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1 Executive summary

1.1 Background

EHealth plays an essential role in supporting healthcare in today’s digital society; it is perceived as crucial for high quality and cost-effective healthcare. However, getting the expected benefits from eHealth has been difficult to demonstrate. There has been a raising interest in adopting eHealth Governance frameworks to obtain re-assurance that investments return the expected results in health care. However how IT Governance is implemented within healthcare and the actual impact on strategic alignment remains poorly understood.

1.2 Method

This technical report is based on a longitudinal study (2008-2013), involving a multi-case analysis of three representative health care organisations in Scotland. A combination of empiric methods has been used: semi-structured interviews with implementers, surveys using our adaptation to health care of Luftman’s instrument [1] for assessing Venkatraman’s Strategic Alignment Model [2] and a cross-sectoral/national benchmarking based on a literature review.

Ninety-two participants have been involved across three HCOs under study, with representation of the main groups of eHealth, clinical and non-clinical stakeholders. The benchmarking exercise incorporated 9226 institutions providing worldwide coverage.

1.3 Results and conclusions

The results show that eHealth Governance is in its infancy across sectors and countries, with 80% of the organisations worldwide in a transition point between a “committed” and an “established” process.

The findings support our proposition that the more mature eHealth Governance is, the better the strategic alignment between eHealth and health care organisations (HCOs).

The Strategic alignment is progressing across the organisation (15% since 2008), indicating a vaguely faster development than the overall maturity of eHealth Governance.

The conclusions of this study suggest there is a potential strong statistical correlation between eHealth Governance and Strategic Alignment, however more data is required in order to confirm this initial findings; it is recommended the longitudinal analysis continues over the forthcoming years to determine the actual correlation ratio. Further research is also required in order to understand the influence the rest of the SAM dimensions have, and to determine how eHealth Governance influences strategic alignment in isolation of the rest of the SAM dimensions. For this purpose, a simplified and adapted method to monitor these trends in future HCOs research has also been provided.
2 Introduction

2.1 Background

This research is a continuation of a previous study conducted between 2005 and 2010, which involved a comprehensive literature review [3], and a Delphi exercise [4] proposing a causal model of determining factors (Figure 1) involved in the adaptation of National Health Services to the digital society with a particular focus on Scotland. The model identified a number of factors that need to be understood in order to help organisations and governments to make better eHealth investment decisions and strategies. This report focuses on two of the main factors identified in the causal model: eHealth Governance and eHealth Strategic Alignment.

This study started in 2008 as part of an IT Governance project co-sponsored by the Scottish Executive in order to demonstrate practical results adopting IT Governance best practices and to provide recommendations for a future adoption across the NHS in Scotland [5]. Three representative NHS Boards in Scotland were selected for this trial [6].

Figure 1 Causal model of determinant factors in the adaptation of the NHS to the Information Society. The arrows indicate the hypothesised relationship between the variables. Source: [3]
2.2 Key definitions

The following definitions will be used in this report:

- **IT governance** is the responsibility of the Board of Directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategy and objectives. [7]. It is worth mentioning the scope of IT Governance, for the purpose of this paper, is as described in COBIT® [8], which involves both the information and related technologies. From this perspective, Information Governance is part of the overarching IT Governance umbrella.

- **eHealth** is an innovation process for delivering better healthcare through a series of creative applications (eHealth initiatives) of information and communication technologies to health care. [6]

- For the purpose of this report, **eHealth Governance** is IT Governance, as described by ITGI [9], within health care organisations.

- **Strategic alignment** is a mechanism by which an organization can visualize the relationship between its business processes and strategies. [10]

- **SAM** is the Strategic Alignment Model developed by Henderson and Venkatraman [2]. This model is widely used as the base of Business/IT Alignment theories. The key message of this model is that to achieve success, organisations should make sure their IT strategy is fully aligned with the business strategy.

2.3 The need for eHealth Strategic Alignment and eHealth Governance.

There is an expectation in digital societies that ICT will contribute to better health care. It is expected that eHealth innovations contribute providing quality and cost-effective solutions for the XXI century health care challenges [11], especially considering aging populations, increasing long term conditions, obesity and alcohol related issues, along with the costs of preventable hospital admissions if prescription medication was taken correctly [12]. Furthermore, eHealth is considered key to achieve sustainable health care, especially in collaborative cross-border spaces [13].

Despite eHealth being considered key for sustainable health care, many eHealth initiatives often have failed [11, 14] and HCOs commonly find themselves caught between the organisational pressures for delivering eHealth and organisational resistance to new ways of functioning [15].

The success implementing eHealth initiatives varies significantly according to experiences reported in the National Health Service (NHS), UK [5, 16]. Some of the downsides are related to delays, over expenditure or budget deficits, poor quality of outcomes and
effectiveness on health care [17], which is consistent with the average ICT projects implementation statistics [16].

After series of disappointing eHealth implementations, there is a raising interest on eHealth/IT Governance [17] as a vehicle to provide assurance to all stakeholders that eHealth Programmes deliver the expected benefits [15]. This interest also derives from the appearance of greater pressures in HCO for compliance with best practices, standards and regulations [5].

It is expected the interest will continue raising in the forthcoming years since investments on eHealth continues to grow at an average rate of 12-16% per year and a global mHealth market worth estimate some $23 billion by 2017 [18]. Despite this, and the expectations of successful eHealth implementations at strategic levels in health care organisations, eHealth Governance is still very much just a CIO/IT director issue [17]. This is an international occurrence widely reported [19].

Governance is in essence the act of governing, which involves decision making but also management [20]. Beyond this concept, governance is also the art of assurance [9], which becomes relevant because of the need for greater results accountability in the best interest of all health care stakeholders.

Although there is a considerable amount of research work on implementation of eHealth initiatives and eHealth Governance, this has still been described as a “young science” [21], demanding more understanding of implementation processes, tools and models for better results [22].

There are a number of IT Governance frameworks used across sectors and industries, commonly COBIT®, ITIL and a range of ISO standards (e.g. ISO9000, ISO17799 and ISO38500), the first two being the ones most commonly adopted within the healthcare sector [19].

This technical report explores the application of these frameworks within the National Health Services in Scotland and their impact on eHealth Governance maturity and strategic alignment with healthcare. We also present an adapted and simplified instrument to speedily measure eHealth Governance and Strategic Alignment maturity levels.

3 Methods

3.1 Design

The wider study involves a combination of methods to capture observations and data of different nature and sources, also to correlate the relevant variables under study. However, in this specific technical report we focus on case studies of three different NHS regional Boards (Scotland) undertaking the adoption of eHealth Governance frameworks. Data was collected using and adapted version of the SAM survey (Annexe 2), semi-structured interviews and benchmarking. This method has been previously used on similar studies around governance and alignment achieving adequate results [1].

3.2 Setting.

In order to ensure appropriate representation of the variety of HCOs within the National Healthcare Services in Scotland, the following criteria were applied when selecting the study cases:
• Clinical context: end-to-end health care service provider, including primary, secondary and community care.
• Must include HCOs serving rural and/or urban settings, and population served should cover the typical range of socio-economic conditions (different deprivation indices)
• Diversity of organisation sizes

The 3 cases compared have been classified as shown in Table 1.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>HCO Type C (Small)</th>
<th>HCO Type B (Medium)</th>
<th>HCO Type A (Big)</th>
</tr>
</thead>
<tbody>
<tr>
<td>eHealth/IT staff</td>
<td>±50</td>
<td>±80</td>
<td>±200</td>
</tr>
<tr>
<td>HCO employees</td>
<td>±4,000</td>
<td>±8,000</td>
<td>±28,000</td>
</tr>
<tr>
<td>Sites / Geographical locations</td>
<td>±40</td>
<td>±90</td>
<td>±280</td>
</tr>
<tr>
<td>Beds (Acute specialities)</td>
<td>±350</td>
<td>±800</td>
<td>±2500</td>
</tr>
<tr>
<td>Population</td>
<td>±112,000</td>
<td>±360,000</td>
<td>±778,000</td>
</tr>
</tbody>
</table>

Table 1 Classification of HCOs under study. Source: [3]

The National Health Service in Scotland (NHS Scotland) is responsible for the provision of public healthcare to the 5.2 million residents of Scotland [23]. NHS Scotland comprises of 14 area NHS boards and a number of special National Health Boards (NHBs). The area NHS boards are responsible for healthcare in their respective regions and the special NHBs for some services on a national basis including the Scottish National Blood Transfusion Service, the Scottish Ambulance Service and NHS Quality Improvement Scotland.

3.3 Participants.

Ninety-two participants were involved across the three case studies including surveys and interviews, representing the main groups of eHealth clinical and non-clinical stakeholders, eHealth providers and health care executives. There were limitations with the representativeness of one of the three cases under study, the smallest Board, due to reduced participation on the survey during the last year of this study; however, previous years all Boards had wide-ranging representation. A number of issues can affect sample size in qualitative studies; however, the guiding principle is the concept of saturation. It is normal that samples for qualitative studies are generally much smaller than those used in quantitative studies. Reasons for this as well documented [24]. As data collection progresses, there is a point when more data does not necessarily lead to more information, meaning that data saturation has been achieved.

In this study data saturation was achieved by:
   a) Reaching representation of all relevant types of stakeholders,
   b) Stopping the collection of data once new responses became repetitive and didn’t add new information.

Consent. Written consent has been obtained from participants in all cases. During face-to-face interviews participants received a PIS (Participant Information Sheet) including details of
the project, contacts and their rights to withdraw at any time without need to provide justification. All participants interviewed completed a consent form. For those participants completing the electronic survey, a PIS was presented during the introduction of the survey and they where explicitly prompted to consent by pressing the “Continue” button or to abandon the electronic survey. No data was captured without participant’s consent.

3.4 Data Collection

During the first year of the study a comprehensive COBIT assessment was conducted along with an anonymous SAM survey (our adapted version for HCOs). This approach provides deep understanding of how eHealth Governance is implemented but is extensively time consuming. In order to facilitate the gathering of an eHealth Governance maturity snapshot and the corresponding Strategic Alignment at a particular point in time, we adapted Luftman’s survey [1] to HCOs. This adaptation was applied subsequently since 2009 on a yearly basis. Luftman’s survey is a recognised de-facto instrument applied in multiple studies [25, 26] and applied in different industries and countries [1]. The instrument, adapted to HCOs, is available through St. Andrew’s University website [27] and the ISACA Knowledge Centre website [8]. Repeated observations were then taken on a regular periods (every other year) across the selected NHS Boards. All main stakeholders involved in eHealth Governance within each organisation were invited to participate in the survey. Interviews were organised with members of the eHealth Governance project on each organisation, which included representation of eHealth, IT, management team and clinical/medical stakeholders. The notes of the interviews were anonymised and coded using NVIVO. The electronic surveys were anonymous since we didn’t collect the identity of the respondent only his/her role. Participation was only available by invitation and access to the survey site was password protected in order to avoid data contamination.

SAM Benchmarking

Data for benchmarking was obtained from a bank of SAM outcomes from 25 Fortune 500 companies and a comprehensive literature review [19]. The benchmarking exercise covered twenty-six selected worldwide studies and 9226 institutions.

To date, SAM has been applied in more than 60 published cases [28]. Its utilisation continues to grow, thereby increasing confidence in the model.

The literature reviewed provided worldwide data across a rich representation of industry sectors [19].

The most relevant studies reviewed include financial services, Government and public sector, Healthcare and pharmaceutical, IT/Telecom, leisure/entertainment, food and beverages, manufacturing and chemicals, and retail.

The geographical scope of the studies analysed provide global information, including specific references to:

- Asia-Pacific—Australia, Hong Kong, Indonesia, Japan, Singapore and New Zealand
- Europe—Austria, Belgium, France, Germany, Sweden, Italy, the Netherlands, Portugal, Spain, Switzerland and the UK
- North and Central America—Canada, the United States and Mexico
- South Africa
- South America—Argentina, Brazil, Chile, Colombia and Peru.
Details of all the studies, regions and sectors consulted are included in Annexe 1.

3.5 Data analysis

Data was analysed using the framework method proposed by Luftman [1]. This method allows the analysis of IT/IS practices within 5 levels of maturity, 5 being the highest (Figure 2).

Data was coded and normalised to six constructs available at each maturity level, namely: communication, competency/value measurement, governance, partnership, scope/architecture and skills.

![Figure 2 Strategic Alignment Maturity (SAM) Levels adapted by the authors to Health Care Organisations [1].](image)

![Figure 3 Strategic Alignment Dimensions adapted by the authors to Health Care [1].](image)
The interviews were coded using NVIVO, a comprehensive qualitative data analysis software package [29]. Each of the SAM dimensions and their attributes/characteristics had a corresponding Analysis Node in the coding tree (NVIVO framework).

The coding framework was applied to the existing studies identified during the literature review. This allowed a harmonised benchmarking with other industry sectors and countries by analysing, comparing and contrasting on the six strategic alignment constructs.

4 Results

We found ample variations in the eHealth Governance implementation approach, with narrower differences in maturity levels but analogous results in terms of achieved strategic alignment.

The responses were provided mainly by eHealth teams (35%) and senior managers (30%) but also included decision makers (20%) and other clinical stakeholders (15%).

4.1 Strategic Alignment maturity

The perception of alignment between eHealth and the HCO strategy has improved to a small extent (Figure 3), but in terms of maturity it remains between level 2 – committed process - and 3 – established focused process.

![Figure 4 Strategic alignment perception.](image)

Most of the alignment dimensions show a modest growth (Figure 5), representing a 15% overall improvement. In recent year, organisations seem to focus their efforts in Partnership and Value Measurement, with a progress of 12% and 24% respectively. In contrast, the Human Resources dimension shows signs of concerns, with no progress in maturity since 2008 to 2012 and a recent 17% deterioration. Communications, Architecture and eHealth Governance seem to remain dormant (0%) within the last period (2012/2013) despite the steady progress (13% to 36%) shown in previous years.
We present more detailed results and full descriptions of the derivation of the levels of maturity and alignment for each dimension in the subsequent sections of this paper.

4.2 Alignment enablers and inhibitors.

The organisations under study coincide on the importance of IT/eHealth achievement power to enable strategic alignment. There is a shared recognition that IT/eHealth demonstrates strong leadership across all the organisations under study. Equally, there is acknowledgment of the IT/eHealth capacity for meeting commitments and the eHealth understanding of the healthcare environment as the main enablers to achieve alignment, along with adequate linked IT/eHealth and business strategic plans.
HCOs seem to understand that alignment is eventually a shared responsibility between IT/eHealth and the healthcare service but still relies on IT/eHealth to drive the shift towards alignment. The main enablers are perceived to be in the IT/eHealth arena (Figure 6) rather than within a shared ground (i.e. sharing resources or using closer relationships between IT/eHealth and the healthcare units) or even driven by clinical requirements (i.e. efficiency, better healthcare). In other words, there is a perception that achieving alignment is mainly an IT/eHealth responsibility.

A lack of state of the art infrastructure is not perceived as a main inhibitor for alignment (Figure 7), although it is considered important. Instead, the lack of adequately linked plans between IT/eHealth and healthcare is a key inhibitor, along with budget and staffing problems and lack of senior executives support to IT/eHealth and resistance to change. It is also perceived that IT/eHealth failures in delivering commitments has a negative impact on moving forward towards better levels of alignment.

### Figure 7 Alignment inhibitors.

#### 4.3 eHealth Targets

The three most important IT/eHealth objectives within the HCOs under study, in order of importance were:

- First target: Availability of adequate solutions to meet healthcare requirements. Strategic alignment between IT/eHealth and HCO objectives. Provide support for healthcare needs in regards of technological infrastructure and information needs. Dependable systems (Figure 8).
- Second target: Accessibility of systems and integrated data. Improve access to information (e.g. clinical portal) and clinical communications. Integrated patient record. Data sharing, even linkages with no HCO (i.e. County Council) (Figure 9).
- Third target: Financial savings and cost management (e.g. reducing costs through convergence and standardisation) (Figure 10) along with Security.
Figure 8 Most important IT/eHealth Objectives identified.

Figure 9 Second most important IT/eHealth Objectives identified.

Figure 10 Third most important IT/eHealth Objectives identified.
The first targets for IT/eHealth are availability of adequate solutions in line with the healthcare requirements, integrated EPR (Electronic Patient Record) and IT & Information security.

The second target areas identified were accessibility of systems and integrated data, security and confidentiality and IT/eHealth delivery within service level agreements (SLAs) above other currently imperative targets, such as financial savings across the NHS, which has been clearly identified as a first (Figure 8), second (Figure 9) or third (Figure 10) target in order of importance within all the organisations consulted.

The main objectives for eHealth are led by a National eHealth Programme, which is essentially a ‘programme of programmes’ that currently consists of numerous projects and services combined under the eHealth banner. These are managed either directly by NHS Boards or by the Scottish Government [30].

The specific objectives of the eHealth Programme that all NHS Boards should be driven by are:

- To enable NHS Boards to implement a clinical portal incrementally, improving the access to information in support of safer, more efficient and more effective care.
- To enable NHS Boards to maximise use of the new GP IT Framework in Primary and Community Care to improve information and support shifting the balance of care.
- Encourage and support integration of clinical and management systems to provide more effective, efficient and safer care that will enable improvements in the management of patient journeys.
- To improve the governance of investment and particularly the governance of benefits across NHS Scotland to ensure that decisions are affordable, implementable, usable and acceptable.
- To develop an assurance strategy and information governance policies which support the efficient and effective use of information.
- To implement strategies for managing and reducing IT costs and for developing IT investment programmes which reduce the cost of providing healthcare.
- To develop the eHealth Strategy, ensuring alignment to the Quality Strategy (thereby providing assurance that eHealth is fundamentally aligned with the NHS strategy.

4.4 Health care objectives.

The three most important healthcare objectives within the HCOs under study, in order of importance were: improving clinical outcomes was identified as the first most important healthcare objective (Figure 11) (41%). It is in line with the next most important objective identified, which is meeting National targets (17%).
Improving clinical outcomes involves safe and effective, improved patient care, whilst meeting National targets is a wider objective.

The organisations under study are driven by a National strategy: “Better health, better care strategy” [14], which aims to improve the health of the population by focusing on quality, efficiency and safety. Projects like “18 week RTT” arose from this strategy, using the principle of increasing throughput of patients through efficiency gains while improving quality and safety. The aim for these organisations is to be world leaders in healthcare quality through 3 key drivers: person-centred, safe and effective service with quality infrastructure.

The three most important second (Figure 12) and third (Figure 13) targets within the organisations consulted were meeting National targets, patient safety and achieving financial savings (12%).
It is concerning that within the HCOs consulted there is still a high percentage of stakeholders that are not aware or are unsure what the health care targets are (12%).

4.5 eHealth/HCO alignment dimensions

4.5.1 Effectiveness of IT and Business communications (Communications Maturity)

This SAM dimension is about mutual understanding [31] between IT/eHealth and the organisation, from both clinical and non-clinical perspectives, and the methods to promote better communication.

As shown in Figure 14, communications are at a transition point between level 2 and 3 with some areas approaching improved and managed processes (level 4).
The understanding of healthcare by eHealth/IT was at senior and mid-management level in HCOs type A and B, with some progress made at lower levels of the organisation, but still too far from being pervasive throughout the boards.

The understanding of IT/eHealth by the healthcare practitioners and management is at emerging awareness stage, which means the HCO is still not fully aware of eHealth potential. Inter- and intra-organisational learning is informal (level 2) for HCOs type A and B. Knowledge sharing on the other hand, is generally strong, structured and institutionalised.

The communications protocols sit near a level 3, away from a command and control style toward and emerging relaxed style of communication, but still not informal enough as a communication culture that should be embedded across the whole organisations and beyond (3rd parties, etc.).

The breadth and effectiveness of liaisons is limited, but is moving from a technology based approach (level 2) towards more formal and regular meetings bonded at different internal levels but there is still a room for improvement, not only internally but extra-enterprise.

Additional results related to Communication Maturity dimension are shown in Figure 15.

![Figure 15 Additional results related to Communication Maturity dimension.](image)

### 4.5.2 Competency/Value Measurement Maturity

SAM describes competency and value measurement as “the management practices and strategic IT choices an organisation makes when determining the importance and contribution of IT to the firm” [31].

Within the HCOs under study, competency and value measurement is mainly between level 2 and 3 with some components significantly immature, specifically in terms of applying benchmarking practices. Regarding IT and Business metrics, there are significant differences across the Boards, variance from an elementary organisational sense of commitment with metrics (level 2) to a managed/improved process (Level 4). Despite this, these organisations perception of demonstrated contribution is high, sitting between level 3 and 4 of maturity,
which suggests that these organisations don’t seem to rely on metrics to recognise the contribution of IT/eHealth (Figure 16)

![Figure 16 Competency/Value Measurement maturity results (2012/2013).](image)

Service Level Agreements (SLAs) are extensively used and measured and regularly monitored, but there is room for improvement in terms of adaptation of SLAs to specific areas of healthcare, also to involve healthcare representation for continuous improvement of SLAs. On the more operational side, OLA (Operational Level Agreements) are not in place, although some OLAs are established with third parties under the SLA umbrella. There are no formal links between third parties SLAs with eHealth/IT and the SLAs eHealth/IT sustains with healthcare units. The management of dependencies and structure of SLAs is emerging.

Measures are not yet integrated. IT/eHealth metrics are not yet linked to healthcare metrics. Integrated dashboards are at not yet present but are emerging. Benchmarking is not conducted regularly but happens on ad hoc basis, although infrequently.

Formal assessment and reviews of the IT/eHealth value is not an adopted practice across these Boards, but they conduct informal reviews as part of either change management processes (significant variance in levels of formality) and/or incipient project management practices, also through different types of eHealth delivery groups and committees which seems to be a consistent practice across all the Boards. It is a common practice that value reviews are not based on metrics, but rather on unmeasured perceptions of value, lessons learnt and outcomes of eHealth projects. They also act as a reactive analysis of IT/eHealth related incidents with high impact on healthcare (IT/eHealth major incidents like major downtimes, major backup failures or security incidents); in such cases a review of value is conducted and decisions are taken as required.

Continuous improvement practices are in place. eHealth/IT Governance continuous improvement plans and projects have been in place since 2008, using best practices and standards to drive improvement processes such as COBIT®, ITIL and more recently LEAN. The situation is not equal in all organisations; the reasons pointed out are mainly related with loss of momentum, senior support to eHealth/IT, staffing and budgetary restrictions and resistance. There is awareness of the need and convenience of continuous improvement practices, but finding ways to make it sustainable seems to be a problem. Board B has
persevered using COBIT and continual improvement plans, this Board has shown steady progress in Value Measurement in contrast with Board A and B who abandoned COBIT.

Key Performance Indicators (KPIs) are dealt with on an ad hoc basis; some efforts to have started to build sets of meaningful KPIs and dashboards, but it is still not settled. The main difficulties pointed out are lack of resources to implement satisfactory tools to facilitate the adoption of dashboards and KPIs, which in turn would allow monitoring and a rich discussion from the metrics obtained.

The current financial situation is driving HCOs to find savings, so IT budgets for control and management are under pressure eHealth Programmes have also important funding constrains, but despite this projects are not required to demonstrate value from formal metrics (i.e. cost effectiveness), instead projects are considered as non measured business cases.

Additional results related to Competency/Value Measurement Maturity dimension are shown in Figure 17.

![Diagrams and graphs showing IT metrics, business metrics, balanced metrics, service level agreements, benchmarking, formal assessments/reviews, continuous improvement, and demonstrated contribution.]

Figure 17 Additional results related to Competency/Value Measurement Maturity dimension

4.5.3 eHealth Governance Maturity

In 1996, Henderson and Venkatraman defined governance in terms of choices and decisions the organisation makes when prioritises investments, takes ownership of projects, budgets and technology [32]. This is the same approach adopted in SAM [31] and hence in this study.

In order to understand how mature is governance within the organisations under study, we considered to whom do CIOs report to, the eHealth/IT organisational style, the strategic planning process, budget control, investments management and prioritisation styles.

CIOs report to either clinical or finance directorates (Figure 18).
There is a trend to report to the clinical side, but some boards have moved back to reporting to finance. This in line with the current financial savings climate, but puts at risk the benefits of good alignment of eHealth/IT and healthcare by not facilitating a closer partnership between eHealth/IT and healthcare, which has been identified by the organisations under study as a key enabler for better alignment, and correspondingly a great inhibitor if good levels of partnership are not established in the organisation (Figure 6 and Figure 7).

63% of the participants convey their eHealth/IT organisation is mainly centralised, whereby a corporate IT/eHealth unit (or other central unit) has primary authority for architecture, standards, and application resource decisions (Figure 19).

21% of the participants think there is a shift towards federated models whereby a corporate IT/eHealth unit (or other central unit) has primary responsibility for architecture, common systems, and standards decisions, while each functional unit has primary authority for application resource decisions.

A further 16% considers their organisation to be quite decentralised, whereby each functional unit within the organization has primary authority for their IT/eHealth infrastructure, standards, and application resource decisions.

79% believe that their organisations do formal strategic healthcare planning at the functional unit levels with some IT/eHealth participation. There is some inter-organizational planning.
21% state that they always involve their healthcare partners/alliances with IT/eHealth participation (21%) across the board.

From a different perspective, regarding strategic IT/eHealth planning with healthcare participation, 47.4% state that formal strategic IT/eHealth planning is at the functional unit levels, with some healthcare participation. There is some inter-organizational planning. 31.6% replied that IT/eHealth planning always involves healthcare services across the board and healthcare partners/alliances (10.5%). There remains 10.5% of stakeholders and/or eHealth/IT related people that don’t know how IT/eHealth planning happens and who is involved.

The organisations consulted are primarily cost centre oriented (89%). There is no indication that these organisations are looking at investment or profit centre models.

In terms of IT/eHealth investment decisions, 47.4% of the participants consider that their organisations are primarily focused on business effectiveness, which includes healthcare effectiveness but also other financial considerations. IT/eHealth is seen as a process driver or healthcare strategy enabler. 42.2% state that the focus is to increase productivity and efficiency, some of them with traditional financial reviews and with IT/eHealth seen as a process enabler but not a process driver. 10.5% do not know how these decisions are made, nor how IT/eHealth is seen in this process.

Regarding IT/eHealth steering committee(s) with senior level IT/eHealth and healthcare management participation, 84.1% report that they have formal committees, which meet regularly and have emerging (36.8%) or demonstrated (36.8%) effectiveness, some of them (10.5%) also include strategic healthcare partners sharing decision-making responsibilities. 10.5% have committee(s) which meet informally on an as-needed basis only and 5.3% don’t know.

In terms of how IT/eHealth projects are prioritized, 68.4% consider that their IT/eHealth project prioritization process is usually mutually determined between senior and mid-level IT/eHealth and healthcare management. 15.8% indicated that they also have taken into consideration the priorities of other healthcare partners/alliances. There is a recognition that some reactive prioritisation remains, in reaction to a healthcare or IT/eHealth need (10.5%), sometimes it is determined exclusively by the IT/eHealth function (5.3%) or the healthcare function (10.5%). 5.3% don’t have clear understanding of how IT/eHealth projects are prioritised.

The ability of the IT/eHealth function to react/respond quickly to the organization’s changing healthcare needs is seen as strong (53%), whereas 42% think that it is not weak but there is room for improvement (42%) (Figure 20).
Figure 20 Ability of the IT/eHealth function to react/respond quickly to the organization’s changing healthcare needs.

In overall terms, Governance is sitting between a high level 2 (2.8) and mid level 3 (3.5) (Figure 21), in other words, is progressing from being tactical at functional level and occasionally responsive to a position where the process is relevant across the organisation, but still is far away from being managed and integrated across the boards.

Figure 21 Governance maturity (2012/2013)

Additional results related to the eHealth Governance Maturity dimension are shown in Figure 22.
4.5.4 Partnership Maturity

Partnership is defined as a style adopted by organisations to work in partnership, in this case, eHealth and healthcare working together to achieve a mature alignment to deliver the healthcare strategy with the best possible results for the organisation.

“eHealth and healthcare units finding ways to work together” has been identified as a key enabler (Figure 6) but lack of close partnership or the presence of conflict between eHealth/IT and healthcare units is an inhibitor for achieving (Figure 7).

Within this study, IT/eHealth is perceived by healthcare as a fundamental enabler (47.4%) or driver (21.1%) of future healthcare activity, in partnership with healthcare that co-adapts/improvises in bringing value to the firm (5.3%), but 21.1% believe that eHealth/IT is a cost of doing healthcare.

IT/eHealth role in strategic healthcare planning is evolving satisfactorily. eHealth is largely perceived as an enabler of healthcare processes (52.6%), in some cases it is also used to drive the healthcare strategy (26.3%). In more mature scenarios IT/eHealth co-adapts with the healthcare to enable/drive strategic objectives (10.5%), but 10.5% feel that IT/eHealth does not have a role in strategic healthcare planning.

31.6% consider risks and rewards (e.g., bonuses) associated with IT/eHealth-based initiatives (i.e., a project being late and over budget because of healthcare requirement changes) are always shared or is emerging, whilst the majority consider IT/eHealth takes most of the risks with little or no reward 52.6%.

Regarding how organisations formally manage the IT/eHealth/healthcare relationship or to what extent are there formal processes in place that focus on enhancing the partnership relationships that exist between IT/eHealth and healthcare (e.g., cross-functional teams, training, risk/reward sharing), most of the participants consider that their organisations...
manage their relationships on an ad-hoc basis (57.9%) or don’t manage the process at all (5.3%). Some have defined programs to manage these relationships (26.3%), but IT/eHealth or healthcare does not always comply with them, although conflict is seen as creative rather than disruptive (10.5%). A further 15.8% stated that both IT/eHealth and the healthcare comply with the programs in place.

Regarding IT/eHealth and healthcare relationship and trust, IT/eHealth is emerging as a valued service provider (79%), and sometime the association is primarily a long-term partnership style of relationship (31.6%). But 21.1% consider that the association is primarily an “arm’s length” transactional style of relationship.

In terms of healthcare sponsors/champions, IT/eHealth-based initiatives often have a senior level IT/eHealth and healthcare sponsor/champion at least at the functional unit level (68.4%) and in some occasions at the corporate level (31.6%) and eventually CEOs sponsoring (5.3%). However, 15.8% believe that their organisations do not have a senior level IT/eHealth or healthcare sponsor/champion.

Partnership maturity is sitting between Level 2 and 4 (Figure 23), which means eHealth/IT is emerging as an asset and it is considered as a process enabler and eventually a driver for future healthcare activity.

![Figure 23 Partnership maturity (2012/2013)](image)

Additional results related to Partnership Maturity dimension are shown in Figure 24.
4.5.5 Scope & Architecture Maturity

This dimension relates to eHealth architecture governance to make it flexible and transparent for healthcare users and professionals. Some of the decision areas for optimisation of eHealth/IT infrastructure involve single-sign-on, authentication, encryption, innovations for telemedicine and intra-office communications, integration, mobility, reusability, storage, telemedicine and wireless, as well as other architectural decisions.

Luftman suggest the following areas of architecture components [31] to be considered when analysing the maturity or the architecture. A broader analysis is available in Beratarbide and Kelsey work on healthcare organisations [19]:

- Sophistication of main systems.
- Integrated standards.
- Architectural integration.
- Infrastructure transparency and flexibility
- Management of emerging technologies.

Regarding the scope of the IT/eHealth systems, the primary systems within the organisations under study are considered business process enablers (IT/eHealth supports healthcare process change) (52.6%) and business process drivers (IT/eHealth is a catalyst for healthcare process change) (31.6%). 10.5% consider their systems to go above the processes becoming business strategy enablers/drivers (IT/eHealth is a catalyst for changes in the healthcare strategy), but still 5.3% consider that their systems are limited to traditional office support (e.g., e-mail, accounting, word processing, legacy systems).

In terms of the articulation of and compliance with IT/eHealth standards, the existent standards are mainly considered as defined and enforced (94.8%), in some cases only at the functional unit level but not across different functional units (26.3%), but 21.1% believe that it transcends with emerging coordination across functional units, or is fully embedded across functional units (31.6%). Only 15.8% feel that it happens with joint coordination among their strategic healthcare partners/alliances.

In terms of the scope of architectural integration, the components of the IT/eHealth infrastructure are mainly considered to be integrated (84.3%), in some cases only at the
functional unit with emerging integration across functional units (31.6%), and with full integration across functional units in the remaining 52.7% of the cases. None of the organisations consulted indicated traces of evolving with healthcare partners but instead integrated with them (31.6%). 10.5% were not sure about the scope of architecture integration in their organisations.

With regards to the level of disruption caused by healthcare and IT/eHealth changes (e.g., implementation of a new technology, healthcare process, merger/acquisition), most of the time, a change in the organisation under study is considered to be transparent (94.7%) at functional level only (26.3%), with emerging transparency across all remote, branch, and mobile locations (21.1%), transparent across the entire organization (36.8%) and to their healthcare partners/alliances (10.5%). 5.3% are not sure about how transparent the process is.

The IT/eHealth infrastructure is viewed as an utility providing the basic IT/eHealth services at minimum cost (5.3%), driven (42.1%) or emerging as driven (26.3%) by the requirements of the current healthcare strategy, emerging as a resource to enable fast response (21.1%) to changes in the marketplace (21.1%) or even driving these changes (5.3%).

The scope and architecture maturity is sitting at a high level 2 (2.9) or at a low level 3 (3.3) (Figure 25), which means it is leaving the transactional archetype and is becoming integrated across the organisation, although the integration does not transcend to partners or evolve with them yet.

![Figure 25 Scope & Architecture maturity (2012/2013)](image)

Additional results related to Scope and Architecture Maturity dimension are shown in Figure 26.
4.5.6  Human Resource/Skills Maturity

This dimension refers to approaches taken by the healthcare organisations under study to IT/eHealth human resources considerations.

The following results pertain to the extent the organization fosters an innovative entrepreneurial environment. Entrepreneurship is mainly perceived as encouraged (52.7%) although it is moderate and applies only at functional unit level (47.4%) in most of the cases, with only 5.3% responding that this transcends to other corporate levels. 31.6% considered it to be discouraged within their organisation and a 15.8% are not sure about how the entrepreneurial environment is in their organisation.

The main IT/eHealth decisions are made at top healthcare or IT/eHealth management at the corporate level exclusively (26.3%), with emerging functional unit level influence (15.8%). 31.6% stated that it happens at corporate and functional unit levels, with emerging shared influence from IT/eHealth management, with 21.1% agreeing that it happens across the organization and is emerging influence on their healthcare partners/alliances. A limited 5.3% consider that decisions are taken with equal influence from their healthcare partners/alliances.

10.5% perceive that their organisations tend to resist change, whilst 89.4% recognize the need for change and change readiness programs are emerging (52.6%) or in place at the functional unit level (10.5%). These plans include training and necessary skills to implement change. 10.5% perceive these plans to be in place at the corporate level and 15.8% consider their organisation to be proactive and anticipate change.

In terms of career crossover opportunities among IT/eHealth and healthcare personnel, 68.5% consider that job transfers occur in their organisation occasionally at functional level (47.4%) or regularly at functional level, but only for management level positions (5.3%) or for all position levels (5.3%). 10.5% consider job transfers regularly occur also at the corporate level. 10.5% are not sure about the way this happens in their organisation.

With respect to employee opportunities to learn about and support services outside the employee’s functional unit (e.g., programmers trained in product/service production functions, customer service trained in systems analysis) using programs such as cross training and job rotation, 68.5% consider that their organization provides opportunities to learn; in
most cases these are dependent on the functional unit (52.6%), but formal programs are emerging at all functional units (5.3%), across the enterprise (5.3%) and with healthcare partners/alliances (5.3%). A significant 26.3% still consider that their organisation does not provide opportunities to learn about support services outside the employee’s functional unit.

With respect to the interpersonal interaction (e.g., trust, confidence, cultural, social, and political environment) that exists across IT/eHealth and healthcare units in healthcare organizations, the vast majority consider that trust and confidence among IT/eHealth and healthcare is emerging (63.2%) or is achieved (31.6%), but 5.3% believe that the association is primarily an “arm’s length” transactional style of relationship. None of the organisations consulted felt that this level of confidence is extended to external parties.

![Skills Maturity](image)

**Figure 27** Skills maturity. Human resource (2012/2013)

The overall skills maturity is sitting at level 2 (
Additional results related to the Skills Maturity dimension are shown in Figure 28.

![Additional results related to the Skills Maturity dimension.](image)

**Figure 28 Additional results related to the Skills Maturity dimension.**

### 4.6 Cross-sectoral and cross-national comparisons: key trends.

After detailed comparison of our results against those from other studies, we identified the following general results illustrated in Figure 29. EHealth Governance within HCOs in all countries studied is in its infancy. The situation across sectors and countries is similar in terms of maturity: at a transition point between SAM level 2 (Committed organisation) and 3 (Established process). Within the NHS there are some timid signs of progress over level 3, particularly in areas of partnership and governance.

![Longitudinal comparison of maturity against situation in other countries and sectors 2012/2013](image)

**Figure 29 Longitudinal comparison of maturity against situation in other countries and sectors 2012/2013**

IT Governance is being set up using a variety of approaches: structural, processes based, and relational. The best results are achieved with combinations of these elements. A key finding is that IT Governance is championed mainly by Chief Information Officers (CIOs) (40% of organisations), followed by Chief Executive Officers (CEOs) (25%) and finally Chief Financial Officers (CFOs) (9%) [33].

The level of centralisation/decentralisation of IT Governance varies across companies, regardless of industry sector and country. The size, culture and geographical-functional distribution of the organisation all influence the approach taken by each enterprise. We
observed a preference for federal IT governance archetypes in healthcare organisations, although some feudal approaches remain, particularly in areas that historically had either bigger IT budgets, or low percentages of shared applications, or very particular needs: radiology units were pointed out in several studies as an example of feudal IT Governance.

Studies across industry sectors and countries indicate that preferred IT Governance archetypes are moving towards Federal IT Governance models quite quickly (4% annual increment) with almost 1 in 4 companies currently adopting this approach [14] We speculate that this is in response to multiple studies which suggest that a federal styles best supports organisation-wide IT architectures and processes [14, 34].

The frameworks and standards implemented by organisations and enterprises vary, but the following are most commonly deployed: COBIT©® (Control Objectives for IT) (30%), ITIL (IT Infrastructure Library) (5% of the HCOs surveyed) and ISO (International Standards Organization) (ISO9000, ISO17799 and ISO38500). Within the healthcare sector COBIT©® and ITIL are most commonly used.

Differences between countries and industry sectors are subtle; studies suggest a reasonable bell shape with approximately 20% of the organisations at level below 2 and 20% at level above 3.

5 Conclusions

This study aimed to provide a better understanding on how IT Governance is implemented within HCOs and the actual impact on strategic alignment.

Our results are summarised in (Figure 30), showing the progress of the main variables under observation and their positive trend: Strategic Alignment and eHealth Governance.

![Figure 30 Strategic alignment and eHealth Governance trends.](image)

5.1 Main conclusion

Our results encourage our hypothesis that the more mature eHealth Governance is, the better the strategic alignment between eHealth and HCOs. A correlation between these two
variables seems to exist, however more longitudinal data is required in order to establish the proportionality of the increment.

Further investigations are required in order to understand better and isolate the effect other SAM dimensions have in the final Strategic Alignment achieved.

We propose a minimum of eHealth Governance maturity is required in order to sustain strategic alignment. Those organisations with eHealth Governance maturity under Level 2 may not show indication of a corresponding strategic alignment. This is mainly due to the fundamental limitations in the decision-making process associated with Ad-Hoc IT governance. In order to achieve better strategic alignment it is key that the appropriate business and IT/eHealth participants formally discuss the priorities and allocate resources amongst the most important enablers/inhibitors of alignment. This decision-making authority needs to be clearly defined as a minimum in order to create the environment for the kind of improvement and progress described in this paper.

5.2 Strategic Alignment is progressing faster.

Strategic alignment between eHealth and HCOs is progressing faster than the overall performance of eHealth Governance (Figure 30). When analysed the specific dimensions of SAM, this rapid progress corresponds to periods where HCOs achieved significant developments in Value Measurement and Partnership while keeping the rest of the SAM dimensions fairly stable.

5.3 eHealth Governance is necessary to sustain Strategic Alignment but only influences its progress within specific circumstances.

Strategic alignment is positively correlated to eHealth Governance, but the overall results depend also on the performance of the rest of the SAM dimensions. This explains the observations obtained in this study: the lack of progress on eHealth Governance within the last period whilst strategic alignment continued to show signs of growth (21%).

This observation led us to a new hypothesis that will require further research: eHealth Governance maturity has to reach at least level 2 or 3 in order to make strategic alignment sustainable. In other words, if the process to make eHealth decisions is not mature enough, the poor quality of the decision will negatively impact the results of any improvement initiative around any of the other SAM dimension, hence strategic alignment will not mature.

5.4 eHealth Governance Benchmarking

eHealth Governance is in its infancy within the three cases analysed. This situation is similar across sectors and countries with 80% of the organisation worldwide at a transition point between committed organizations with repeatable processes (SAM Level 2) and organisations with well defined and established eHealth Governance processes (SAM Level 3). Organisations are still far away from having measured and improved eHealth Governance processes.

All types of organizations, regardless of the country, are looking for strategic eHealth alignment and eHealth Governance for similar reasons, particularly for demonstrating value of investments, audit compliance and regulations, increased pressures for better service quality and the internal transformation on the IT role from service provider to business enabler. A common denominator is that IT governance is championed mainly by chief information officers (40% of organizations). The preferred IT governance archetypes are rapidly moving towards federal IT governance models (4% annual increment) with almost
one in four companies currently adopting this approach, in contrast, the NHS remains substantially centralised with presence of some IT silos (i.e. Radiology and Laboratories).

6 Competing interests

EB led on implementing eHealth Governance (COBIT®) within one of the NHS Boards under study.

7 Ethics

This research does not involve NHS patient data.

Relevant ethical approval has been obtained for the relevant period of research (longitudinal study 2008-2013) under the Governance Arrangements for NHS Research Ethics Committees (Scotland), IRAS (Integrated Research Application System) reference 10/S0501/27.

8 Authors' contributions

All authors have made substantial contributions to the conception and design of the study, have been involved in drafting and revising the manuscript and have approved the final version. EB and TK collected and coded the data. EB is the guarantor of the paper.

9 Acknowledgements

We are very grateful to all the participants for their time and commitment, and the R&D departments across all participant NHS Boards for their help recruiting participants, but specially David Chinn and Amanda Wood for their constructive criticisms through the entire research project. We also want to thank the NHS Fife and the Ethics Committee for supporting this work over the years.

10 List of abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
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<tr>
<td>CFO</td>
<td>Chief Finance Officer</td>
</tr>
<tr>
<td>CIO</td>
<td>Chief Information Officer</td>
</tr>
<tr>
<td>COBIT®</td>
<td>Control Objectives for IT</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>GP</td>
<td>General Practitioner</td>
</tr>
<tr>
<td>HCO</td>
<td>Health Care Organisation</td>
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<tr>
<td>HEAT</td>
<td>NHS performance targets for H: Health Improvement</td>
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<tr>
<td></td>
<td>E: Efficiency and Governance</td>
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<td></td>
<td>A: Access to Service</td>
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<td></td>
<td>T: Treatment Appropriate to Individuals</td>
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<tr>
<td>HEPMA</td>
<td>Hospital Electronic Prescribing and Medicines Administration</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<td>---------</td>
<td>-------------</td>
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<tr>
<td>ICT</td>
<td>Information and Communication Technologies</td>
</tr>
<tr>
<td>ISO</td>
<td>the International Organization for Standardization</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technologies</td>
</tr>
<tr>
<td>ITIL</td>
<td>IT Infrastructure Library</td>
</tr>
<tr>
<td>KIS</td>
<td>Key Information Summary</td>
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<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
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<tr>
<td>LEAN</td>
<td>Set of tools and techniques for organisational improvement.</td>
</tr>
<tr>
<td>LTC</td>
<td>Long Term Conditions</td>
</tr>
<tr>
<td>NHS</td>
<td>National Health Service</td>
</tr>
<tr>
<td>NVIVO</td>
<td>Software that supports qualitative and mixed research methods.</td>
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<tr>
<td>OLA</td>
<td>Operational Level Agreement</td>
</tr>
<tr>
<td>PPMS</td>
<td>Patient Privacy Monitoring System</td>
</tr>
<tr>
<td>RTT</td>
<td>Referral to Treatment (18 Weeks)</td>
</tr>
<tr>
<td>SAM</td>
<td>Strategic Alignment Model</td>
</tr>
<tr>
<td>SHS</td>
<td>Scottish Household Survey</td>
</tr>
<tr>
<td>SIBIS</td>
<td>Statistical Indicators Benchmarking the Information Society</td>
</tr>
<tr>
<td>SLA</td>
<td>Service Level Agreement</td>
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11 Annexe 1: Most relevant sources consulted to compare the situation of IT governance across industry sectors and countries.

<table>
<thead>
<tr>
<th>INDUSTRY SECTOR</th>
<th>COUNTRY</th>
<th>SOURCE</th>
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<tbody>
<tr>
<td>Financial Services</td>
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<td>[35]</td>
</tr>
<tr>
<td>Multi-sectoral (Retail, Pharmaceutical, Manufacturing, Financial Services, Leisure/Entertainment, Food and Beverages)</td>
<td>Australia</td>
<td>[36]</td>
</tr>
<tr>
<td>Credit Cooperative</td>
<td>Germany</td>
<td>[37]</td>
</tr>
<tr>
<td>Industry sector not disclosed. Large organization. Multi-divisional.</td>
<td>Australia and New Zealand</td>
<td>[38]</td>
</tr>
<tr>
<td>Multi-sectoral (Consumer and Industrial Products and Services, Financial Services, Technology, Information, Communication and Entertainment, Public Sector, Healthcare and Pharma)</td>
<td>Belgium, France, UK, Germany, The Netherlands, Italy and Spain</td>
<td>[39]</td>
</tr>
<tr>
<td>Healthcare (British National Health Service-NHS)</td>
<td>UK</td>
<td>[40]</td>
</tr>
<tr>
<td>Multi-sectoral (Trace 23%, Manufacture 21%, Construction 21%, Logistics 8%, Information 5%)</td>
<td>Austria</td>
<td>[41]</td>
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<tr>
<td>Multi-sectoral</td>
<td>Global</td>
<td>[17]</td>
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<tr>
<td>Healthcare</td>
<td>USA (Boston)</td>
<td>[33]</td>
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<td>Healthcare</td>
<td>UK (Scotland)</td>
<td>[5]</td>
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</tbody>
</table>

12 Annexe 2: Adapted SAM survey instrument for health care.

PDF attached as a separate document. Also available from ISACA Knowledge Centre: [http://www.isaca.org/Knowledge-Center](http://www.isaca.org/Knowledge-Center)

References


8. ISACA Knowledge Center. What is Cobit 5? [http://www.isaca.org/COBIT/Pages/default.aspx]


12. GOV.UK [http://www.dh.gov.uk/health/2012/03/sbri/]


27. Tom Kelsey [http://tom.host.cs.st-andrews.ac.uk/index.html]


34. eHealth [http://www.ehealth.scot.nhs.uk/]


