crisis provides strong rationale for investment in measures that aim to increase productivity in the public health services and improve their quality. Another driver for improving the economics of health systems is the challenge of population demographics. While Ireland has one of the youngest populations in the advanced economies, two factors increasingly are likely to characterise demographic demand for e-health investment.

- » Firstly, Ireland's overall quality of healthcare services remains below the levels consistent with the country's shift toward the Knowledge and Innovation Economy geared toward internationally traded services that are heavily dependent on internationalised and highly skilled workforce (Dirks et al, 2010)¹¹⁶.
- » Secondly, Ireland is a small open economy within the larger European markets and is exposed to high degrees of open

migration, implying significant potential pressures of an ageing European population on Ireland via migration work-related and retirement-related migration flows.

Open migration and labour market pressures are expected to generate growing demand for internationally transferable health services, including patient records, prescriptions and patient-maintenance systems. At the current rate of exports growth, the Irish economy can be expected to add between 20,000 and 30,000 new highly-skilled internationally-mobile workers per annum between 2015-2025. Attracting these workers, while keeping wages inflation to a minimum will require improved provision of public health (Dirks et al, 2010).

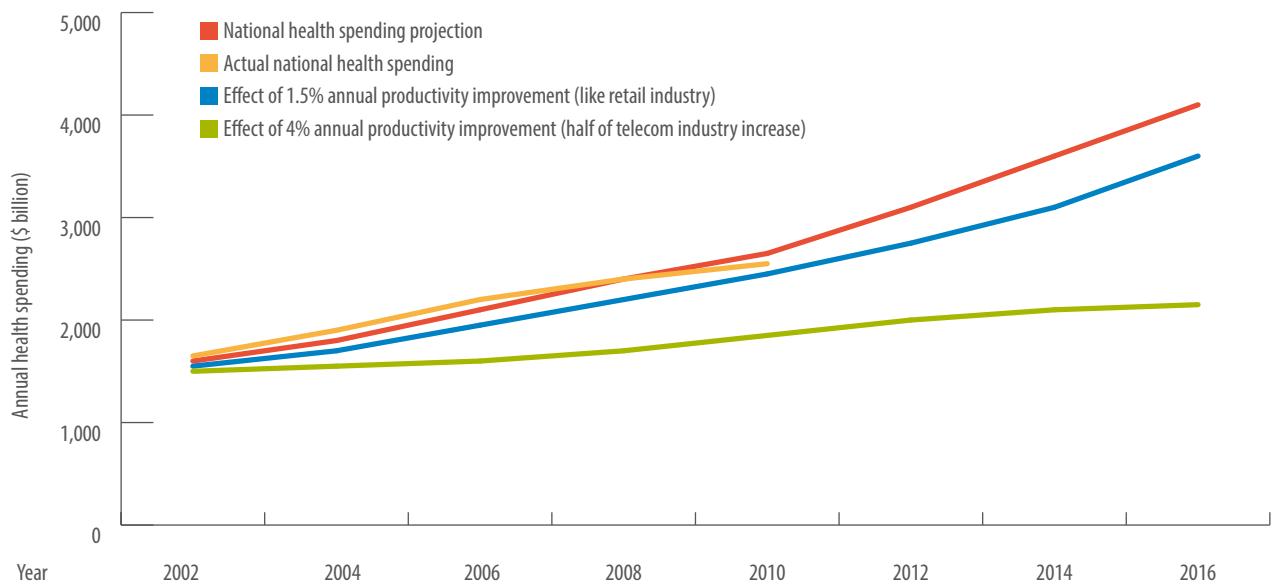
The challenges associated with an ageing European population imply increasing demand for healthcare provision in the case of patients suffering from chronic diseases and age-related conditions. These coincide with internal demographic trends. Based on the Irish Central Statistics Office (CSO) in 2013¹¹⁷, the population of aged 65 years and over is projected to increase from 532,000 in 2011 to 850,000 - 860,700 by 2026, and to close to 1.4 million by 2046. At the same time, the very old population (i.e. those aged 80 years of age and over) is set to rise even more dramatically from 128,000 in 2011 to 484,000 - 470,000 in 2046. Improvements in life expectancy are assumed to continue for the foreseeable future resulting in male life expectancy increasing from 77.9 to 85.1 by 2046 and female life expectancy increasing from 82.7 to 88.5.

These pressures raise the twin problems of increased calls on personnel and plant resources, exacerbated by the demand for new types of services associated with maintenance and off-site treatments, which are increasingly moving in the direction of telemonitoring, remote and mobile-health (mHealth) provisioning. Shifting of demand toward these more off-site and decentralized systems, in turn, implies reallocation of financial resources within the health system and across public and private providers of services.

eHealth Introduces a New Market Force

As the EU Commission (2007) explicitly argued¹¹⁸, in the near future *"...policy makers ...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. Radical transformation of the healthcare delivery process is needed, 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... 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"*.

Possible Improved Productivity Effects of Health Information Technology on Future National Health Spending, 2012-2016



Sources: (1) Hillestad R, et al. Can electronic medical record systems transform healthcare? (Note in text). (2) CMS. National Health Expenditure Accounts [Internet]. Baltimore (MD): CMS: 2010 [cite 6 Dec 2012]. Available from: <http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/tables.pdf>

Appendix B. Figure 1. A RAND report forecasted effects of small Healthcare ICT improvements on overall budget spending in the USA.

In other words, eHealth emerges as a new input in the overall healthcare system namely;

- » A substitute for other resources, such as personnel time
- » A source of greater efficiencies in delivery of services
- » A platform for development and provision of new services (such as Telemedicine, data analytics, remote diagnostic and treatment, and resources management systems) (EU Commission, 2006¹¹⁹ and 2007).

Return on Investment

A RAND report¹²⁰ noted that very small percentage increases in efficiency as a result of eHealth (or Healthcare ICT) can have significant knock on to overall healthcare spending, see figure 8.1.

Overall, there are five main and broadly defined drivers for returns on investment in a comprehensive long-term eHealth strategy:

- » **Efficiency gains within existing systems – Immediate Gains** which cover lower costs of operations, and help to reduce demand pressures on core resources, and increase productivity. The associated returns can be expected to start accruing from year 1 and rising through year 5, with flattening of returns thereafter. Rapid decline of the growth momentum in returns is driven by the expectation that the largest gains

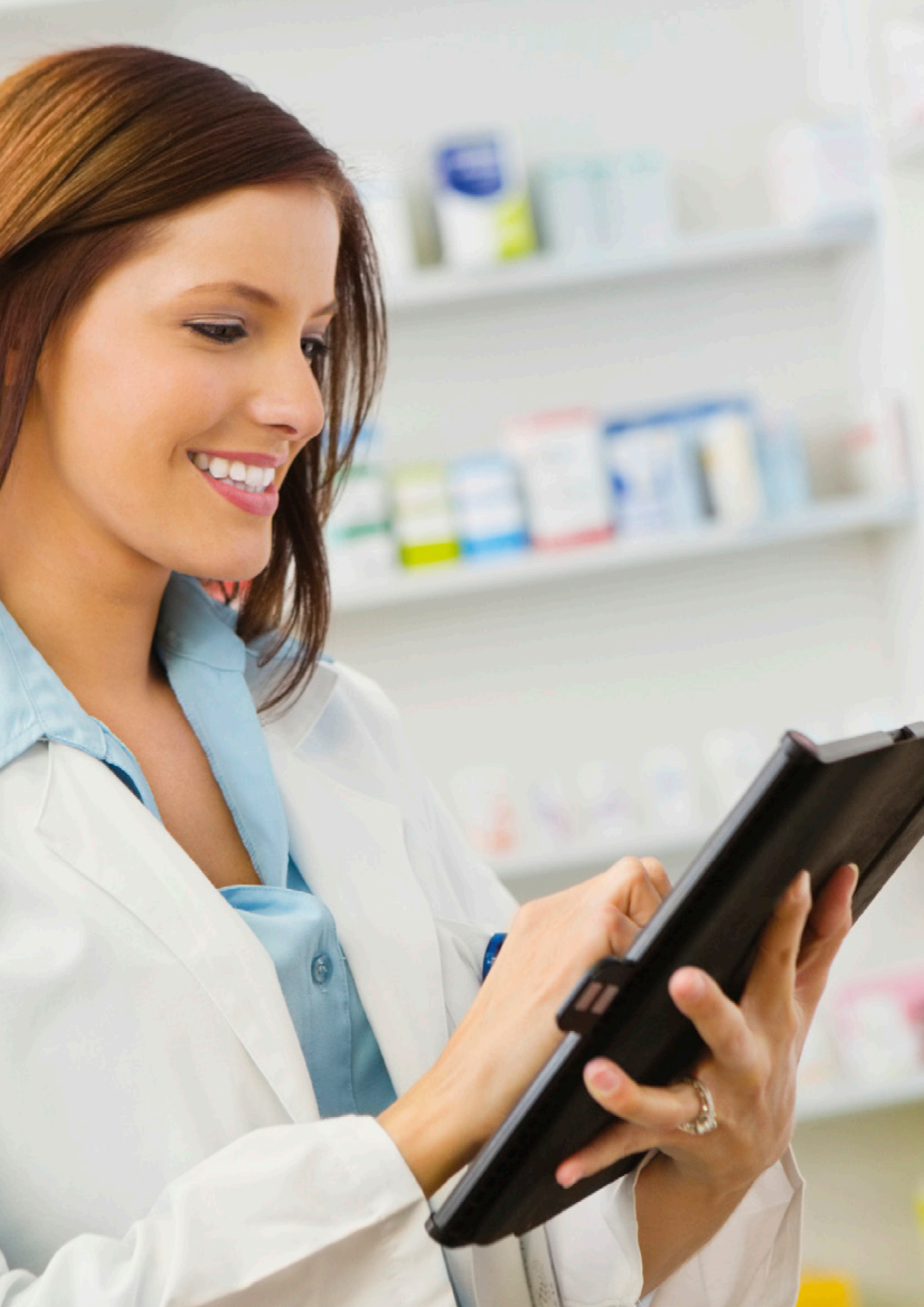
will be derived from one-off costs reductions and improved efficiencies in resources allocations. In size, these are the largest short to medium-term gains, amounting up to 7% of the current operational (ex-capital investment) budget of the HSE at the peak [Estimate based on EU Commission (2008)¹²¹ reported range of returns and on DH (2010)¹²² net present value estimates over 10 year horizon]. This stage of development of an eHealth strategy is also associated with higher risks relating to potential failure. The EU Commission (2007 and 2008) state that 74% of all IT projects in 2008 in healthcare have failed at some point along their deployment journey, and this percentage has remained unchanged since the 1980s. Approximately 28% of all projects fail completely. Risk factors here relate to skills shortages in healthcare ICT. It should be noted though that the other side of this also holds true i.e. an investment and accumulation of healthcare ICT skills can lead to the development over time of eHealth exporting opportunities and also higher efficiencies within the existing healthcare delivery systems. Converting these challenges into opportunities requires careful design and implementation of the eHealth strategy, creation of incentives for staff training and upskilling, and increasing clinical awareness and understanding as to the benefits of increased system productivity. As per the EU Commission (2008)¹²³ (and covered in Chapter 4 earlier):

“Focusing on ICT alone is the wrong starting point. ... 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.”

- » **New Systems Cost Efficiency Gains.** These relate to new investments in staff, plant, systems and equipment, with eHealth deployments allowing for better integration of new investments into legacy work processes and service delivery systems and opening up services delivery systems to provision of new services, such as remote monitoring and telehealth. Associated returns accruing from the date of new investment, with flattening out of returns growth after years 5-10, are as per point (1) above. In scope, these gains are subject to overall capital investment and current expenditure projections for the future. Gains margins can range between 5-7% pa for capital programmes (DH,2010), to over 50% for operational programmes relating to some treatments and to 84% for some administrative processes (Ingenico, 2012¹²⁴). These are net gains not realizable under the legacy systems and as such are revenue-additive to the public health system and the exchequer.
- » **Net Additional Returns Within the Health System – Gains from increased utilisation** rates and productivity of core and specialist plant, equipment and personnel. Rising health system efficiency leads to improved quality (as well as enhanced willingness to pay for such quality) of health system outputs. Associated returns here are accruing over longer periods of time, with an expected horizon of up to 10 years (EU Commission, 2007). Gurdgiev (2010¹²⁵) forecasts the internal market size for eHealth-related services in Ireland to be €26.6-35.8 million per annum in 2015, rising to EUR 42.0-88.1 million by 2025. This market potential can be exploited through the implementation of a comprehensive eHealth strategy. Additional positive impetus for this will be a more open market for health services in the EU over time, and greater re-orientation of future EU healthcare systems to a *‘Money Follows the Patient’* model.
- » **Improved Health Outcomes and Associated Returns** to the economy at large (extended life expectancy, improved quality of life and productivity during treatment, shorter treatment period disruptions to labour supply etc). Associated returns as in (3) above are likely to be long-term in nature. While very hard to quantify, these returns can be approximately gauged via the overall link between human health and economic activity in general. Extending active life of an average employee in Ireland by 1 year can lead to a 1.5% rise in the GDP without taking into the account the savings that can be delivered by

reducing demand for healthcare during that period of time (based on CSO, 2013c¹²⁶). Based on CSO (2010¹²⁷) comparatives relative to CBC [2012¹²⁸] for Ireland and Canada, the net effect of deploying a fully operational eHealth platform on time savings and labour market impact in Ireland can be estimated at 0.40-0.56% of GDP. These estimates relate directly to time saved on visits to hospitals, ambulatory treatments and physicians, and exclude the effects of improved health and life expectancy on time savings from reduced use of ‘sick days’, improved health outcomes and reduced reliance on direct visits for continued maintenance treatments and drugs prescriptions.

- » **Opening up of Export Markets:** Increased value-for-money in the system and improved specialist output can lead to opening health systems to export potential. Associated returns in this area can be expected to accrue in years following full deployment of the eHealth platform, with returns scaling up thereafter. Gurdgiev (2010¹²⁹) estimated the size of the market potential for direct eHealth linked exports in Ireland at EUR559-573 million per annum through 2020, with employment potential of ca 2,360 new full-time jobs added and exchequer impact (based on 2010 taxation rates) of ca EUR135 million. This relates to the stand-alone effects (outside the existing HSE system of healthcare provision). In addition to this, we can expect within-HSE system exports generation in core specialist services, as well as associated jobs creation. The size and scope of this latter effect is impossible to estimate with any precision however. Note: these figures relate to the lower growth forecast scenario.



12 References

- 1 Canada Health Infoway. Annual Report 2012-2013. <http://infoway-inforoute.ca>
- 2 McCrone, P., M. Knapp, et al. (2004). "Cost-effectiveness of computerised cognitive behavioural therapy for anxiety and depression in primary care: results from a randomised controlled trial." *Br J Psychiatry* 185: 55-62.
Mihalopoulos, C., L. Kiroopoulos, et al. (2005). "Exploratory economic analyses of two primary care mental health projects: implications for sustainability." *Med J Aust* 183(10): s73-6.
Christensen, H. and K. Griffiths (2007). *Reaching standards for dissemination: a case study*. MEDINFO 2007, IOS Press.
Shandley, K., Austin, D., Klein, B., & Kyrios, M. (under review). An evaluation of 'Reach Out Central': an online therapeutic
- 3 National eHealth Strategy Toolkit. World Health Organisation and the International Telecommunications Union, 2012.
- 4 eHealth Action Plan 2012-2020: Innovative Healthcare for the 21st Century. European Commission 2012, Com (2012) 736.
- 5 CMS from "The Long-Term Projection Assumptions for Medicare and Aggregate National Health Expenditures," Office of the Actuary, Centers for Medicare and Medicaid Services, March 2008. CBO - estimated using the excess cost growth assumptions in The Long -Term Outlook for Health Care Spending, CBO, November 2007, coupled with CBO Baseline Budget projections 2008-2018, September 2008.
- 6 OECD Health Data 2008.
- 7 The New Agenda on Ageing. To Make Ireland the Best Country to Grow Old In. Ageing Well Network Ireland, 2012.
- 8 Central Statistics Office (2013b). <http://www.cso.ie/>
- 9 Diabetes Forecasts to 2025 and Beyond: The Looming Crisis Demands Change. William R. Rowley and Clement Bezold. Institute for Alternative Futures, November 2005.
- 10 Prevalence and Trends in Obesity Among US Adults. Flegal, KM, et al 1999-2000. *JAMA* 2002;288:1723-1727
- 11 Survey of Lifestyle, Attitudes & Nutrition in Ireland. Morgan K, McGee H, Watson D, Perry I, Barry M, Shelley E, Harrington J, Molcho, M, Layte R, Tully N, van Lente E, Ward M, Lutomski J, Conroy R, Brugha R (2008). *SLÁN 2007*: Irish Department of Health and Children.
- 12 Obesity in Europe - The Case for Action. International Obesity Taskforce and European Association for the Study of Obesity (2002).
- 13 Irish Universities Nutrition Alliance (2006) National Children's Food Survey.
- 14 <http://www.oecd.org/ireland/BriefingNoteIRELAND2012.pdf>
- 15 Future Health. A Strategic Framework for Reform of the Health Service 2012-2015. Department of Health, November 2012.
- 16 Money Follows the Patient. Policy Paper on Hospital Financing. February 2013.
- 17 The Path to Universal Healthcare. Preliminary Paper on Universal Health Insurance. Department of Health, February 2013.
- 18 ICT Opportunities in Healthcare: Key issues, growth prospects and market opportunities in Europe and the US. Research and Markets. <http://www.researchandmarkets.com>.
- 19 <http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/ehealth/>
- 20 A Systematic Review of Published Definitions. *J Med Internet Res*. 2005 Jan-Mar; 7(1): e1. Hans Oh, Carlos Rizo, Murray Enkin, and Alejandro Jadad.
- 21 <http://www.healthvault.com>
- 22 Department of Health and Human Services. Medicare Program; ePrescribing and the Prescription Drug Program; Final Rule. 2005. Available online from: <http://edocket.access.gpo.gov/2005/pdf/05-22026.pdf>.
- 23 When is it a Medication Error? Osborne I, Blais K, Hayes JS. Nurses' perceptions: *J Admin* 1999; 29(4): 33-38
- 24 ePrescribing and Electronic Transfer of Prescriptions: an International Review. Health Information and Quality Authority. December 2012. <http://www.hiqa.ie/publications/eprescribing-and-electronic-transfer-prescriptions-international-review>
- 25 Moore's Law. Intel Corporation. www.intel.com/technology/mooreslaw/
- 26 The Internet of Things. How the Next Evolution of the Internet Is Changing Everything. Dave Evans. Cisco Internet Business Group White Paper 2011. <http://www.cisco.com/go/ibsg>
- 27 http://www.ideallifeonline.com/newsroom/Press_Release_ENG_IDEAL_LIFE_Nov_26.pdf
- 28 <http://www.echalliance.com/content.asp?PagelD=221&id=221>
- 29 Hal Wolf, Senior Vice President and Chief Operating Officer, The Permanente Foundation, Kaiser Permanente LLC 2012. <http://www.kp.org>
- 30 Healthy Ireland – A Framework for Improved Health and Wellbeing. 2013-2025. http://dohc.ie/issues/healthy_ireland
- 31 National Standards for Safer Better Healthcare. Health Information and Quality Authority. June 2012. Available from <http://www.hiqa.ie>

- 32 Global Observatory for eHealth. World Health Organisation. <http://www.who.int/goe/publications/en/>
- 33 http://ec.europa.eu/health/ehealth/policy/index_en.htm
- 34 e-Health - making healthcare better for European citizens: an action plan for a European e-Health Area. Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - COM/2004/0356 final
- 35 The Renewing Health Project. RegioNs of Europe WorkINg toGether for HEALTH. <http://www.renewinghealth.eu/>
- 36 The epsOS project. July 2008-December 2013. <http://www.epsos.eu/>
- 37 <http://www.aer.eu/en/media-corner/press-releases/2013/201306281.html>
- 38 European Funding for Health Research. Dr.Paul Rubig, MEP. <http://www.ehma.org>
- 39 <http://www.ec.europa.eu/research/horizon2020>
- 40 <http://www.fp7ireland.com/Page.aspx?SP=224>
- 41 Connected Health in Ireland – An All Island Review. BioBusiness Ltd and Enterprise Ireland. <http://biobusinessni.org>
- 42 Report of the Tribunal of Inquiry into the Infection with HIV and Hepatitis C of Persons with Haemophilia and Related Matters. <http://www.dohc.ie/publications/lindsay.html>
- 43 <http://www.gs1ie.org>
- 44 <http://www.hse.ie/eng/about/Who/clinical/natclinprog/opatprogramme/>
- 45 <http://www.iheed.org>
- 46 2013 Action Plan for Jobs. http://www.djei.ie/publications/2013APJ_Annex.pdf
- 47 <http://www.casala.ie>
- 48 <http://www.shimmer-research.com>
- 49 <http://www.arch.ie>
- 50 <http://www.insight-centre.org/>
- 51 Dirks, S., Gurdgiev, C. and Keeling, M. (2010) "Smarter Cities for Smarter Growth: How Cities Can Optimize Their Systems for the Talent-Based Economy". IBM Institute for Business Value, May 2010. Available at SSRN: <http://ssrn.com/abstract=2001907>
- 52 Central Statistics Office (2013b). <http://www.cso.ie/en/newsandevents/pressreleases/2013pressreleases/pressreleasepopulationandlabourforceprojections2016-2046/>
- 53 EU Commission (2007). "Conceptual framework, healthcare and eHealth investment context and challenges", Financing eHealth, European Commission, DG INFSO & Media, December 200. http://www.financing-ehealth.eu/downloads/documents/Financing_eHealth_D1_3_concept_and_context_web.pdf
- 54 EU Commission (2006). "eHealth IMPACT: Study on the economic and productivity impact of eHealth", commissioned by European Commission, DG IN-FSO <http://www.ehealth-impact.org>
- 55 Hillestad R, Bigelow J, Bower A, Girosi F, Meili R, Scoville R, et al. Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health Aff (Millwood)*. 2005;24(5):1103–17.
- 56 EU Commission (2008). "Sources of financing and policy recommendations to Member States and the European Commission on boosting eHealth investment", Financing eHealth, European Commission, DG INFSO & Media, Final study report, Version 1.0, December 2008. http://www.financing-ehealth.eu/downloads/documents/FeH_D5_3_final_study_report.pdf
- 57 DH (2010). The power of information: Putting all of us in control of the health and care information we need – Impact Assessment. Department of Health, 16/05/2010. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/134336/dh_134205.pdf.pdf
- 58 Ingenico (2012). "e-Health in Europe", White paper produced by Ingenico Corporate Communication and Thierry Spanjaard, Smart Insights. June 2012. <http://www.ingenico.com/ru4fef.pdf?t=/documentManager/sfdoc.file.supply&fileID=1341391556104>
- 59 Gurdgiev (2010). "Market size for remote ICT services in healthcare in Ireland", Your Country, Your Call, submission, August 2010.
- 60 Gurdgiev (2010). "Market size for remote ICT services in healthcare in Ireland", Your Country, Your Call, submission, August 2010.
- 61 Central Statistics Office (2013c). http://cso.ie/px/pxeirestat/Database/eirestat/Institutional%20Sector%20Accounts%20Non-Financial/Institutional%20Sector%20Accounts%20Non-Financial_statbank.asp?SP=Institutional%20Sector%20Accounts%20Non-Financial&Language=0]
- 62 CSO (2010). Health Status and Health Service Utilisation Quarterly National Household Survey, Quarter 3 2010. <http://cso.ie/en/media/csoie/releasespublications/documents/labourmarket/2010/healthstatusq32010.pdf>

- 63 CBC (2012). Valuing Time Saved: Assessing the Impact of Patient Time Saved from the Adoption of Consumer Health Solutions, The Conference Board of Canada, September 19, 2012. https://www.inforoute.ca/index.php/resources/other/cat_view/2-resources/37-other?limit=5&limitstart=0&order=hits&dir=ASC
- 64 The Irish Exporters Association. <http://www.irishexporters.ie/section/OverviewofLifeSciencesIreland>
- 65 IDA Ireland. <http://www.idaireland.com/business-in-ireland/information-communication/>
- 66 Doing More with Digital – National Digital Strategy for Ireland. Phase 1 – Digital Engagement. July 2013. Department of Communications, Energy and Natural Resources. <http://www.dcenr.gov.ie/Communications/NDS/>
- 67 <http://www.imi.europa.eu>
- 68 <http://www.epemed.org>
- 69 <http://www.epsos.eu>
- 70 <http://www.ec.europa.eu/research/horizon2020>
- 71 Anatomy of an E-Health Ecosystem. Booz and Co. <http://www.booz.com/media/file/BoozCo-Anatomy-of-E-Health-Ecosystem.pdf>
- 72 Open Innovation 2.0: A New Paradigm. Martin Curley and Bror Samelin. Intel Newsroom. <http://newsroom.intel.com/docs/DOC-3929>
- 73 http://www.ticalut.cat/en_index/
- 74 <http://cht.oulu.fi/>
- 75 <http://nyehealth.org/>
- 76 <http://www.ierc.ie/>
- 77 <http://www.icmr.ie/>
- 78 <http://www.mcci.ie/>
- 79 <http://www.clarity-centre.org>
- 80 <http://www.deri.ie>
- 81 <http://www.tril-centre.org>
- 82 <http://ec.europa.eu/digital-agenda/en/news/draft-transatlantic-ehealth-health-it-cooperation-mou-roadmap>
- 83 http://www.dohc.ie/issues/eHealth/eHealth_Irish_Presidency_Declaration.pdf?direct=1
- 84 <http://www.echalliance.com>
- 85 <http://www.nyehealth.org>
- 86 <http://www.informatics.manchester.ac.uk/mhealthecosystem/Pages/default.aspx>
- 87 http://ec.europa.eu/health-eu/europe_for_patients/cross-border_healthcare/index_en.htm
- 88 Report of the Research Prioritisation Steering Group. <http://www.forfas.ie/publications/featuredpublications/title,8958,en.php>
- 89 An international Healthcare Services Centre. Joseph Dalton 2010. <http://www.ihsc.ie>
- 90 Healthcare IT 2012 Executive Summary. Mercom Capital Group. <http://www.mercomcapital.com>
- 91 Doing More with Digital – National Digital Strategy for Ireland. Phase 1 – Digital Engagement. July 2013. Department of Communications, Energy and Natural Resources. <http://www.dcenr.gov.ie/Communications/NDS/>
- 92 <http://www.thedigitalhub.com/>
- 93 <http://www.ndrc.ie/>
- 94 <http://www.nra.ie>
- 95 Delivering 21st century IT support for the NHS: national strategic programme. UK Department of Health, June 2002. <http://www.dh.gov.uk>
- 96 The Power of Information. Putting all of us in control of the health and care information we need. UK Department of Health, May 2012.
- 97 eHealth Strategy 2008-2011. NHS Scotland. <http://www.scotland.gov.uk/Resource/Doc/236550/0064857.pdf>
- 98 Transforming Your Care. A Review of Health and Social Care in Northern Ireland. December 2011. <http://www.dhsspsni.gov.uk/hscreview131211.htm>
- 99 <https://webgate.ec.europa.eu/eipaha/>
- 100 <http://www.oecd.org/netherlands/BriefingNoteNETHERLANDS2012.pdf>
- 101 Netherlands National IT institute for Healthcare, June 2008. <https://www.nictiz.nl/>
- 102 Zorginnovatieplatform 2009
- 103 <http://www.ehealthnu.nl/>
- 104 <http://oecd.org/germany/BriefingNoteGERMANY2012.pdf>
- 105 <http://www.oecd.org/denmark/BriefingNoteDENMARK2012.pdf>
- 106 eHealth in Denmark. eHealth as a part of a coherent Danish health care system. Danish Ministry of Health 2012. ISBN 978-87-7601-332-5
- 107 <http://www.oecd.org/australia/BriefingNoteAUSTRALIA.pdf>
- 108 National E-Health Strategy Summary. Australian Health Ministers' Advisory Council. <http://www.ahmac.gov.au>

- 109 <http://www.ehealthinfo.gov.au/model-healthcare-community>
- 110 The e health revolution—easier said than done. Parliament of Australia, Parliamentary Library, Research Paper No.3 2011-2012. 17th November 2011.
- 111 Healthcare System Ratings: US, Great Britain, Canada. www.gallup.com
- 112 Canada Health Infoway. <http://infoway-inforoute.ca>
- 113 University of Victoria eHealth Observatory. <http://ehealth.uvic.ca>
- 114 Canada Health Infoway. Summary Corporate Plan 2012-2013. <http://infoway-inforoute.ca>.
- 115 Canada Health Infoway. Annual Report 2012-2013. <http://infoway-inforoute.ca>
- 116 Dirks, S., Gurdgiev, C. and Keeling, M. (2010) "Smarter Cities for Smarter Growth: How Cities Can Optimize Their Systems for the Talent-Based Economy". IBM Institute for Business Value, May 2010. Available at SSRN: <http://ssrn.com/abstract=2001907>
- 117 Central Statistics Office (2013b). <http://www.cso.ie/en/newsandevents/pressreleases/2013pressreleases/pressreleasepopulationandlabourforceprojections2016-2046/>
- 118 EU Commission (2007). "Conceptual framework, healthcare and eHealth investment context and challenges", Financing eHealth, European Commission, DG INFSO & Media, December 200. http://www.financing-ehealth.eu/downloads/documents/Financing_eHealth_D1_3_concept_and_context_web.pdf
- 119 EU Commission (2006). "eHealth IMPACT: Study on the economic and productivity impact of eHealth", commissioned by European Commission, DG IN-FSO <http://www.ehealth-impact.org>
- 120 Hillestad R, Bigelow J, Bower A, Girosi F, Meili R, Scoville R, et al. Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health Aff (Millwood)*. 2005;24(5):1103-17.
- 121 EU Commission (2008). "Sources of financing and policy recommendations to Member States and the European Commission on boosting eHealth investment", Financing eHealth, European Commission, DG INFSO & Media, Final study report, Version 1.0, December 2008. http://www.financing-ehealth.eu/downloads/documents/FeH_D5_3_final_study_report.pdf
- 122 DH (2010). The power of information: Putting all of us in control of the health and care information we need – Impact Assessment. Department of Health, 16/05/2010. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/134336/dh_134205.pdf.pdf
- 123 EU Commission (2008). "Sources of financing and policy recommendations to Member States and the European Commission on boosting eHealth investment", Financing eHealth, European Commission, DG INFSO & Media, Final study report, Version 1.0, December 2008. http://www.financing-ehealth.eu/downloads/documents/FeH_D5_3_final_study_report.pdf
- 124 Ingenico (2012). "e-Health in Europe", White paper produced by Ingenico Corporate Communication and Thierry Spanjaard, Smart Insights. June 2012. <http://www.ingenico.com/ru4fef.pdf?t=/documentManager/sfdoc.file.supply&fileID=1341391556104>
- 125 Gurdgiev (2010). "Market size for remote ICT services in healthcare in Ireland", Your Country, Your Call, submission, August 2010.
- 126 Central Statistics Office (2013c). http://cso.ie/px/pxeirestat/Database/eirestat/Institutional%20Sector%20Accounts%20Non-Financial/Institutional%20Sector%20Accounts%20Non-Financial_statbank.asp?SP=Institutional%20Sector%20Accounts%20Non-Financial&Planguage=0]
- 127 CSO (2010). Health Status and Health Service Utilisation Quarterly National Household Survey, Quarter 3 2010. <http://cso.ie/en/media/csoie/releasespublications/documents/labourmarket/2010/healthstatusq32010.pdf>
- 128 CBC (2012). Valuing Time Saved: Assessing the Impact of Patient Time Saved from the Adoption of Consumer Health Solutions, The Conference Board of Canada, September 19, 2012. https://www.infoway-inforoute.ca/index.php/resources/other/cat_view/2-resources/37-other?limit=5&limitstart=0&order=hits&dir=ASC
- 129 Gurdgiev (2010). "Market size for remote ICT services in healthcare in Ireland", Your Country, Your Call, submission, August 2010.

