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Ph.D. Dissertation

Longitudinal analysis of eHealth Governance within healthcare organizations as a critical factor in the adaptation to the Information Society in Scotland

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"The time will come when diligent research over long periods will bring to light things which now lie hidden. A single lifetime, even though entirely devoted to the sky, would not be enough for the investigation of so vast a subject... And so this knowledge will be unfolded only through long successive ages. There will come a time when our descendants will be amazed that we did not know things that are so plain to them... Many discoveries are reserved for ages still to come, when memory of us will have been effaced."

— *Seneca, Natural Questions*

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Abstract

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. How IT Governance is implemented within healthcare, the actual impact on strategic alignment and its influence to the information society progress, remains poorly understood. For this purpose we have explored the application of these frameworks within the National Health Service in Scotland and their impact on the following three aspects: eHealth Governance maturity, strategic alignment within healthcare and local progress of digital societies. This research is a longitudinal study (2008-2013), involving an exploratory and explanatory multi-case analysis of three representative organisations across Scotland. A combination of empiric methods has been used: semi-structured interviews with implementers, surveys (Strategic Alignment Model), cross-sectoral/national benchmarking based on a literature review and a qualitative analysis of established eHealth progress indicators. Ninety-two participants have been involved across three case studies. The outcomes of this study have been published over a period of 5 years representing a composite thesis based on relevant publications.

Results sustain that EHealth Governance is in its infancy across sectors and countries. 80% of the organisations worldwide are in a transition point between a "committed" and an "established" process. Our results support that the more mature eHealth Governance is, the better the strategic alignment between eHealth and health care organisations (HCOs), hence the better progress of eHealth and the Digital Society.

The Strategic alignment is slowly maturing across organisations (15% since 2008), indicating a faster development than the overall Digital Society (Scotland) progress indicators.

The National eHealth Strategy shows signs of steady progress and very positive eHealth uptake in society with an overall growth of 12% since 2008, despite the deep economical recession within the period of this research.

The conclusions of this study as a longitudinal analysis are limited and more research over the forthcoming years is required. For this purpose, a simplified and adapted method to monitor these trends in future HCOs research has also been provided.

Resumen

La eSalud juega un papel esencial en el desarrollo de la asistencia médica en sociedades digitales; se percibe como un elemento crucial en la provisión de servicios médico-sanitarios de alta calidad y costo-efectivos. A pesar de ello, hasta ahora ha sido difícil demostrar la materialización de los beneficios esperados de la eSalud, pero hay un interés creciente en la adopción de marcos de referencia basados en buenas prácticas, y estándares profesionales internacionales para la gestión y dirección de la eSalud, con el propósito de asegurar que las inversiones revierten los resultados esperados en el cuidado y servicios de la salud.

Hasta ahora se sabe muy poco sobre el fenómeno de cómo la eSalud se integra en el cuidado y servicios de la salud, y del impacto que esta tiene en la alineación estratégica de la eSalud. Igualmente, sabemos muy poco de la influencia real que estas prácticas tienen en el progreso de sociedades digitales. Este estudio se centra en explorar la aplicación de buenas practicas y estándares internacionales como marco de referencia en el gobierno de la eSalud en el servicio de salud Escocés; también contrastamos y comparamos el fenómeno con otros países y sectores. Esta investigación es un estudio longitudinal (2008-2013) que incorpora un análisis exploratorio y explicativo de casos. Se obtuvieron un total de noventa y dos participantes a lo largo de los tres casos estudiados, con representación de los principales grupos de interés (médicos y no médicos). Los resultados se han divulgado a lo largo del periodo de investigación en un compendio de publicaciones relevantes que conforman la tesis. Los principales hallazgos muestran que el gobierno de la eSalud está en su infancia en los sectores y países analizados: el 80% de las organizaciones a nivel mundial presentan este proceso en un punto de transición entre "comprometido" y "establecido" (Modelo SAM). Los resultados corroboran que cuanto más maduro es el gobierno de la eSalud, mayor alineación estratégica entre la eSalud y la organización, y mayor progreso de la variable eSalud en los indicadores de la sociedad de la información. La alineación estratégica esta madurando lentamente (15% desde 2008); este crecimiento es mas rápido que el progreso observado en los indicadores de la sociedad digital (Escocia).

La estrategia nacional Escocesa muestra signos de progreso sostenido y de integración (por uso o adopción) de las iniciativas de eSalud en la sociedad (crecimiento del 12% desde 2008), a pesar de la profunda depresión económica durante el periodo de investigación.

Las conclusiones de esta investigación, como estudio longitudinal, son limitadas y requieren la captura de más datos y observaciones durante los próximos anos. Con el fin de facilitar este proceso, se ha propuesto un método simplificado y adaptado al sector salud, que permite capturar observaciones, comparar y monitorizar estas tendencias en futuras investigaciones en el sector salud.

Resum

La eSalut juga un paper essencial en el suport a l'assistència sanitària a la societat digital de hui en dia; es percep com crucial per a l'alta qualitat i efectivitat del servicis de salut. No obstant això, ha estat difícil de demostrar la obtenció dels beneficis esperats de la eSalut. Hi ha hagut un interès en augmentar l'adopció de marcs de governança de la eSalut per obtenir re-assegurament que les inversions retornen els resultats esperats en els servicis sanitaris. Com s'implementa la governança de les TIC dins de l'assistència sanitària, l'impacte real en l'alineació estratègica i la seua influència en el progrés de la societat de la informació, continua sent poc conegut. Aquest estudi explora l'aplicació d'aquests estàndards i marcs de referència dins dels Serveis Nacionals de Salut d'Escòcia i el seu impacte en els tres aspectes següents: la maduresa de la governança de la eSalut", l'alineació estratègica amb l'assistència sanitària i, finalment, el progrés local de les societats digitals. Aquesta investigació és un estudi longitudinal (2008-2013), que implica una anàlisi multi cas exploratori i explicatiu de tres organitzacions representatives del servici nacional de salut de Escòcia. S'ha utilitzat una combinació de mètodes empírics: entrevistes semi estructurades, enquestes (Model SAM) comparatives de mercat intersectorial i internacional basat en una revisió bibliogràfica i, finalment, una anàlisi qualitativa dels indicadors de progrés eSalut. Noranta dos participants han informat a través de tres estudis de casos. Els resultats s'han divulgat al llarg del període d'investigació en un compendi de publicacions rellevants que conformen la tesi. Els resultats assenyalen que la governança de la eSalut està en la seua infància en tots els sectors i països. 80% de les organitzacions de tot el món es troben en un punt de transició entre un procés "compromès" i "establint". Els nostres resultats apunten que quan més madur es la governança de la eSalut, millor serà l'alineació estratègica entre la eSalut i les organitzacions d'atenció sanitària (HCOs), per tant el millor progrés de la sanitat electrònica a la Societat Digital. L'alineació estratègica està madurant lentament en les organitzacions (15% des de 2008); aquest desenvolupament és més ràpid que el progrés de la societat digital (Escòcia).

L'estratègia Nacional de eSalut mostra signes de progrés constant i l'absorció de la eSalut en la societat es prou positiva, amb un creixement global del 12% des de l'any 2008, tot i la profunda recessió econòmica durant el període de temps d'aquesta investigació.

Les conclusions d'aquest estudi com una anàlisi longitudinal són limitades i es requereix més investigació en els propers anys.

Ethics

This research does not involve patient data.

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

1

INTRODUCTION

1 Introduction

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 [2], especially considering aging populations, increasing long term conditions, obesity and alcohol related issues, along with the costs of preventable hospital admissions [3]. Furthermore, eHealth is considered key to achieve sustainable health care, especially in collaborative cross-border spaces [4].

Despite eHealth being considered key for sustainable health care, many eHealth initiatives often have failed [2, 5] and HCOs commonly find themselves caught between the organisational pressures for delivering eHealth and organisational resistance to new ways of functioning [6].

The success implementing eHealth initiatives varies significantly according to experiences reported in the National Health Service (NHS), UK [7, 8]. Some of the downsides are related to delays, over expenditure or budget deficits, poor quality of outcomes and effectiveness on health care [9], which is consistent with the average ICT projects implementation statistics [7].

After series of disappointing eHealth implementations, there is a raising interest on eHealth/IT Governance [9] as a vehicle to provide assurance to all stakeholders that eHealth Programmes deliver the expected benefits [6]. This interest also derives from the appearance

of greater pressures accross HCOs for compliance with best practices, standards and regulations [8].

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 [9]. 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 [9]. This is an international occurrence widely reported [11].

Governance is in essence the act of governing, which involves decision making but also management [12]. Beyond this concept, governance is also the art of assurance [13], 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, this has still been described as a "young science" [14], demanding more understanding of implementation processes, tools and models for better results [15]. There are a number of IT Governance frameworks used across sectors and industries, commonly COBIT®, ITIL and ISO (9000, 17799 and 38500), the first two being the ones most commonly adopted within the healthcare sector [11].

Aims, Objectives and Hypothesis.

We were interested in exploring the application of these frameworks within the National Health Services in Scotland and their impact on the following three aspects: a) eHealth

Governance maturity, b) strategic alignment within healthcare and, c) local progress of digital societies. In other words, we expected to understand if the investments and efforts in maturing eHealth Governance practices have a perceivable impact on better healthcare from both, the strategic alignment within Health Care Services and their social impact on digital society's progress (measured by key performance indicators).

Our hypothesis was: the more mature eHealth Governance is, the better alignment with the local and national healthcare strategy, which ultimately will incentivise digital society progress by positively influencing the adoption of eHealth within the local population.

This study has the following objectives:

a. To understand how the participant HCOs are implementing eHealth Governance
b. Justify why HCOs should invest on mature eHealth Governance practices, by demonstrating the impact on better health care through better strategic alignment and digital society progress.
c. Present a methodology for local and national monitoring of eHealth Governance impact than can allow appropriate future planning and benchmarking of eHealth services and initiatives.

This research is a continuation of a previous study conducted between 2005 and 2010, which involved a comprehensive literature review[16], and a Delphi exercise [17], to propose a causal model of determining factors involved in the adaptation of National Health Services to the digital society with a particular focus on Scotland [17]. The model identified a number of factors that needed to be understood in order to help organisations and governments to make

better eHealth investment decisions and strategies. This paper focuses on two of the main factors identified in the model: eHealth Governance and eHealth Strategic Alignment.

This study started in 2008 as part of an IT Governance project co-sponsored by The Scottish Government (eHealth Division) in order to demonstrate practical results adopting IT Governance best practices and to provide recommendations for future adoption across the NHS in Scotland [8].

Three representative NHS Boards in Scotland were selected for this trial [18].

In this paper we also include the following outcomes and deliverables:

a. An adapted and simplified instrument to swiftly measure eHealth Governance and Strategic Alignment maturity levels.

b. A validated method to continue performing a longitudinal analysis and monitoring the progress and interaction between eHealth Governance, strategic alignment and eHealth as a component of the digital society.

c. Results of the longitudinal analysis within the three cases under study.

d. Insights on the situation in other countries and sectors.

e. A suite of recommendations for HCOs wishing to enhance their levels of eHealth Governance maturity and strategic alignment.

2

METHODS

2 Methods

2.1 Design

A combination of methods has been required in order to capture observations and data of different nature and sources, and to correlate the relevant variables under study.

We report mainly on case studies of three different NHS regional Boards (Scotland) undertaking the adoption of eHealth Governance frameworks. Data was collected using surveys and semi-structured interviews. This method has been previously used on similar studies around governance and alignment achieving adequate results [20].

Benchmarking is a method focused on evaluations by comparison. It has been applied based on a comparison of studies related to eHealth Governance and strategic alignment different sectors and countries. Data was collected through a thorough literature review of governance and alignment studies (Table 1 in Appendix 5 Annexe 1).

Progress on eHealth and Information Society was analysed using a selection of recommended indicators elaborated by SIBIS (Statistical Indicators Benchmarking the Information Society) [25]. SIBIS developed and tested across all state members of the EU a set of information society indicators to monitor the rapidly changing nature of modern societies and to enable the benchmarking of progress in EU Member States.

Local data was captured from official statistics from Eurostat and The Scottish Government public databases.

This is a qualitative longitudinal study presenting observations since 2008. It is also an exploratory and explanatory piece of research based on the experience of three Scottish case studies, along with an evaluation by comparison with documented studies in other countries and sectors. A correlation analysis is lastly presented between the main variables of the main

hypothesis, namely Strategic Alignment, eHealth/IT Governance, eHealth and Digital Society.

2.2 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 indexes)
- Diversity of organisation sizes

The 3 cases compared have been classified as shown in Table 3.2.2.1 (Appendix 5).

The National Health Service in Scotland (NHS Scotland) is responsible for the provision of public healthcare to the 5.2 million residents of Scotland[18]. 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.

2.3 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 sound representation.

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.

2.4 Data collection

Three different sets of data were collected:

a. Strategic alignment and eHealth Governance maturity
b. Benchmarking
c. Digital society progress

2.4.1 Strategic Alignment and eHealth Governance Maturity

During the first year of the study a comprehensive COBIT assessment was conducted along with an anonymised SAM survey. This approach provides deep understanding of how eHealth Governance is implemented but is extensively time consuming. In order to facilitate the gathering of eHealth Governance maturity snapshots and the corresponding measure of the Strategic Alignment maturity at particular points in time, we adapted Luftman's survey [20] to HCOs. This adaptation was applied subsequently since 2009 on alternate year basis. Luftman's survey is a recognised de-facto instrument applied in multiple studies [21, 22] and applied in different industries and countries [20]. The instrument, adapted to HCOs, is available through St. Andrew's University website [23]. Repeated observations were then

taken on a alternate year basis 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 possible by invitation and access to the survey site was password protected in order to avoid data contamination.

2.4.2 Benchmarking

Data for benchmarking was obtained from a bank of SAM outcomes from 25 Fortune 500 companies [20] and a comprehensive literature review [11].

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

The literature reviewed provided worldwide data across a rich representation of industry sectors [11]. 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 provides 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.

2.4.3 Digital Society Progress

Data from Eurostat and The Scottish Government was available to compare progress of Digital society based on a combination of eHealth progress indicators (SIBIS) [25] recommended by the European Commission (EUROSTAT Digital society database) [26], HEAT targets [27] and Scotland Performance reports [28].

2.5 Data analysis

Data were analysed using the framework method proposed by Luftman [20]. This method allows the analysis of IT/IS practices within 5 levels of maturity, 5 being the highest. Data was coded and normalised to six constructs available at each maturity level, namely: communication, competency/value measurement, governance, partnership, scope/architecture and skills.

The interviewer and chief investigator coded the interviews developing a coding framework supported by NVIVO [29]. This framework was reviewed in a multidisciplinary research workshop involving all authors.

The revised 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.

Finally, a subset of the SIBIS indicators framework has been used in order to analyse, compare and contrast progress of Digital Societies in Scotland since 2008 and progress of eHealth. The data was obtained from Eurostat and the Scottish Government databases.

Progress of the main variables of our driving hypothesis was calculated and a correlation analysis of these variables (Strategic Alignment, eHealth/IT Governance, eHealth and Digital Society) over the 2008 -2013 period was conducted.

The NHS Research and Development department designated an R&D advisor who supervised the design of the study, the ethics approval and the overall progress of the study. A formal report with participant volumes and progress was presented on yearly basis along the whole period of study.

3

RESEARCH STRUCTURE AND ARGUMENTATIVE LINE

3 Research structure and argumentative line

The format of this Thesis is a compilation of scientific publications. Each of them can be read independently comprising all the relevant sections for a scientific paper: background, targets, methods, results, discussions and conclusions. All publications together form a wider but individual and unique piece of research, progressing from the overall view to the specifics (Figure 1).

This section depicts the context of the whole research and presents an overview of the relationship between the different elements, their importance and the links to the specific publications.

The following sections correspond to each of the publications, with a final section presenting our conclusions.

All articles are published except the last one, which is currently under re-design as recommended by the editorial of BMC Health Services Research.

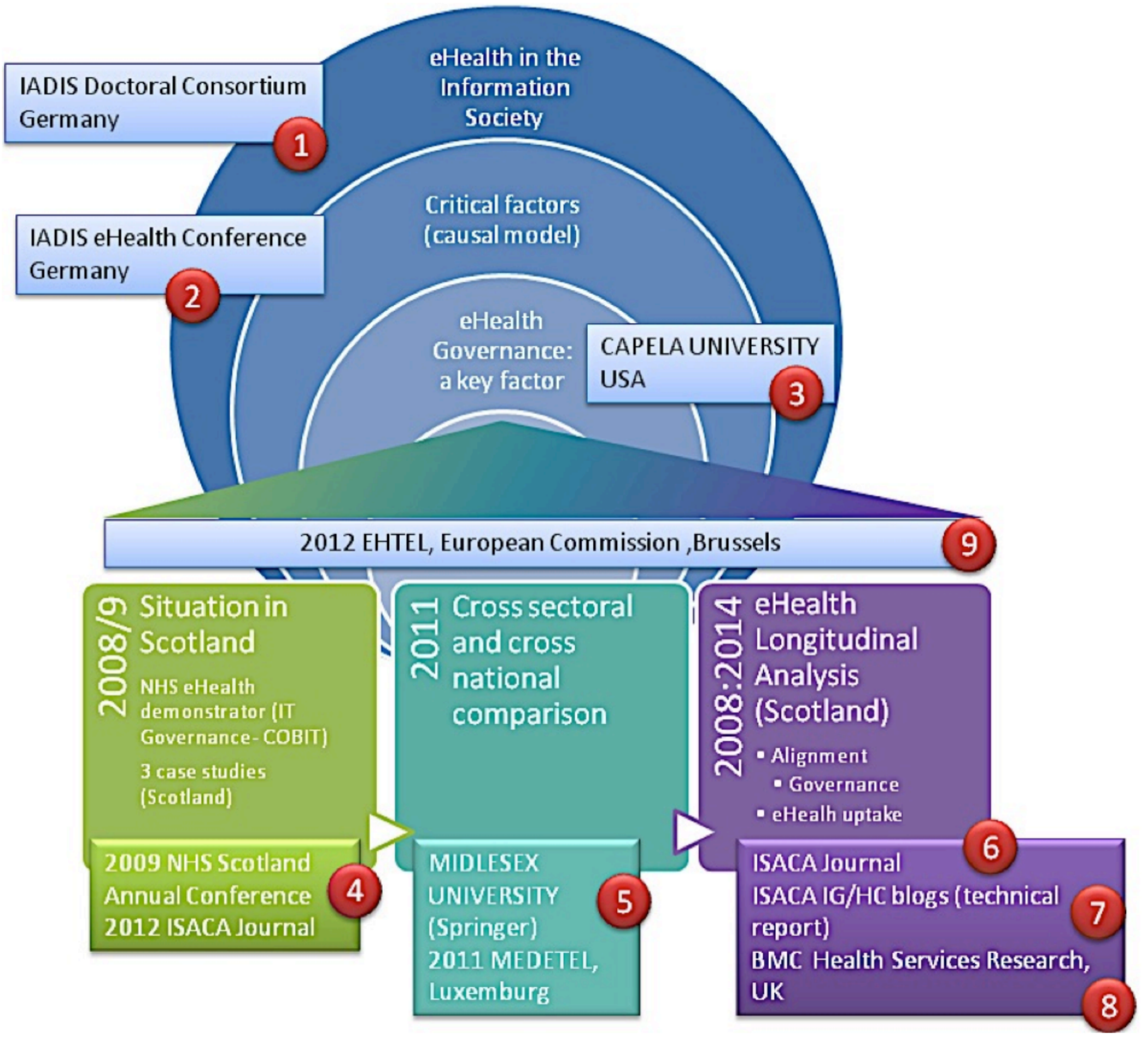


Figure 1 Thesis structure: argumentative line and published papers.

3.1 Critical factors in the adaptation of the National Health Service (NHS) to the Information Society in Fife (Scotland)

IADIS eHealth 2010 Doctoral Consortium, Germany 2010

ISBN 978-972-8939-16-8 p.135-142

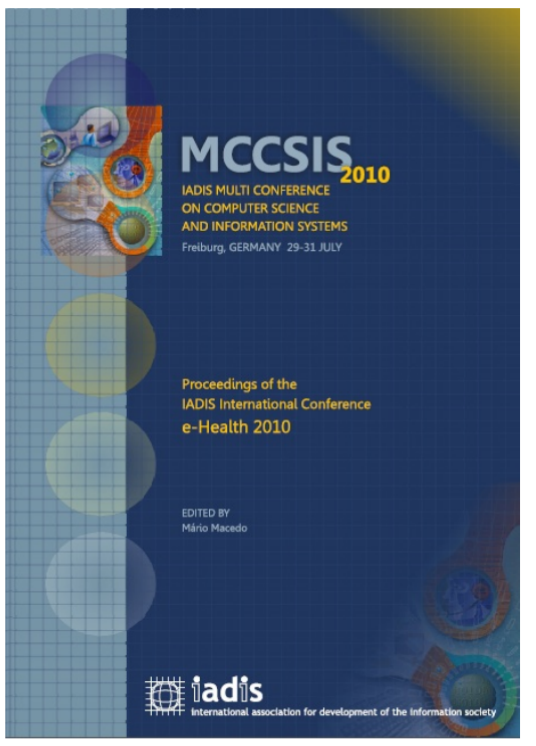
Full paper: Appendix 1a

http://www.iadisportal.org/eh-2010-proceedings

Award: Appendix 1b

Extended paper Appendix 1c

http://www.iadisportal.org/ijwi/vol9_1.html



3.1.1 Paper introduction

This paper presented a proposed causal model of determinant factors involved in the adaptation of the national health services to the Information Society. This model represented the initial stage of the overall research and presented the outcome of an exhaustive literature review and a Delphi exercise to discover and define the main factors in the proposed model. Due to the wide extension of the model, the subsequent stages of the research were focused on one of the independent variables in this model (eHealth Governance) and, the effect on the dependant variable (Information Society Progress – eHealth component).

3.1.1.1 Awards

This paper recieved the Outstanding Paper Award (**Appendix 1b**), as a result, a longer paper was published in the IADIS INTERNATIONAL JOURNAL (IIJ) ISSN: 1645-7641 Vol.9

Issue 1 (2011) under the title: “EHEALTH IN THE KNOWLEDGE SOCIETY: A CAUSAL MODEL OF DETERMINANT FACTORS”. The full paper is available in **Appendix 1c**.

This paper includes an expanded explanation of the causal model and each of the dependant and independent variables.

3.1.2 Abstract

This piece of research covers a descriptive study of the subject through an exhaustive bibliography review and a Delphi approach to develop a proposed causal model of determinant factors involved in the adaptation of the national health services to the Information Society, with the purpose to optimize eHealth Governance decisions about a broad range of issues and opportunities that information and related technologies offer to healthcare professionals, patients, relatives and carers; in other words, citizens interacting with healthcare services in the Information Society age. This research was carried out in two stages. The first stage was a descriptive piece of work illustrating the status of the context. The outcome was a proposed causal model of determinant factors (dependent and independent variables) involved in the adaptation of the NHS to the Information Society. The second stage involves a series of exploratory and explanatory pieces of research based on the causal model obtained from the previous stage; this succession of research works will measure selected variables in the model to understand their behaviour applying multivariable correlation analysis techniques.

3.2 Critical factors in the adaptation of NHS to the Information Society in Fife, Scotland: a multi case analysis of the eHealth Governance factor

IADIS eHealth 2010 Doctoral Consortium, Germany 2010

ISBN 978-972-8939-16-8 p. 317-321

Full paper: Appendix 2

http://www.iadisportal.org/eh-2010-proceedings

3.2.1 Paper introduction

This paper presented the overall research design to the Doctoral Consortium at the IADIS International Conference e-Health 2010; rationalises the width of the model and the justification of the need to focus in some of the variables. Correspondingly describes the opportunities for supplementary research work exploring further variables in the model.

3.2.2 Abstract

Exploratory and explanatory work covering a longitudinal analysis of IT/eHealth Governance implementation as a critical factor to adapt eHealth to the information society in Scotland, with the purpose to optimize eHealth Governance decisions about a broad range of issues and opportunities that information and related technologies offer to healthcare professionals, patients, relatives and carers; in other words, citizens interacting with healthcare services in the Information Society (IS) age. The study is based on the outcome of a previous descriptive piece of work of the subject which involved an exhaustive bibliography review and a Delphi approach, to develop a proposed causal model of determinant factors involved in the national health services adaptation process to the IS. The study doesn't exhaust the understanding of

the causal model, and opens opportunities for future research works to measure other identified variables in the model, so as to understand their behaviour, and to develop future analysis to integrate studied factors in a unified model. The outcome of this piece of research will provide new knowledge about the actual impact of eHealth Governance on the Information Society progress, a proposed methodology to continue with a longitudinal analysis, and the incorporation of the experiences of other NHS Boards. We also give recommendations that support the successful implementation of the eHealth Governance model across NHS Scotland.

3.3 eHealth Governance, A Key Factor for Better Health Care: Implementation of IT Governance to Ensure Better care through Better eHealth

"Ethical Issues and Security Monitoring Trends in Global Healthcare: Technological Advancements" (2011)

Chapter 6. p. 72-93

DOI: 10.4018/978-1-60960-174-4.ch006

ISBN13: 9781609601744 ISBN10: 1609601742 EISBN13: 9781609601768

Full paper: Appendix 3

http://www.igi-global.com/book/ethical-issues-security-monitoring-trends/45948\

3.3.1 Paper introduction

This paper was published in a multi-author book presenting trends in global healthcare, edited by Steven A. Brown and Mary Brown (Capella University, USA) and published by IGI Global (2011).

This publication explains key concepts related to eHealth Governance and examines this factor as a key enabler for better eHealth and better healthcare.

This paper presents key findings obtained during the Delphi exercise. Furthermore, this chapter introduces preliminary results of early experiences within the three NHS Boards under study, as part of their initial implementation of CobIT as eHealth Governance good practice framework.

3.3.2 Abstract

In this chapter, a set of recommendations for aligning eHealth with healthcare strategies is developed. After introducing the key concepts, IT Governance is discussed and described as a key enabler of successful alignment. Taking outcomes from a study conducted in Scotland, this chapter compares & contrasts preliminary results with those from similar studies in other countries. This analysis forms the basis of the chapter's recommendations, the most important of which are: (a) to employ a well-known and well- developed IT governance standard, (b) to ensure that the healthcare organisation has a high level of readiness for the transformation towards strategic alignment, and (c) to utilize experts to direct and monitor both the organisational change and the eHealth alignment.

Importantly, the results presented in relation to perceived eHealth-NHS alignment were preliminary, but significant deviations compared with the results presented in advance on this chapter were not expected.

3.4 CobIT® Maturity Assessment and Continual eHealth Governance improvement at NHS Fife

COBIT Focus Volume 4: October 2012 p. 6-9

Information Systems Audit and Control Association

(ISACA)

Full paper: Appendix 4

http://www.isaca.org/Knowledge-Center/cobit/cobit-focus/Pages/COBIT-Focus-Volume-4-October-2012.aspx

3.4.1 Paper introduction

This paper presents details of the NHS Fife experience in the implementation of CobIT as eHealth Governance good practice framework. This paper also explains how the outstanding results obtained in the NHS Fife captured the interest of other healthcare boards and the Scottish Government. This interest triggered a multi-case study to demonstrate benefits of eHealth Governance good practices across Scotland and to provide recommendations on this regard.

In 2009 the demonstrator project was selected to be presented in the NHS Scotland Annual National Conference (Glasgow). The poster presented is available in Appendix 4b.

This paper was published in the ISACA COBIT Focus journal in 2012.

3.4.2 Abstract

NHS Fife began working with COBIT® in 2007 led by the need to ensure that its e-health services were aligned with NHS's national and local strategies, along with internal pressures

to improve security, audit outcomes and compliance with recognized standard. COBIT was introduced as a best practice framework for IT Governance.

Results were impressive. In 2010, the change management process was externally audited; showing an achievement of a high, level 3 (incipient level 4) maturity. This result represents one of the highest scores and quickest improvements obtained for processes externally audited within the e-health practices at NHS Fife.

The improvements to the change management process also resulted in a series of improvements in linked processes, e.g. service desk and incident management, change and configuration, service level management, security management, and business continuity, which consequently led and allowed the ISO 27001 certification (January 2012). The NHS Fife has been the first in the history of the NHS in Scotland to obtain an ISO 27001 certification.

Since 2010, the NHS Fife has developed a corporate framework for IT governance, which demonstrates recognition of the importance of IT governance regardless of whether the IT service is provided by the e-health department or another department (currently within NHS Fife there is a federated archetype where eHealth services and decisions are made not only by the eHealth Department but Laboratories, Radiology, Primary Care, General Practitioners and National services). E-health governance is positively influencing the expansion of the use of COBIT across other processes linked to e-health services within NHS Fife, but residing outside of the e-health infrastructure team, e.g. within the e-Health Programme, information services and other federated IT services.

3.5 eHealth Governance in Scotland: A Cross-Sectoral and Cross-National Comparison

eHealth: Legal, Ethical and Governance Challenges (2013)

Chapter 13. p. 299-327

DOI 10.1007/978-3-642-22474-4_13

Full paper: Appendix 5

http://link.springer.com/book/10.1007/978-3-642-22474-4

3.5.1 Paper introduction

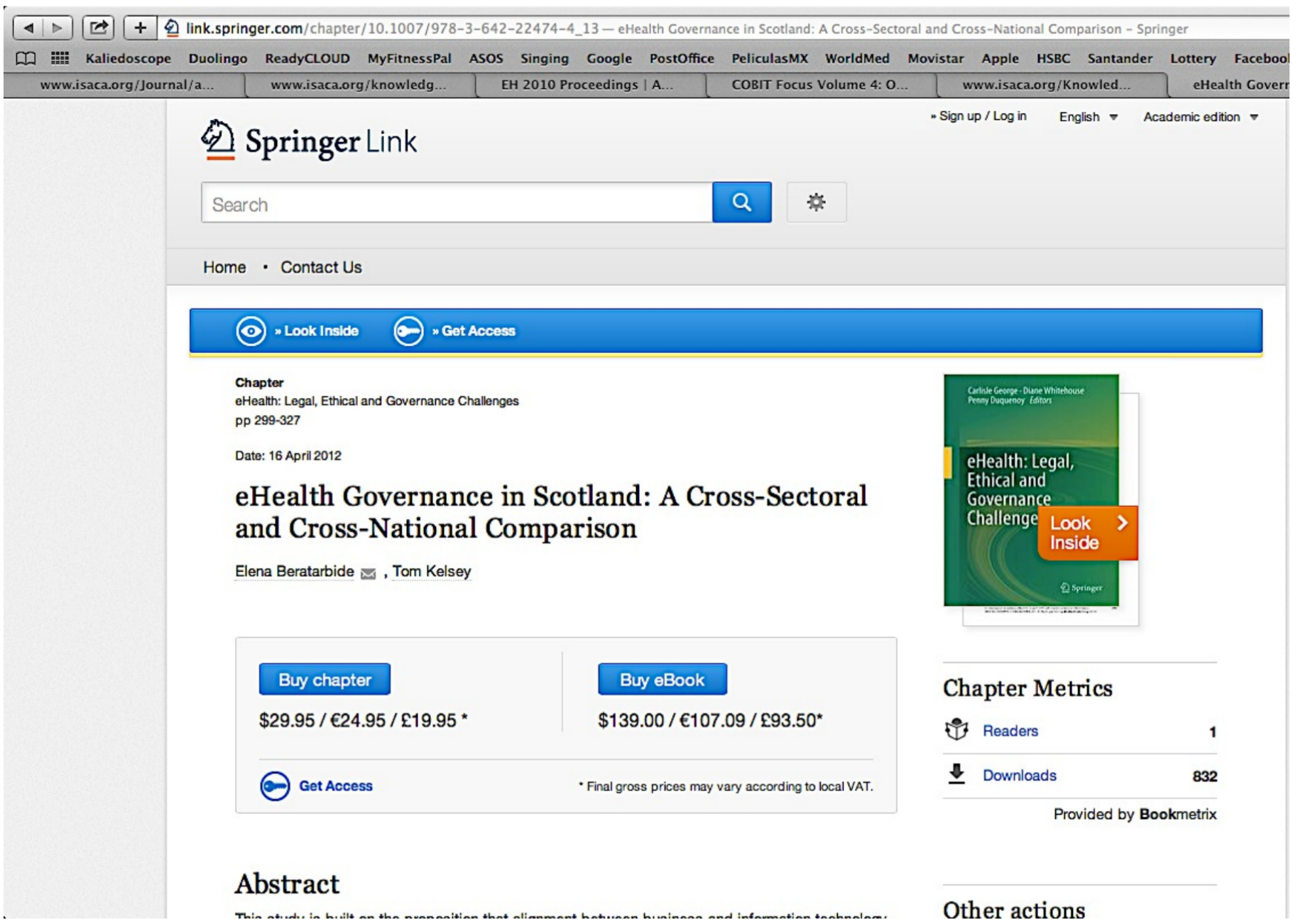
This paper was published in a multi-author book, eHealth: Legal, Ethical and Governance Challenges (2013), edited by Middlesex University (UK), Carlisle George, Diane Whitehouse and Penny Duquenoy, and published by Springer Berlin Heidelberg (2013). The publication identifies and discusses important challenges affecting eHealth in the EU and North America in the three areas of law, ethics and governance.

In Chapter 13 we presented theoretical foundations and the outcome of the observations on the three case studies in Scotland, comparing and contrasting the situation of eHealth and IT governance in other industry sectors and countries.

This publication was presented in 2011 in MED-E-TEL, Luxemburg (Appendix 5b) in anticipation to the release of the book, which was significantly delayed due to mistimed changes in eHealth legislation that affected some sections in the book.

3.5.2 Abstract

This study is built on the proposition that alignment between business and information technology (IT) through eHealth governance has a positive effect on healthcare performance and effectiveness. We present some theoretical foundations and the outcome of healthcare organization case studies in Scotland, comparing and contrasting the situation of eHealth governance with IT governance in other industry sectors and countries. This study is a contribution towards a better understanding of how IT governance is happening. We propose practical recommendations for healthcare executives to optimize eHealth governance decisions on a broad range of issues and opportunities that information and related technologies offer to healthcare professionals, patients, relatives and carers; in other words, citizens interacting with healthcare services in the Information Society.



3.6 ISACA Journal: Strategic alignment and eHealth Governance in health care organisations

ISACA Journal 2015 Volume 3

Full paper: Appendix 6

http://www.isaca.org/Journal/Blog/Lists/Posts/

3.6.1 Paper introduction

This paper is split in two publications:

a. A short article in the ISACA Journal introducing the full technical report of a longitudinal study (2008-2013) on eHealth Governance (Appendix 6a) and
b. A technical report (Appendix 6b) published in the ISACA Knowledge Center with open discussions in two specialised blogs on COBIT and Healthcare (http://www.isaca.org/knowledge-center/research/documents/)

This publication presents the results of the longitudinal study (2008-2013) within the three NHS Boards participating.

The technical report describes exhaustively the background of the study, the applied methods and the adapted SAM instrument, the design of the study, a description of the setting and the participants, an explanation of how data was collected but also, the corresponding results, data analysis, conclusions and discussion.

This paper describes longitudinal observations on strategic alignment, being eHealth Governance one of the main dimensions. The impact of eHealth Governance on the information society is not examined in this report but in the next and final article.

3.6.2 Abstract

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.

Methods

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 (Strategic Alignment Model) and a cross-sectoral/national benchmarking based on a literature review.

Ninety-two participants were 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.

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 slowly progressing across the organisation (15% since 2008), indicating a 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. It is recommended the longitudinal analysis continues over the forthcoming years in order to confirm the actual correlation ratio, also further research is required in order to isolate and understand the influence of the rest of the SAM dimensions in strategic alignment. For this purpose, a simplified and adapted method to monitor these trends in future HCOs research has also been provided.

3.7 BMC Journal: Monitoring progress on eHealth strategic alignment and eHealth Governance in health care organisations

BMC Health Services Research Journal (Biomed Central)

Manuscript Reference: 1372800582126062.

Full paper: Appendix 7

3.7.1 Paper introduction

This paper ha been submitted to Biomed Central (BMC Health Services Research JCR 1.66). The submission is under review for second time after structural changes to the initial article. All questions presented by the reviewers have been addressed. The main request has been to reduce significantly the content, rewrite focusing in the key messages for busy service managers and re-edit with separating the content that is more relevant for a technical report. In this sense, the initial article was split in 3 different publications:

a. Short article introducing the technical report to be publish in the ISACA Journal (Appendix 6a). The ISACA audience is mainly information systems and I.C.T. professionals, including managers, practitioners and auditors.
b. Technical report, as explained earlier, this report explain granular details of the study in terms of eHealth Governance as a dimension of the Strategic Alignment Model, and present the results of the longitudinal analysis.
c. The article submitted to BMC covers the part of the research related to the analysis of the eHealth Governance impact on the Information Society. This article closes the loop from the research structure point of view and the argumentative line of the publications.

3.7.2 Abstract

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. How IT Governance is implemented within healthcare, the actual impact on strategic alignment and its influence to the information society progress, remains poorly understood.

This article presents an analysis of eHealth Governance and Strategic Alignment progress within three case studies in Scotland and analysis a potential correlation of this factor with the progress of the Information Society (indistinctively referred also as Digital Society in this paper). Data from Eurostat and The Scottish Government was available to compare the local progress of eHealth in the Digital society.

4

CONCLUSIONS

4 Conclusions

This study aimed to provide a better understanding on how IT Governance is implemented within HCOs, the actual impact on strategic alignment and its influence to the information society progress.

Our results are summarised in two main publications:

a. A Technical Report accessible via ISACA Knowledge Centre (Appendix 6a and 6b) which summarises the main findings on strategic alignment and eHealth Governance and,
b. The article submitted to BMC (Appendix 7) showing the progress of the main variables under observation: Strategic Alignment, eHealth Governance, Digital society and eHealh uptake.

4.1 Main conclusion

Our results support positively our hypothesis that the more mature eHealth Governance is, the better the strategic alignment between eHealth and HCOs, hence the better progress of eHealth and the Digital Society.

Our results show very strong positive correlation between all these variables; any effort in improving eHealth Governance quite likely will have a positive impact on Strategic Alignment, which in return will have a positive effect on the eHealth progress and the progress of Digital Society (r=1).

Increments in eHealth Governance maturity are correlated to increments in the Strategic Alignment (HCO-eHealth) maturity. More data is required in order to establish the proportionality of the increment, but the correlation seems to be strong (r=0.73). It is also

required further investigations in order to isolate the effect other SAM dimensions in to the final Strategic Alignment achieved.

Increments in the Strategic Alignment maturity are correlated to increments in eHealth (r=0.88) uptake indicators and Digital Society progress (r=1, perfect positive correlation).

We propose a minimum of eHealth Governance maturity is required in order to sustain eHealth societal uptake. Those organisations with eHealth Governance maturity under Level 2 may not respond to our correlation analysis as suggested in this study. This is mainly due to the fundamental limitations in the decision-making process associated with Ad-Hoc IT governance. In order to achieve progress on any other variables of our model, 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.

4.2 Strategic Alignment is progressing faster

Strategic alignment between eHealth and HCOs is progressing faster than the overall performance of the Digital Society, eHealth uptake or even eHealth Governance (Figure 32 in Appendix 7). 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.

4.3 eHealth Governance is necessary to sustain Strategic Alignment

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 it 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.

4.4 Strategic alignment will promote eHealth progress and will influence the Digital Society evolution

Our study demonstrates that eHealth, as a component of the Digital Society [25] is progressing, what is more, is doing it at a quicker pace than the overall Information Society indicators in Scotland. This is positive news for the Scottish population as eHealth has too many benefits to offer to citizens in the Digital Society, especially for those with long-term conditions and living in rural areas. A steady progress since 2008 is a promising result.

The Digital Society is also showing signs of steady progress since 2008, despite of the fear that the economical recession could have slow down the required investments.

Our results support the hypothesis that the more mature eHealth Governance, the better strategic alignment in HCOs, therefore the better progress of eHealth, which in return will impact positively the overall progress of the Digital Society.

4.5 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 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).

4.6 eHealth Progress

eHealth is showing signs of steady uptake in Scotland (3% growth per year). The delivery of the National eHealth Strategy is monitored centrally and shows also stable progress on the key areas: paper-light hospital (43%), video-conferencing (24% growth per year), patient portals (20% increase per year), Key Information Summaries (0.0017% population in 2013), Clinical Portals (20% more users and 500% more accesses every quarter), Information Assurance (Patient Privacy monitoring systems in 85% Boards), eReferrals (5% increment every quarter).

eHealth has the potential to allow unprecedented transformations of healthcare processes, not just technologies, but minimising clinical risk, materialising better and wider multidisciplinary care teams and shifting the self-management of citizen's own health. Any effort improving the outcomes of eHealth should be nurtured within HCOs in order to be able to face the challenges of the future healthcare system. eHealth Governance has the potential

to provide the assurance required by HCOs for efforts and investments to be aligned with the healthcare strategy.

4.7 Future research opportunities

eHealth Governance, Strategic Alignment and eHealth in Digital Societies

This study provides some light with regards to how eHealth Governance has been implemented, the impact on Strategic Alignment and the progress of eHealth in Digital Societies, however this study covers a limited time span for observations of a gentle and gradual process of organisational and social transformation, hence the need to continue monitoring for a longer period of time. Our results suggest a potential correlation between eHealth Governance, Strategic Alignment and eHealth as a dimension of the "Information" or Digital Society, but further research is required to confirm our findings and validate our correlation analysis. This work will continue during the forthcoming years and further updates will be published accordingly.

For this purpose, this study presents a methodology to continue monitoring the correlation between eHealth Governance, strategic alignment, eHealth and Digital Society progress.

Causal model of factors

Our research started from a proposed causal model of determining factors involved the adaptation of healthcare to the information society. We have focused in one of the factors: eHealth Governance as a dimension of Strategic Alignment, however the vast majority of the independent variables identified still need further research, each of which could represent and independent piece of work.

5

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6

ABBREVIATIONS

6 List of abbreviations

CEO	Chief Executive Officer
CFO	Chief Finance Officer
CIO	Chief Information Officer
COBIT®	Control Objectives for IT
EU	European Union
GP	General Practitioner
HCO	Health Care Organisation
HEAT	NHS performance targets for **H**ealth Improvement, **E**fficiency and Governance, **A**ccess to Service and **T**reatment Appropriate to Individuals
HEPMA	Hospital Electronic Prescribing and Medicines Administration
ICT	Information and Communication Technologies
ISO	The International Organization for Standardization
IT	Information Technologies
ITIL	IT Infrastructure Library
KIS	Key Information Summary
KPI	Key Performance Indicator
LEAN	Set of tools and techniques for organisational improvement.
LTC	Long Term Conditions
NHS	National Health Service
NVIVO	Software that supports qualitative and mixed research methods.
OLA	Operational Level Agreement
PPMS	Patient Privacy Monitoring System
RTT	Referral to Treatment (18 Weeks)
SAM	Strategic Alignment Model
SHS	Scottish Household Survey
SIBIS	Statistical Indicators Benchmarking the Information Society
SLA	Service Level Agreement

7

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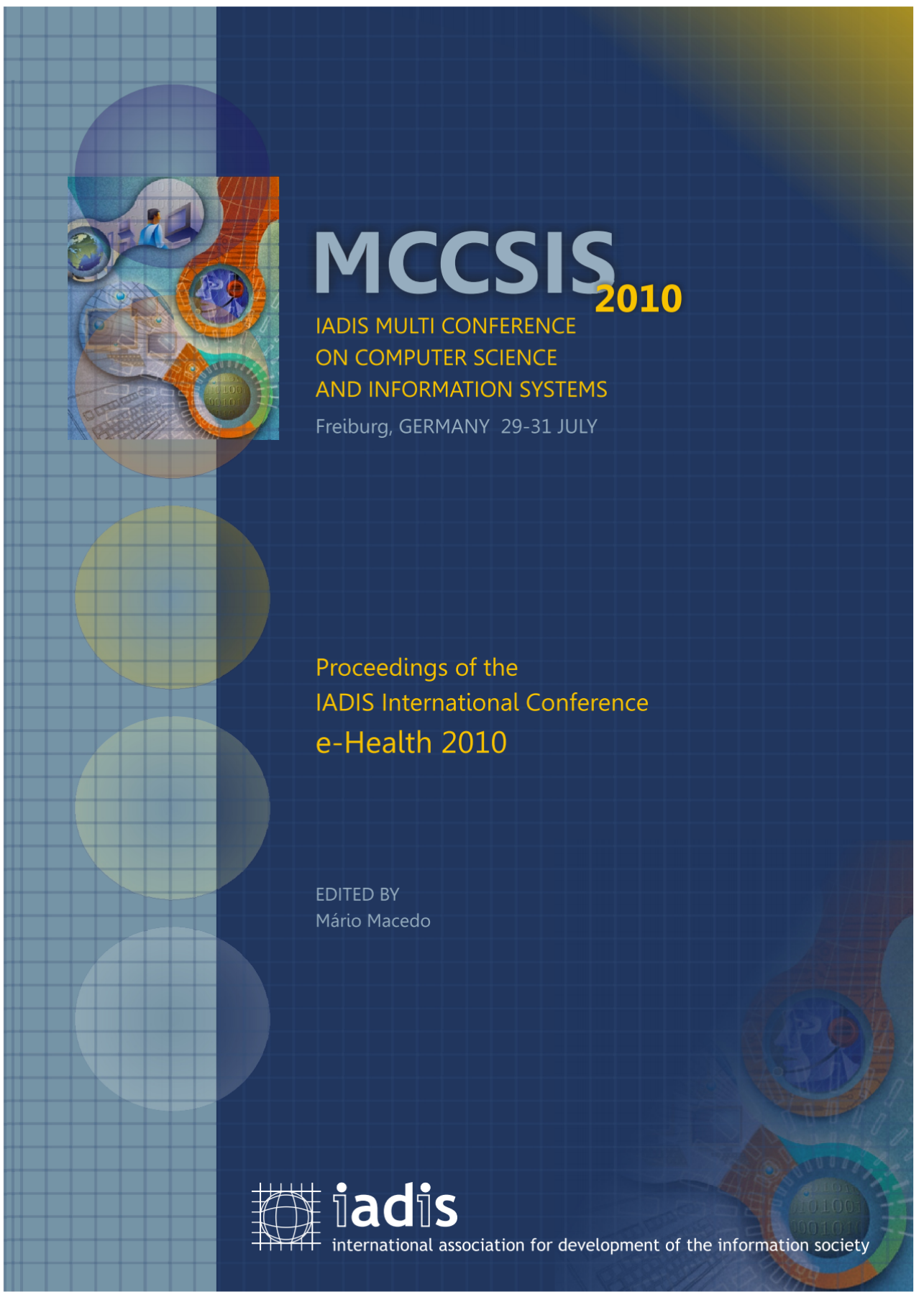
8

APPENDIXES

8 Appendixes

8.1 Appendix 1a: Critical factors in the adaptation of the National Health Service (NHS) to the Information Society in Fife



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CRITICAL FACTORS IN THE ADAPTATION OF THE NATIONAL HEALTH SERVICE (NHS) TO THE INFORMATION SOCIETY IN FIFE

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ABSTRACT

This piece of research covers a descriptive study of the subject through an exhaustive bibliography review and a Delphi approach to develop a proposed causal model of determinant factors involved in the adaptation of the national health services to the Information Society, with the purpose to optimize eHealth Governance decisions about a broad range of issues and opportunities that information and related technologies offer to healthcare professionals, patients, relatives and carers; in other words, citizens interacting with healthcare services in the Information Society age. This research was carried out in two stages. The first stage was a descriptive piece of work illustrating the status of the context. The outcome was a proposed causal model of determinant factors (dependent and independent variables) involved in the adaptation of the NHS to the Information Society. The second stage involves a series of exploratory and explanatory pieces of research based on the causal model obtained from stage 1; this succession of research works will measure selected variables in the model to understand their behavior applying multivariable correlation analysis techniques.

KEYWORDS

e-Health, Information Society, e-Health Governance, IT Governance, TeleHealth, Telemedicine.

1. INTRODUCTION

1.1 Nature of the Problem

Health services across the UK, are making important investments and efforts to deliver the eHealth strategy, which involves more than an internal set of transformations oriented towards the implementation of an integrated care record jointly managed by patients and healthcare professionals with embedded data security and confidentiality consented by the patient.

eHealth involves the development, innovative application and tangible implementation of information and related technologies across the healthcare service, wherever it's needed, to improve effectiveness of the healthcare for better health. It includes the use of telemedicine and clinical systems used for diagnosis and care pathways, but also policies and protocols that assure the confidentiality and security of sensitive data. eHelath involves "the provision of information, education and services to consumers, including patients and citizens" (Pagliari 2005).

The term "eHealth" conveys the need to address a broader agenda than what is implied by the term IT. eHealth encompasses much more than the deployment of computer technology. It suggests information and related technologies and governance processes in support of health and stimulates thought and discussion about the broad range of issues and opportunities that technology offers in the health care setting to both healthcare professionals and patients. This wider picture of eHealth, with boundaries above the healthcare institutions, involving patients that are also citizens, is the foundation of this piece of research. eHealth requires a transformation of the way citizens (patients, potential patients or carers) and healthcare services interact (Castells 2005) in other words, eHealth it is an initiative towards the Information Society assimilation.

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1.2 Purpose

This piece of research analyses determinant factors in the adaptation process of the public national healthcare services to the Information Society, assuming that these factors are not only such as related to ICT (Information and Communication Technologies) infrastructures and economical funds but factors related with perceived benefits and data quality including security. All these factors will be variables in a causal model and how these variables interact and determine the result: the adaptation of the national health services to the Information Society (IS).

1.3 Contribution of the Paper

The outcome can be used to optimize decisions on eHealth Governance, focusing the economical, human and organisational efforts towards critical factors with a high impact in better healthcare by optimizing the opportunities that the information and related technologies offer to healthcare professionals, patients (actual or potential), relatives, carers, in other words: citizens interacting with eHealth in the Information and Knowledge Society.

1.4 Antecedents

This research is based on a previous work conducted since 2005 based on a literature review (Beratarbide 2008)to develop an initial model of acknowledged factors. This piece of work presented partial results at early stages of the Delphi exercise; the purpose at the time was only to demonstrate research proficiency as required by the Ph. D. programme.

The outcome was an "Initial causal model of variables" subjected to further Delphi validation of applicability within the National Health Service. The proposed model also suggests the expected direction of the relationship between independent factors and the dependant variable: he progress of the IS within the areas under study in Scotland.

To simplify the analysis some variables were grouped in families of factors based on their proximity or relation with specific topics of interest. All the factors are vastly explained in the preliminary work (Beratarbide 2008).

2. METHOD: THE DELPHI EXERCISE

In order to validate the causal model of variables, a Delphi exercise was applied. This method use a group of experts to obtain their opinion about how adequate is the model according with their knowledge and experience.

The experts worked independently, providing their opinion in a written way and giving special consideration to the freedom of their opinion.

The rest of the participants don't know the personal opinion but the group conclusions to ensure experts' feedback was not influenced. The composition of the panel was published but not the personal feedback provided. In any case, participation was anonymous when explicitly requested by the participant.

Throughout the process (Figure 1) participants reviewed the group outcome having the opportunity to keep or change their initial opinion. Changes in opinions are reflected in a new outcome paper that might be circulated or not, depending on the level of consensus achieved.

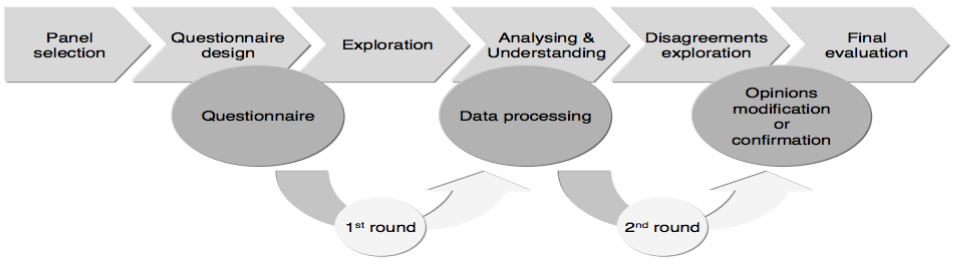

Figure 1. The Delphi process.

Panelists involved individuals with a good understanding, knowledge and experience in the subject. In this case the areas of expertise targeted were: information society, national health services and information technologies.

Although it is generally accepted in the research community that Delphi exercises are not statistically representative, the size of the panel is transcendent; the more experts involved the better the conclusions. It was a premise on this piece of research, not only to ensure quality of the outcome but also to minimize the risk of withdrawals. Special attention was dedicated to obtain the maximum of the panelists' commitment and to try to increase the number of them in the exercise to mitigate the risk.

The panel had a representation of relevant "change agents" as detailed below (Figure 2). 35 experts were invited and 22 responded.

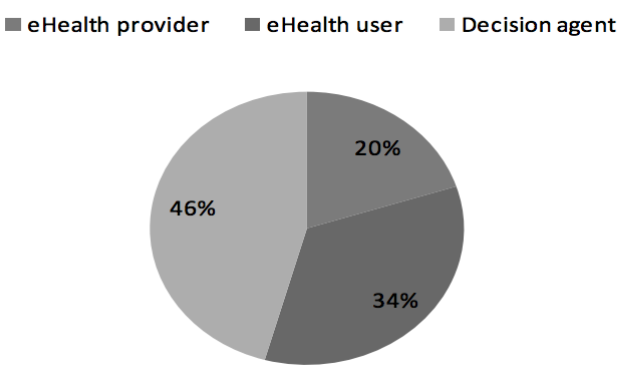

Figure 2. Composition of the panel of experts.

The expertise although was clearly higher in areas related with eHealth, IT and NHS followed by expertise in topics purely related with the Information Society.

Although the size of the panel is reduced, the quality and richness is considered adequate in terms of level of expertise and varied background; representing eHealth providers, users and decision agents, independent highly experienced eHealth consultants but also people directly involved in the design and delivery of eHealth across the UK, particularly within the National Health Service in Scotland.

The panel included the expertise of Healthcare Consultants (eHealth Business, Public Health Medicine, Primary Care and Acute Services), Medical Directors, Clinical Leads for eHealth, eHealth architects, Heads of eHealth (Information Services, ICT, eHealth Strategy and Programme), eHealth continuity specialists, Heads of Learning and Development, eHealth Project Managers, IT Consultants, eHealth researchers and eHealth users.

3. THE INSTRUMENT

A questionnaire was distributed to gather experts' feedback. The instrument was presented with the following structure:

- **Part I.** Introduction to the research in terms of objectives, scope and plan.
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- **Part V.** New factors. The last section gathers new factors not included in previous versions of the causal model circulated for consultation. The panelists can suggest other factors to be incorporated, including a description and the suggested direction of the relationship with the dependant variable.

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For each variable, the experts self-assess their degree of confidence in the accuracy of their position according to their specific expertise in that particular matter. The purpose was to mitigate the risk of assigning equivalent weights to opinions based on significant differences of expertise levels on specific matters, as the questionnaire covered a wide spectrum of matters, although all of them were related with eHealth. The "expertise" scale offered these options:

- **Expert (Well informed and documented).** At this level the expert think he/she has a really good informed and documented knowledge and experience in this matter to provide the most expert opinion.
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- **Don't answer / don't know**. It means the panelist prefers not giving an opinion about a specific question.

4. ETHICS

This piece of research has been conducted under the ethics protocols and governance frameworks applicable within the healthcare service R&D (Research & Development) activity in Scotland. The study is also compliant with the ethics code of both universities supervising this piece of research.

5. RESULTS

5.1 Model Acceptance

The level of responses shows the model has been highly accepted (Figure 3). None of the factors were rejected because it was considered they had no influence in the model but because one or more factors were aggregated or because the impact of the factor compared with other variables was considered almost negligible.

Figure 3 illustrates weighted values to reflect the level of expertise and confidence in the response provided by each member of the panel on each of their responses. Expert responses were weighted as 100% whereas general opinions (GO) where downgraded to 25%. By weighting responses is possible to get a more accurate view of experts' actual confidence on their specific area of expertise: IT, eHealth, Information Society or health service.

The outcome of the model is consistent with the indicators proposed by the EU to benchmark the Information Society (SIBIS Consortium 2003). It is also consistent with other studies as the initial model comes from a robust literature review (Beratarbide 2008) as explained in the antecedents.

Most of the comments and rejected factors were related with overlaps between factors that suggested grouping them in more meaningful variables, sometimes modifying slightly the scope of the initial factor in order to accommodate related and close variables.

Language was controversial because while clearly this factor refers to the number of non English speakers treated within the health service in Scotland, which according to the demographics is so vanishingly small so it should be considered not significant at the present time. However the health service within the EU has to allow accessibility to non English speakers and can be predictable this factor influence might change with globalization effect. On the other hand, special consideration should have from the investments decisions point of view; when there is a finite budget then the more that is spent on translations and means less available for information services and patient care in general. In any case is a factor that within the area under study it is considered it has a negligible effect due to current demographics but it might change in the future.

Persistence of traditional channels was controversial. The reality shows that despite of investments in automated systems that actually work, areas of health care continue using traditional channels for different reasons: genuine or perceive security, preference, trust in technology, etc. Areas like laboratories at hospitals

still send results to GPs on paper although there is enough technology in place to overcome this stage. On the other hand, as health services are within the area of study are under pressures to make efficiency savings and get value for the money invested in the healthcare system. Traditional channels will be used less and less in the face of an effective IS option that works better. The mere persistence of traditional channels will reduce the move to the IS depending on the outcomes for users.

Connection costs. Infrastructure dependency is well understood in healthcare so a large proportion of connection costs is borne centrally hence having a complex to measure effect. Individual connections are increasingly charged and paid for as a cost of connection independent of the data actually carried and hence it is an effect difficult to measure. Connection cost should include not only the obvious as broadband but also devices or training; all costs involved in effectively connect. On the other hand, the majority of the population appreciates the cheaper connection costs compared with the situation years ago. Connectivity, as any other utility, is subject to competition, and in the current climate it is not likely to have increments in fares but the overall connectivity cost might increase due to extensive usage and also due to the effect of new technologies coming up continually and changing the infrastructures required to get a better service; it's a cycle that also has cost implications, not only the ongoing cost of broadband consumptions.

Operational groups. It is related with the eHealth governance structure and the relationship between groups to deliver eHealth, the programme, projects, "implementators" and final users. Operational groups must exist to deliver the strategy y groups with the skills sets to deliver the strategy with leadership and commitment; dependency here will rest on change and quality of the people who need to deliver on the multiple levels of eHealth. Operational groups have to be closer to general health service developments in particular areas to manage needs and requirements of users and ensuring smooth transitions from old to newer ways of doing things.

Direct Contact. Although it was accepted, the sense of the relation with the dependant variable in the model was controversial. There is not clear picture about what is the actual relationship, if this is matching or opposite.

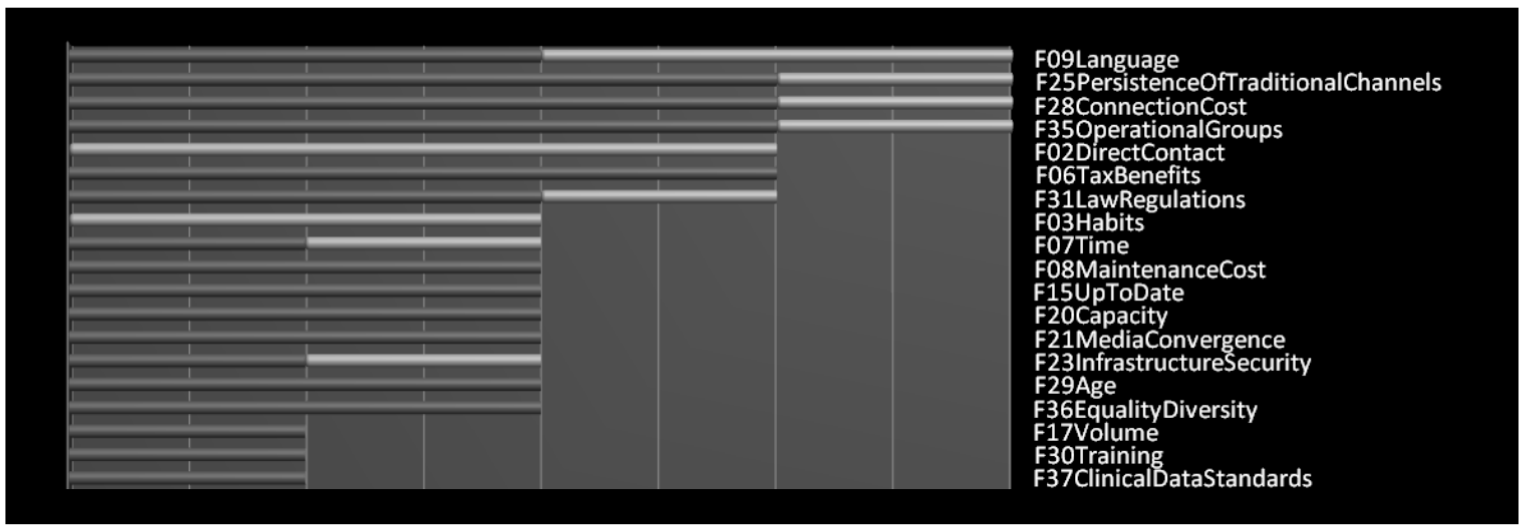

Figure 3. Controversial factors

There is specific evidence in patient care were alternatives were put in place that didn't work because patients prefer direct contact with health carers. There are cases like VC-based consultations and also a piece of research regarding the introduction of a new type of leg ulcer dressing in the community. Previously the generally old patients got a daily and lengthy visit at home from the community nurse. The new dressing meant one quick visit and again a fortnight later. Some patients however had damage to their ulcers, preventing healing. Turned out this was because the patients did the damage themselves; they enjoyed having the nurse come in every day and wanted to go back to that.

In general there is agreement regarding the tendency for people to want to speak or have contact with a real person may tend to mitigate against the information society, however, this effect in itself may be influenced by the way the Information Society is taken forward. For example ICT can be used to ensure the patient speaks or even video link to a real person on the phone who knows the situation, and sorts the problem out efficiently, even though they are not in a local office near to each other. In other words it would also depend on how things are done. The future may hold new ways of doing things that would get over the initial proposed direction, by producing a better outcome for people.

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From a different perspective, **Direct Contact** might not be person to person, but person to group, or group to person, this in effect enables multi-disciplinary care to be used in the eHealth context of a mature information society. The assumption here is that patients can take more responsibility for their own care reducing the need for hospitalization and therefore direct contact with the health service, hence the relation with the dependant variable of the model (Information Society progress) will be opposite rather than matching as initially proposed.

It has to do also with population habits and customs and the age of the targeted collective. **Direct Contact** is a matter of a preference but also is a habit or custom.

In the same way, the factor "**Mediators**" was accepted but the sense of the relation is questionable. Initiatives like NHS24 and NHS Direct have failed delivering the benefits expected. As the number of mediators falls, the expertise they individually have is increasingly challenged and while theoretically patients can be better targeted to point of care this is not happening reliably. Fewer mediators is only a benefit if they are suitably skilled and resourced to provide accurate service.

Another controversial factor is "**Tax saving and other benefits**". The argument is that support programs based on tax savings and other benefits, because of using ICT, are an incentive to move towards the Information Society. In the case of the financial sector, for example, some discounts obtained for buying financial products or services via the Internet is an incentive to use it. In several EU countries there are tax savings or discounts for buying PCs for home or for business purposes, for implementing new innovative software, etc. But if the rationale is the greater the savings on taxes or other equivalent benefits the greater the impact for IS in NHS Fife, it requires a note of caution; there are few examples where investment in eHealth have proven to have reduced cost or tax. On the contrary most governments spend between 2-5% of GDP on eHealth because this is accepted basis service; however there is no clear savings accrued. The test could be finding the source of savings for the equivalent expenditure on eHealth. In any case the factor remains key.

Habits and customs. This should be inclusive of culture; the acceptance will be variable based upon degree of cultural acceptance, previous 'good experience' and the like, and nature of demand. There is a marked difference between a service that can provide information about a condition such as diabetic ulceration, but this information service will be unable to 'change a dressing' for this ulceration - so the limitations are set and should be key in developing future habits and customs for the Information Society.

Groups of variables.

For the purpose of the model some variables were grouped by "families" or matters. When measuring variables and correlating the results not necessarily the variables can be mathematically group without a detailed analysis as some variables could have almost a null effect if the rest of factors in the same "family" have considerable higher values.

These groups are then proposed only to simplify the model but future mathematical application will require further analysis.

Apart from the initially suggested groups (Perceived benefits, Quality of contents and Infrastructure quality) the following groups were included:

eHealth Governance, which includes all the factors related with the structures, processes, strategies and decision making related with eHealth. Variables like Strategic plans and programmes (F34), operational groups (F35), Leadership and commitment (F33), Law and Regulations environment (F31), Acceptability (F32), Training (F30), Availability (F27), Clinical data Standards (F37), Security (F14) were included under this group.

6. CONCLUSION

Although the model was accepted and seams to reflect the main aspects in the adaptation of eHealth to the Information Society, a number of variables cause controversy around the sense of the relationship, therefore further research is required to understand the dynamics behind this factor in order to take appropriate decision on eHealth.

This model is just a small contribution to clarify what are the main aspects influencing this adaptation process and covers only the experience within a specific NHS Board in Scotland. Despite of this, the reviewed literature supports the applicability of the model not only to other geographical areas but other

sectors; most of the factors are commonly referenced in research related with the Information Society in the public and private sector.

This paper covers only the main aspects but comments supported all the controversy generated around these factors, although they were accepted the direction of the relationship was not clear. Future research has to continue and clarify these aspects as the scope of this initial piece of research doesn't cover such a vast task.

This model will support further research work, some of them already started; specifically in Scotland an eHealth Demonstrator project was initiated to measure the impact of eHealth Governance related factor; the study was concluded in terms of the evaluation of the experiences of 3 NHS Boards across Scotland with different levels of eHealth Governance maturity. Also this piece of research is already supporting the correlation of the eHealth Governance family of factors with the perceived alignment of eHealth and the healthcare business; the study is not concluded but partial results are already available.

This model is consistent with other models available, for example the one proposed by the European Commission with the collection of SIBIS indicators, but there are other models that are referred to in this paper (SIBIS Consortium 2003).

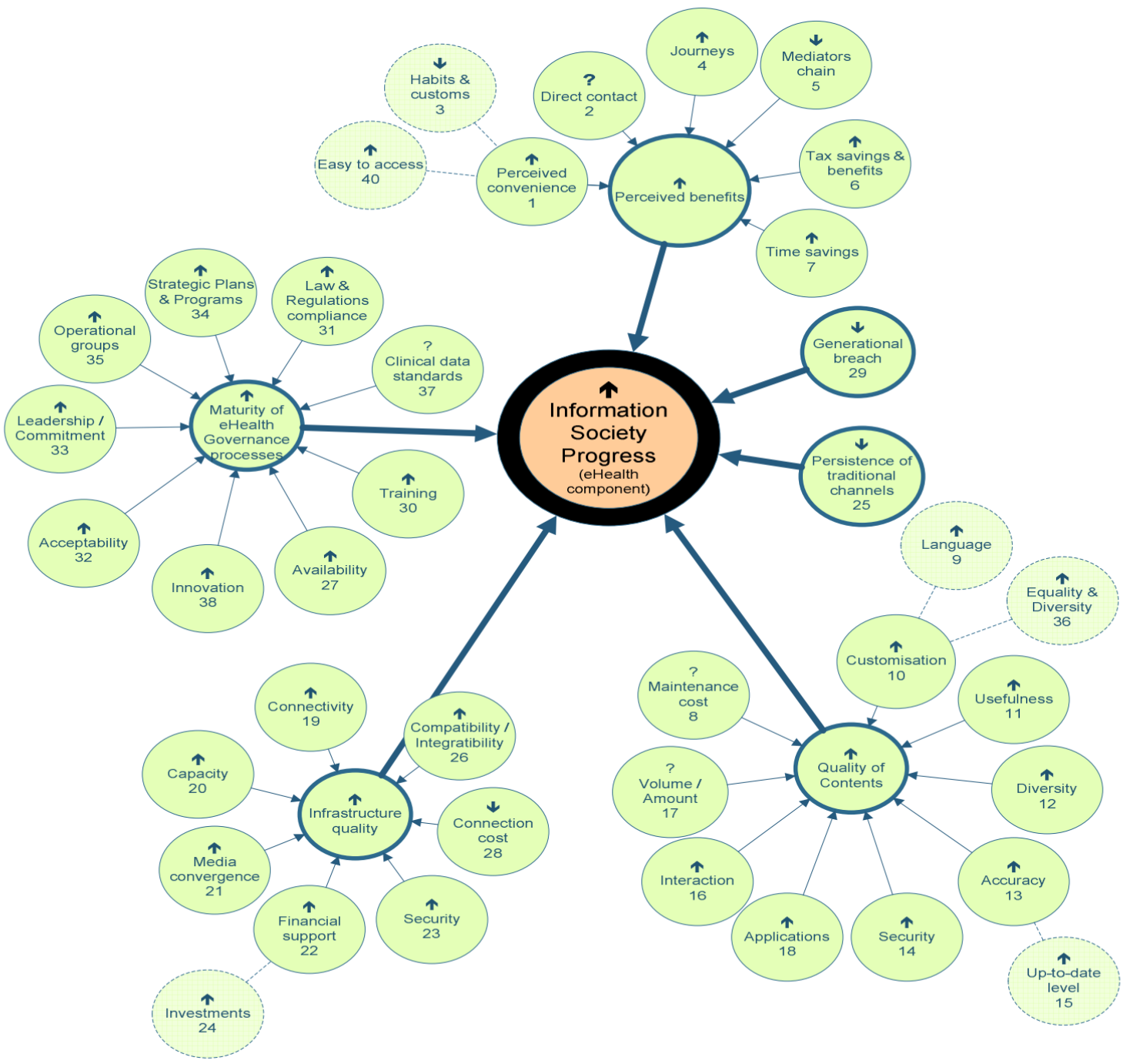

Figure 4. Causal model after Delphi (final)

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ACKNOWLEDGEMENT

We have to thank the support provided by the Polytechnical University of Valencia, St. Andrews University, the NHS Boards involved, and all the participants in the Delphi exercise who with their personal dedication, usually out of working hours, helped in a valuable way this piece of research.

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8.2 Appendix 1b: IADIS 2010 – Outstanding Paper Award

Certificate

The paper entitled

CRITICAL FACTORS IN THE ADAPTATION OF THE NATIONAL HEALTH SERVICE (NHS) TO THE INFORMATION SOCIETY IN FIFE

Elena Beratarbide
CISA, Polytechnical University of Valencia,
NHS Fife

was selected for the

Outstanding Paper Award

at the

IADIS International Conference

e-Health 2010

The Conference Committee, taking into account the blind review process, considers this paper of the highest standard.

Mário Macedo

Program Chair

iadis

international association for development of the information society

8.3 Appendix 1c: IIJ (IADIS International Journal). EHealth in the Knowledge Society: a causal model of determinant factors.

IADIS INTERNATIONAL JOURNAL ON WWW/INTERNET (ISSN: 1645-7641)
VOL.9 ISSUE 1 (2011)

EHEALTH IN THE KNOWLEDGE SOCIETY: A CAUSAL MODEL OF DETERMINANT FACTORS.

Elena Beratarbide. *CISA, Polytechnical University of Valencia, NHS Fife Kirkcaldy, Scotland, UK.Address.*
eberatarbide@nhs.net

ABSTRACT

This piece of research covers a descriptive study of the subject through an exhaustive bibliography review and a Delphi approach to develop a proposed causal model of determinant factors involved in the adaptation of the national health services to the Information Society, with the purpose to optimize eHealth Governance decisions about a broad range of issues and opportunities that information and related technologies offer to healthcare professionals, patients, relatives and carers; in other words, citizens interacting with healthcare services in the Information Society age. This research was carried out in two stages. The first stage was a descriptive piece of work illustrating the status of the context. The outcome was a proposed causal model of determinant factors (dependent and independent variables) involved in the adaptation of the NHS to the Information Society. The second stage involved a series of exploratory and explanatory pieces of research based on the causal model obtained from stage 1; taken together, they measure selected variables in the model to understand their behavior by applying multivariable correlation analysis techniques.

KEYWORDS

eHealth, Information Society, eHealth Governance, IT Governance, TeleHealth, Telemedicine.

1 INTRODUCTION

1.1 Nature of the problem

Health services across the UK are making important investments and efforts to deliver an eHealth strategy, which involves more than an internal set of transformations oriented towards the implementation of an integrated care record jointly managed by patients and healthcare professionals with embedded data security and confidentiality consented by the patient.

eHealth involves the development, innovative application and tangible implementation of information and related technologies across the healthcare service, wherever it's needed, to improve effectiveness of the healthcare for better health. It includes the use of telemedicine and clinical systems used for diagnosis and care pathways, but also policies and protocols that assure the confidentiality and security of sensitive data. eHealth involves "the provision of information, education and services to consumers, including patients and citizens" (Pagliari 2005).

The term "eHealth" conveys the need to address a broader agenda than that implied by widespread constricted views of the IT term, which frequently is associated with computer technology only - although it is arguable that this proposition is not consistent with the definition and scope of IT according to well-known frameworks and standards, for example CobIT© (IT Governance Institute 2007). It is not the purpose of this

paper to create a debate regarding what IT and eHealth involve, but to suggest that eHealth encompasses much more than the deployment of computer technology. It implies information and related technologies and governance processes in support of health and stimulates thought and discussion about the broad range of issues and opportunities that technology offers in the health care setting to both healthcare professionals and patients. This wider picture of eHealth, with boundaries above the healthcare institutions, involving patients that are also citizens, is the foundation of this piece of research. eHealth requires a transformation of the way citizens (patients, potential patients or carers) and healthcare services interact (Castells 2005) in other words, eHealth it is an initiative towards the Information Society assimilation.

1.2 Purpose

This piece of research analyses determinant factors in the adaptation process of the public national healthcare services to the Information Society, assuming that these factors are not only such as related to ICT (Information and Communication Technologies) infrastructures and economical funds but factors related with perceived benefits and data quality including security. All these factors will be variables in a causal model and how these variables interact and determine the result: the adaptation of the national health services to the Information Society (IS).

1.3 Contribution of the paper

The outcome can be used to optimize decisions on eHealth Governance, focusing the economical, human and organisational efforts towards critical factors with a high impact in better healthcare by optimizing the opportunities that the information and related technologies offer to healthcare professionals, patients (actual or potential), relatives, carers, in other words: citizens interacting with eHealth in the Information and Knowledge Society.

1.4 Antecedents

This research is based on a previous work conducted since 2005 based on a literature review (Beratarbide 2008) to develop an initial model of acknowledged factors. This piece of work presented partial results at early stages of the Delphi exercise.

The outcome was an "Initial causal model of variables" subjected to further Delphi validation of applicability within the National Health Service. The proposed model also suggests the expected direction of the relationship between independent factors and the dependant variable: the progress of the IS within the areas under study in Scotland.

To simplify the analysis some variables were grouped in families of factors based on their proximity or relation with specific topics of interest. All the factors are vastly explained in the preliminary work (Beratarbide 2008).

2 METHOD: THE DELPHI EXERCISE

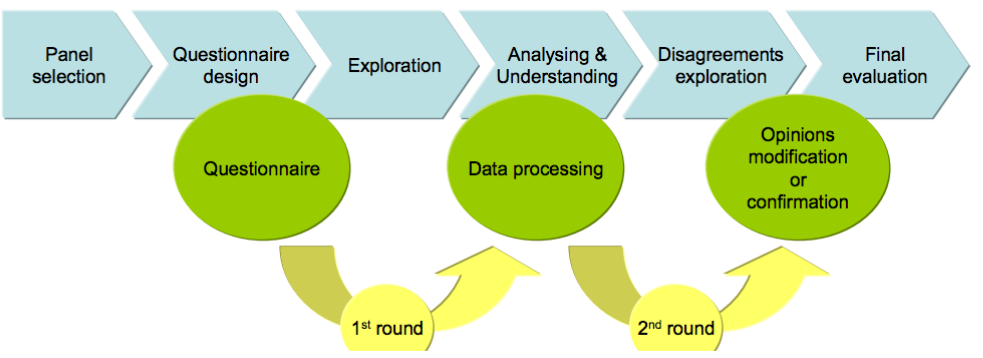
In order to validate the causal model of variables, a Delphi exercise was applied. This method uses a group of experts to obtain opinions about how adequate the model is, according to their knowledge and experience. The experts worked independently, providing their opinion in a written way and giving special consideration to the freedom of their opinion.

The rest of the participants had no knowledge of the personal opinions, but only of the group conclusions to ensure experts' feedback was not influenced. The composition of the panel was published but not the personal feedback provided.

Participation was anonymous when explicitly requested by the participant.

Throughout the process (Figure 1) participants reviewed the group

Figure 1 The Delphi process.



outcome having the opportunity to keep or change their initial opinion. Changes in opinions are reflected in a new outcome paper indicating the level of consensus achieved.

Panelists involved individuals with a good understanding, knowledge and experience in the subject. In this case the areas of expertise targeted were: information society, national health services and information technologies.

Although it is generally accepted in the research community that Delphi exercises are not statistically representative, the size of the panel is transcendent; the more experts involved the better the conclusions. This was a premise on this piece of research, not only to ensure quality of the outcome but also to minimize the risk of withdrawals. Special attention was dedicated to obtain the maximum commitment and to try to increase the number of panelists in the exercise to mitigate the risk.

The panel had a representation of relevant "change agents" as detailed in Figure 2. A total of 35 experts were invited and 22 responded.

The collective expertise was clearly higher in areas related with eHealth, IT and NHS followed by expertise in topics purely related with the Information Society (Figure 3). Although the size of the panel was reduced, the quality and richness was considered adequate in terms of level of expertise and varied background; representing eHealth providers, users and decision agents, independent highly experienced eHealth consultants and also people directly involved in the design and delivery of eHealth across the UK, particularly within the National Health Service in Scotland.

Figure 2 Composition of the panel of experts.

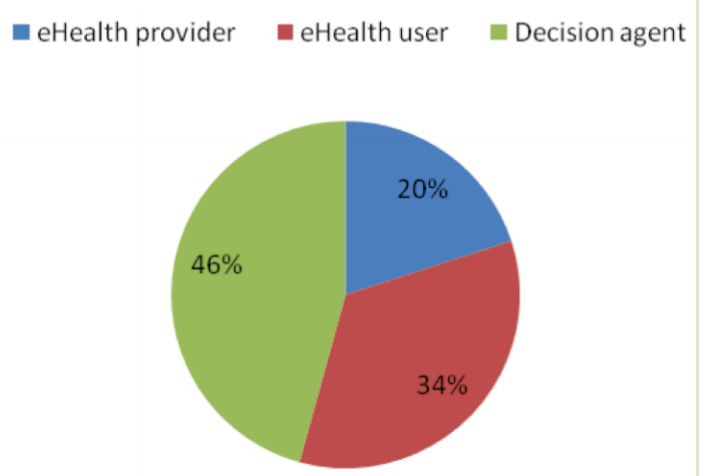
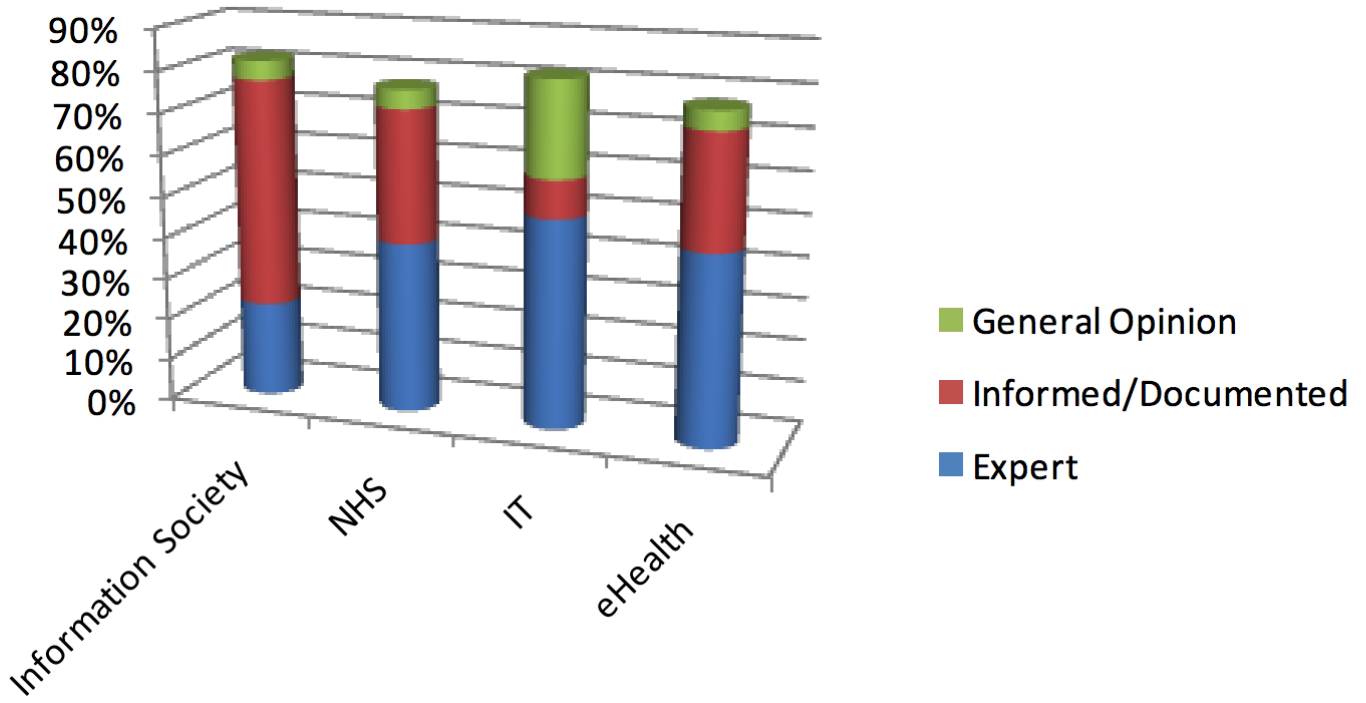


Figure 3 Panel expertise



The panel included the expertise of Healthcare Consultants (eHealth Business, Public Health Medicine, Primary Care and Acute Services), Medical Directors, Clinical Leads for eHealth, eHealth architects, Heads of eHealth (Information Services, ICT, eHealth Strategy and Programme), eHealth continuity specialists, Heads of Learning and Development, eHealth Project Managers, IT Consultants, eHealth researchers and eHealth users.

3 THE INSTRUMENT

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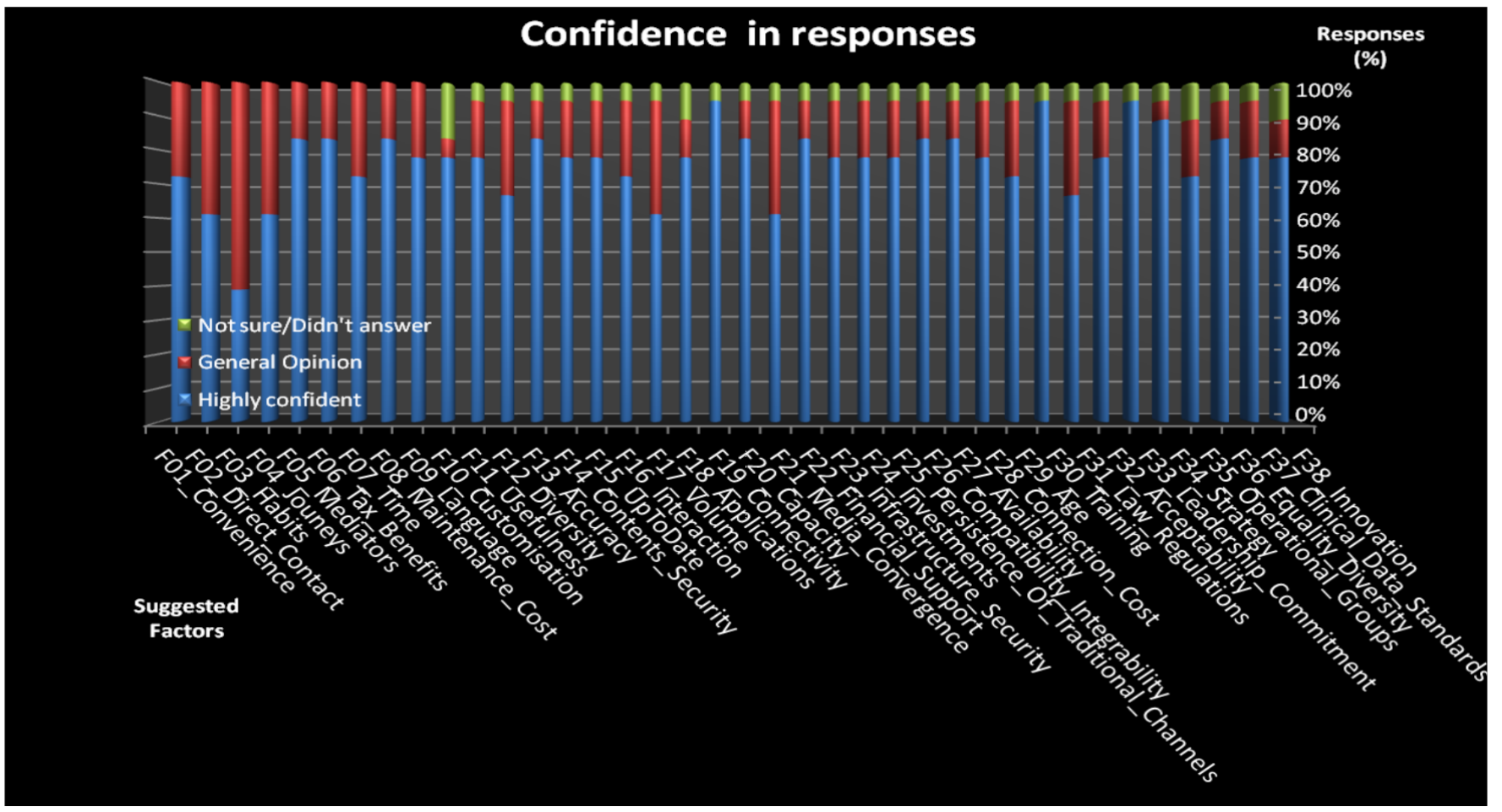
- **General opinion**. It means the panelist has only an opinion but not enough informed or documented
- **Don't answer / don't know**. It means the panelist prefers not giving an opinion about a specific question.

Figure 4 shows the level of confidence of the panel in the accuracy of the responses provided according to their level of expertise in the subject. The level of confidence has been weighted to get a more accurate view of experts' actual confidence on their specific area of expertise: IT, eHealth, Information Society or health service. Expert responses were weighted as 100% whereas general opinions (GO) where downgraded to 25%.

Figure 4 Level of confidence of the panel per factor.



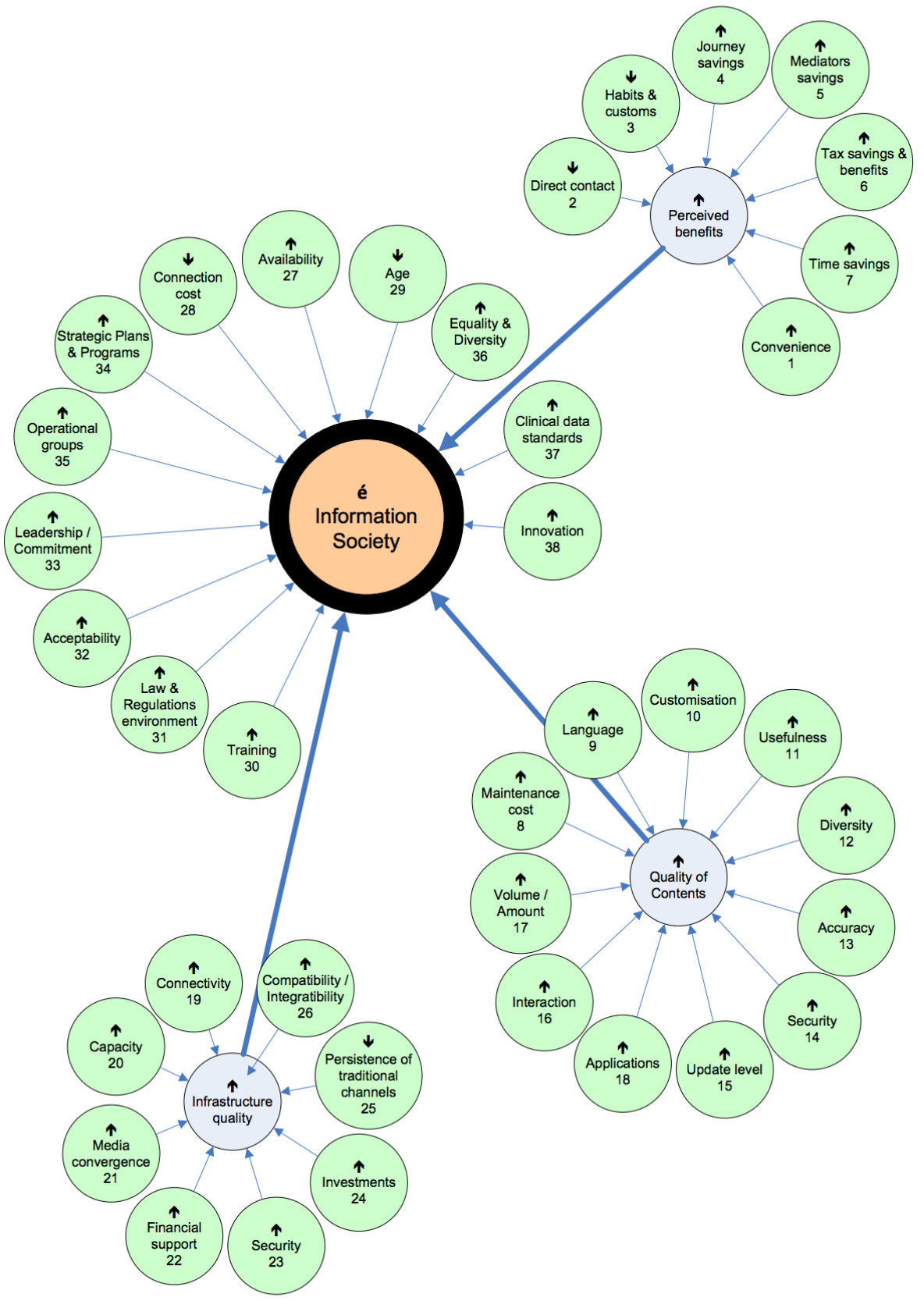
4 ETHICS

This piece of research has been conducted under the ethics protocols and governance frameworks applicable within the healthcare service R&D (Research & Development) activity in Scotland. The study is also compliant with the ethics code of both universities supervising this piece of research. Further information about the application process required by the NHS can be obtained from the National Research Ethics Service website whttp://www.nres.npsa.nhs.uk/applications/.

5 INITIAL CAUSAL MODEL OF FACTORS

Figure 5 illustrates the causal model of factors initially proposed to start the Delphi rounds. This model was subject to validation and adapted according to the panel consensus. Definitions of each variable are presented following the model diagram.

Figure 5 Initial causal model of factors.



5.1 The dependant variable: Adaptation level to the Information Society

The dependant variable (D) on this study is the level of adaptation of an specific healthcare organisation to the Information Society. This variable will increase according to the independent variables behaviour. The organisation under study is the NHS Fife (National Health Service Fife (Scotland, UK).

5.1.1 Conceptual description

In the context of this research, **the Information Society** is visualised as a community that uses extensively and in an optimised way the opportunities offered by information and communication technologies as a media for citizen's personal and professional development (Basque Government 2000).

Adaptation means changing or adjusting something to suit a new situation, environment or circumstances. In this case, the **level of adaptation of a healthcare organisation to the Information Society** is the intensity a healthcare organisation is changing and adjusting the provision and management of health services, in order to suit the demands of this new community called the Information Society.

The stakeholders involved in this process are not only health professionals and patients but any potential user of health services, support staff from other departments than clinical areas and third parties involved in the health service provision.

5.1.2 Measurement

To measure the level of adaptation of a healthcare organisation to the Information Society, there are a proposed number of indicators used by SIBIS, the Statistical Indicators Benchmarking the Information Society (SIBIS Consortium 2003). This project will offer a conceptual and methodological structure to map and benchmark the Information Society development.

SIBIS have developed an entire indicator system, which is very comprehensive, offering selected key indicators by thematic domains to monitor the development of specific areas of the Information Society, for example the eHealth (see eHealth indicators at the bottom of the Table below).

These indicators have been selected because they are supposed to be suitable for monitoring the most important and far-reaching aspects of IS developments and benchmarking in the current EU member states, the US and Switzerland.

5.2 Perceived benefits.

This is an aggregated variable that combines a number of factors involved in the way people perceive how favourable could be for them the changes and adjustments healthcare organisations are doing to improve the way health services are delivered in the Information Society. These new ways of interaction with health services could be more useful or improve their life quality, for example the NHS 24 website allows users to get health care advice without necessarily going to their GP or A&E unless it is necessary. Our hypothesis is that an increased perceived benefit means a greater level of adaptation of NHS Fife to the Information Society. For the purpose of this research we have classified the benefits into seven (7) categories as follows.

5.2.1 Convenience

Our hypothesis is that people will have a better perception of the changes on healthcare services to the Information Society if the adjustments reflect services that become more useful, comfortable, easier, quicker or suitable for them. Any increase in the perceived convenience will be reflected in an increase in the perceived benefit.

Table 1 Selected key indicators. Source: SIBIS WP 6: Indicator handbook.

Thematic Domain	Sub-domain	SIBIS key indicators	Sources of data
1. General access and use			
Internet readiness			
Citizens' Readiness	ICT infrastructures	Table 3.1-1: Degree of broadband technologies take-up	SIBIS GPS, eEurope 2005 indicators
Business Readiness	ICT access availability indicators	Table 3.1-9: Multiple computer network presence within enterprises (Internet, Extranet, Intranet, EDI over IP)	SIBIS DMS
Digital divides			
Basic access divides		Table 3.1-16: Internet use amongst citizens	SIBIS GPS, Eurobarometer, NTIA
2. Factors determining Internet access and use			
Information security			
Malicious acti-vities and their prevention	On-line malicious activities	Table 3.2-1: Security breaches occurred in the organisation	SIBIS DMS
Perceptions as possible access barriers			
Concerns regarding security and privacy		Table 3.2-16: Concerns regarding on-line privacy	SIBIS GPS
Digital literacy, learning and training			
Skill acquisition		Table 3.2-24: Participation in ICT-related training	Eurostat
		Table 3.2-30: Use of e-learning tools for work-related learning	SIBIS GPS
Skill provision		Table 3.2-40: Digital literacy (COQS-Index)	
3. On-line purposes			
E-Commerce			
General e-Commerce indicators		Table 3.3-2: Share of businesses selling on-line	SIBIS DMS
B2B		Table 3.3-9: Share of businesses procuring on-line	
E-Work			
Work Organization	Place of work	Table 3.3-13: Share of home-based teleworkers	SIBIS GPS
		Table 3.3-19: Share of mobile teleworkers	
E-Science			
Readiness for e-Science	Research Networks (RN)	Table 3.3-27: Core usable backbone capacity on a national RN	TERENA
Use of e-Science	Scientists' web presentations	Table 3.3-39: World Wide Web penetration ratio	SIBIS R&D survey
E-Government			
G2C	Usage	Table 3.3-51: Citizen experience of using on-line government services	SIBIS GPS
	Assessment	Table 3.3-53: Citizen preference for on-line government services	
E-Health			
Usage of e-Health		Table 3.3-63: Usage of the Internet by the general public to search for health-related information	SIBIS GPS
		Table 3.3-66: Usage of the Internet by the general public to purchase medications	BISER survey

5.2.2 Direct contact

This variable collects the citizens (Information Society individuals) preferences in terms of a direct contact, for example face to face, with a person who offer a product or services directly or on behalf of a healthcare organisation or related service.

5.2.3 Habits & customs

Some of the habits and customs are not directly related with obtaining tangible benefits like savings of effectiveness but with individual preferences: why does somebody prefer going to their local general practice to discuss results of a blood test rather than accessing the results via web and having an on line discussion with a competent member of a 24hrs healthcare service.

5.2.4 Journey savings

Information Society offer new ways of doing things, mainly using new information and communication technologies (ICT), which enables reductions in travelling time, particularly for things than can be done remotely, for example, finding out preliminary information about healthcare services, treatments, risks, self-assessments, forms that might need to be completed, checking results, verification of treatment changes (i.e. new medication or doses), communication of regular feedback on long term conditions (i.e. diabetes monitoring) etc.

5.2.5 Mediators (intermediaries) savings.

In general, fewer mediators means efficiency for final users, not only in terms of the speed to get the outcome of the service, but reducing the risk of introducing "noise" or misinformation in the communication process more likely in a larger chain of intermediaries and the consequent clinical risks if errors are made.

For example, a single point of information reduces the amount of calls, trips and people the user has contact with. As the NHS 24 aim states it "is designed to help you to get the right care from the right people at the right time", which is a way of providing a service in a more efficient way reducing the amount of calls, trips and contact points to gather information about the right care service a user is looking for.

This variable could be measured in terms of number of intermediaries but also time expend or financial costs associated.

5.2.6 Tax savings and other benefits

Support programs based on tax savings and other benefits because of using ICT, are an incentive to move towards the Information Society. In the case of the financial sector, for example, some discounts obtained for buying financial products or services via the Internet is an incentive to use it. In other EU countries there are tax savings for buying PCs for private use or for business, for implementing new innovative software, etc. This could be finding the source of savings for the equivalent expenditure on eHealth. In any case the factor remains key.

5.2.7 Time savings

Reduced time delivering health services could improve the perceived benefits of the adjustments healthcare organisations are making in order to adapt services to the Information Society population.

5.3 Quality of contents.

"Content" refers not only to data related to healthcare but knowledge, information and services available through ICT (information and related technologies), as a part of the Information Society offering, like electronic patient record, remote accessibility to healthcare information and services or telemedicine contribution between other types of contents.

This content is created to benefit the Information Society consumers according to the value the users give to it: if the content is not suitable the actual quality is considered poor, unsatisfactory and not adequate for the purpose. This variable will measure the level that the content matches user expectations.

This variable aggregates a number of factors that combine different types of user expectations. The categories of expectations that have been considered more relevant are presented below.

5.3.1 Maintenance cost

The majority of the content is perishable. The content needs to be updated continually, otherwise it loses value. To keep it updated requires time, effort and continuous maintenance. It is expected the more content is offered through ICT the higher the maintenance costs.

5.3.2 Language

This variable measures the languages in which the content is offered. This factor can be measure in terms of the number of language (an absolute measure) or relative to the adequation of content to the languages more commonly required in an specific community on the basis that offerings of content in languages that are not required add no value.

5.3.3 Customisation

This variable measures the availability of customisable contents. ICT facilitates the customisation of products and services offered to users and customers. It requires a good understanding of user preferences and needs based on the use they have to do of data, information and related healthcare services.

5.3.4 Usefulness

Contents have to be useful from the user's experience perspective. It is based on the principal of offering what different types of users require, no more no less than what is needed as none of these add value.

5.3.5 Diversity

This variable measures the diversity of content, richness and comprehensiveness. Diversity can be found in different ways, e.g. providing comprehensive information about different healthcare topics, but also variety of services, languages, channels (phone, computer, paper, video/teleconference), format (voice, text, graphical, video, sensorial), aggregated and detailed, static, dynamic or interactive.

5.3.6 Accuracy

This variable is related with the content proximity to the truth or the true value. Some content is less sensible to expire with the progress of time than other types of content. There are challenges regarding associating different pieces of content with the same relevant subject (e.g. identifying and linking different pieces of clinical records with the same individual) that might affect the accuracy of the content.

5.3.7 Security

This variable measures the user's confidence in information and services provided via ICT. Confidentially is an important element of perceived security, but also the perception of the availability, accessibility and accuracy of the contents. The more users can trust healthcare information and services via ICT in terms of confidentiality, availability, accessibility and accuracy, the better satisfaction of their expectations.

5.3.8 Up-to-date level

As mentioned above, most of the contents need to be updated continually to be useful. This variable measures how updated the contents are with the progress of time.

5.3.9 Interaction

Part of this research hypothesis is that interactive contents are more interesting than others, from the user's experience when using ICT for interacting with healthcare organisations and related services. This variable measures how interactive the content is.

5.3.10 Volume

The hypothesis is that there should be enough services and content to satisfy the user needs and expectations. It is like a library without books, how much interest could it have? This variable measures the amount of healthcare content, including services, offered via information and related technologies.

5.3.11 Applications

It means the application of ICT, for example pieces of software for different healthcare services and functions, available and actively used to complete a task that the user wishes to perform when interacting

when the healthcare service. Some examples are directly related with clinical systems in place, for example radiology, laboratory orders, early alerts of clinical risks/conditions, single electronic patient record, healthcare pathways management software but also remote diabetes monitoring systems, TV via IP for inpatients and other patient entertainment innovations.

5.4 Infrastructures quality

An information infrastructure is defined by (Hanseth, 2002) as "a shared, evolving, open, standardized, and heterogeneous installed base" and by (Pironti, 2006) as all of the people, processes, procedures, tools, facilities, and technology which supports the creation, use, transport, storage, and destruction of information. For this research purpose, only issues related with the "installed base" of facilities and technology that support the information life cycle has been considered in this variable, and specifically the aspects mentioned below. The infrastructures quality is an aggregated variable that combines the factors explain below and measures the level the ICT infrastructure is available to provide healthcare services to meet the expectations of the Information Society citizens.

5.4.1 Connectivity

This variable measures the level of available connections to the network and the Internet in the area of influence of a specific healthcare organisation.

5.4.2 Capacity

This variable is expected to measure the capability of the ICT infrastructure to carry information and provide eHealth services. The greater the capacity (e.g. bandwidth, storage, CPU/processing), the greater the infrastructure potential.

5.4.3 Media convergence

The possibility to access the Information Society through a variety of channels, media or tools promotes technology integration in all socio-economic groups. This variable includes, for example, the convergence of clinical systems based on ICT with Internet and web based services and/or TV interactive options or mobile telecommunications in order to offer an specific integrated healthcare service or piece of information.

5.4.4 Financial support

This variable measures the financial support directly related with using, developing, implementing or improving the eHealth related infrastructure not only within an specific healthcare organisation but the infrastructure require by citizens that need to interact with it.

5.4.5 Infrastructure security

A high percentage of the European population consider that the Internet is not safe enough for transactions and communications. These concerns are related with both contents and infrastructure security. This variable measures the users' trust in the infrastructure security.

5.4.6 Investments

This factor reflects private and public investments to improve and support the ICT infrastructure. This is complementary to financial support, since the "Investments" factor involves the organisation or citizens own financial contributions whilst the "financial support" variable involves external contributions.

5.4.7 Compatibility / Integrability

This variable measures the volume of ICT components integrated or compatible with the rest of the ICT infrastructure. "Integrated" means that an ICT component, directly or via software and/or architectural principles of computer systems, fits into the enterprise applications infrastructure. "Compatible" means that an ICT component can co-exist with the rest of the infrastructure because it complies with the standards.

5.4.8 Connection cost

Necessary investments in equipment and communications (e.g. network connections) are considered as a limiter by an important part of the European population at the present time. This variable includes citizen connection cost and eHealth services connection cost.

5.5 Availability

Modern societies appreciate high availability (24x7x365) services, such as financial, leisure and health. This variable measures the volume of eHealth services available 24x7x365.

5.6 Persistence of traditional channels

There is a fear that using virtual channels could be a threat to the continuity of traditional businesses, services or channels. From the users' point of view, the persistence of traditional channels allows users to make a choice about accessing the service through either traditional or eHealth channels. This variable measures the amount of health services that can be accessed in both ways: via traditional channels and through eHealth services.

5.7 Age

Young people are the easiest to adapt to technological changes. This variable measures the number of users by age groups using and providing eHealth services.

5.8 Training

Knowledge can reduce the resistance to change and improve confidence in new ways to access health services and information. This variable measures the amount of training provided, it could be measured in terms of training budget, amount of training initiatives or number of trained users or citizens.

5.9 Law & regulations environment

This variable measures the number of different matters, regulated via law and other international, EU or local regulations, related with eHealth services.

5.10 Acceptability

It means how acceptable eHealth services are to healthcare professionals and Information Society citizens.

5.11 Leadership / commitment

An effective eHealth implementation requires vision, commitment and leadership at the highest levels. This variable measure the existence of organisational structures leading the process towards the eHealth services in a healthcare organisation representing all sides: clinical, ICT, the healthcare organisation and the citizens.

5.12 Strategic plans and programs

This variable is very close to the variable defined above, but this one measure the amount of strategic actions and programmes related with the eHealth services.

5.13 Operational groups

This variable measure the existence of groups implementing the eHealth & ICT strategies.

5.14 Equality & diversity

Equity & Diversity is an underpinning principle in information for patients, hence we must ensure that patients and their carers have various 'channels' through which they can obtain health advice.

5.15 Clinical data standards

As expressed in the NHS Scotland eHealth/ IM&T Strategy 2004-2008 that "NHS Fife need well-defined and agreed core data standards and datasets to underpin the key clinical systems that contribute to the Integrated Care Record. These will be developed to achieve compatibility between clinical datasets for individual specialties such that information common to the datasets will, where possible, be collected once and where appropriate be re-used. The NHS will align wherever possible with other UK developments and to SNOMED[1] Clinical Terms as the strategic standard. Patients should not have to supply information repeatedly."

Healthcare organisations also need agreed datasets for the collection and maintenance of local service provider information, to underpin the delivery of comprehensive patient information services.

According with it, this variable measures the level of alignment of a healthcare organisation with other local or National developments and to SNOMED Clinical Terms.

5.16 Innovation

This variable measures the innovative use of eHealth resources, including ICT services, to support better working practices and health improvement.

6 RESULTS

6.1 Model acceptance

The level of responses shows the model has been highly accepted (Figure 6). None of the factors were rejected due to a lack of influence in the model, but because one or more factors were aggregated or because the impact of the factor compared with other variables was considered almost negligible.

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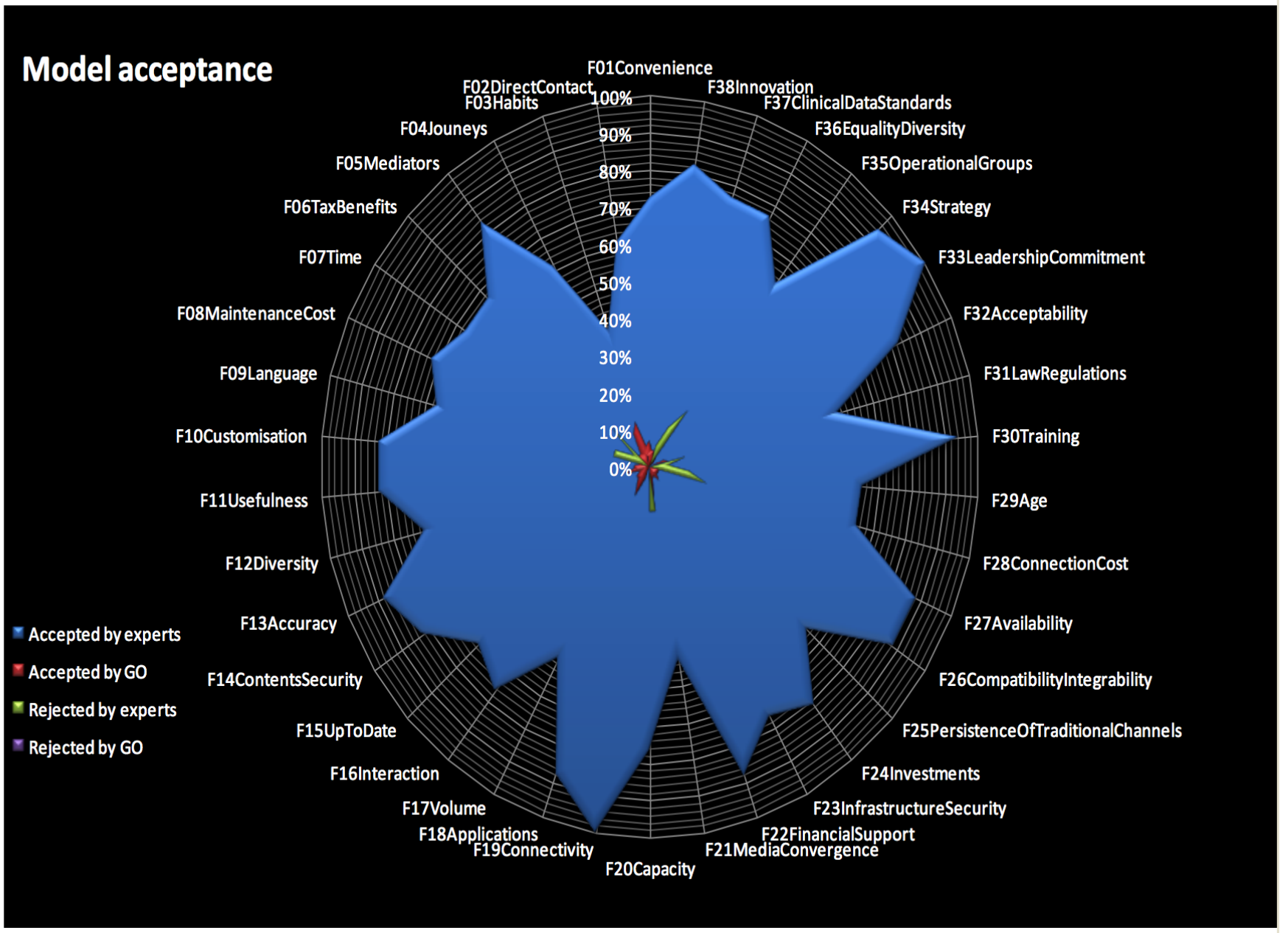
[1] ***SNOMED*** *(**S**ystematized **No**menclature of **Med**icine -- **C**linical **T**erms)*

Figure 6 Model acceptance



The outcome of the model is consistent with the indicators proposed by the EU to benchmark the Information Society (SIBIS Consortium 2003). It is also consistent with other studies as the initial model comes from a robust literature review (Beratarbide 2008) as explained in the antecedents.

Most of the comments and rejected factors were related with overlaps between factors that suggested grouping them in more meaningful variables, sometimes modifying slightly the scope of the initial factor in order to accommodate related and close variables.

6.2 Controversial factors

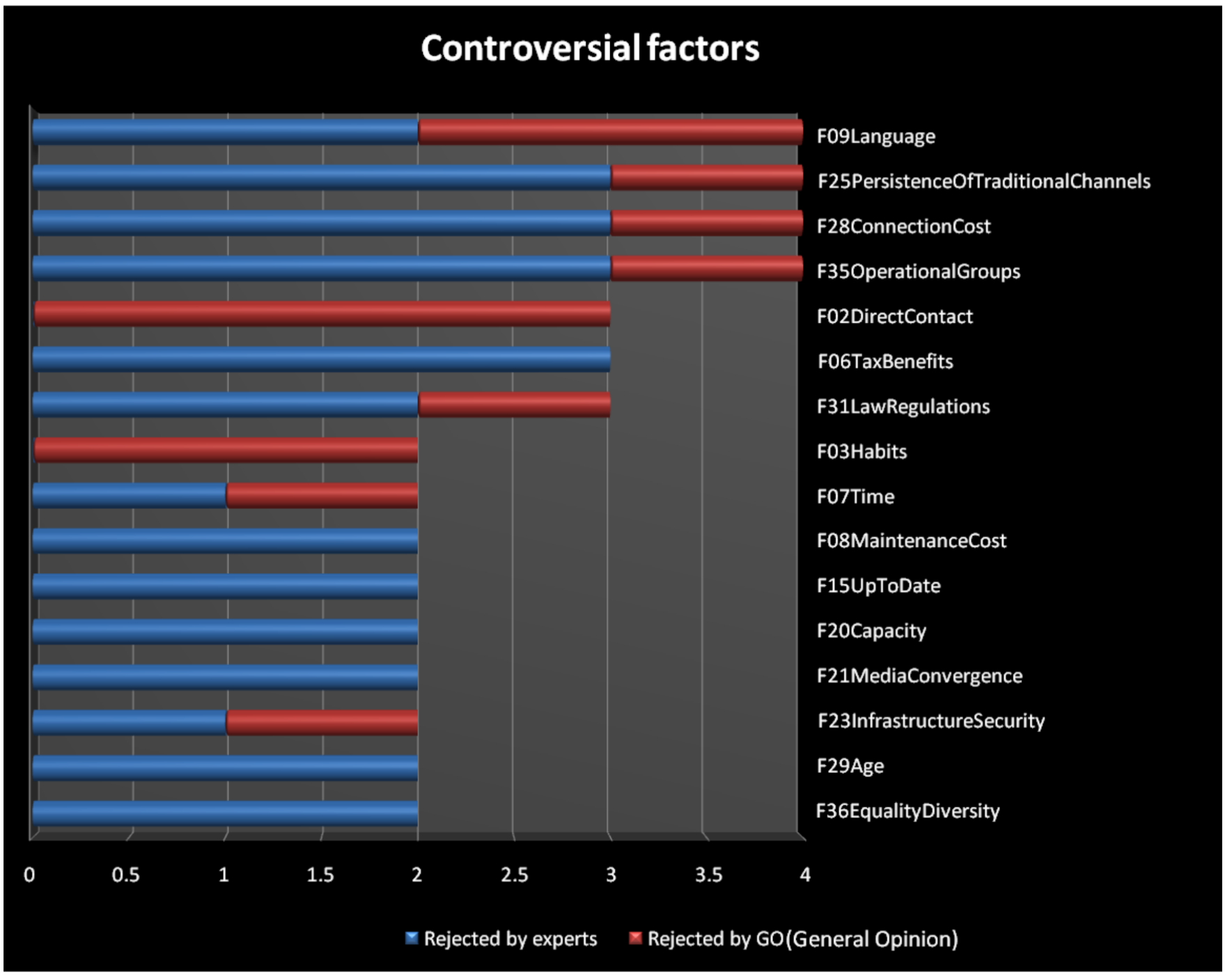
Some factors were controversial as shown in Figure 7; the reasons for debate are explained subsequently.

Language was controversial because while clearly this factor refers to the number of non-English speakers treated within the health service in Scotland, which according to the demographics is so vanishingly small so it should be considered not significant at the present time. However the health service within the EU has to allow accessibility to non-English speakers and can be predictable this factor influence might change with globalization effect. On the other hand, special consideration should have from the investments decisions point of view; when there is a finite budget then the more that is spent on translations and means less available for information services and patient care in general. In any case is a factor that within the area under study it is considered it has a negligible effect due to current demographics but it might change in the future.

Persistence of traditional channels was controversial. The reality shows that despite of investments in automated systems that actually work, areas of health care continue using traditional channels for different reasons: genuine or perceive security, preference, trust in technology, etc. Areas like laboratories at hospitals still send results to GPs on paper although there is enough technology in place to replace this. On the other hand, as health services are within the area of study are under pressures to make efficiency savings and get

face of an effective IS option that works better. The mere persistence of traditional channels will reduce the move to the IS depending on the outcomes for users.

Figure 7 Controversial factors.



Connection costs. Infrastructure dependency is well understood in healthcare so a large proportion of connection costs is borne centrally hence having a complex to measure effect. Individual connections are increasingly charged and paid for as a cost of connection independent of the data actually carried and hence it is an effect difficult to measure. Connection cost should include not only the obvious as broadband but also devices or training; all costs involved in effectively connect. On the other hand, the majority of the population appreciates the cheaper connection costs compared with the situation years ago. Connectivity, as any other utility, is subject to competition, and in the current climate it is not likely to have increments in fares but the overall connectivity cost might increase due to extensive usage and also due to the effect of new technologies coming up continually and changing the infrastructures required to get a better service; it's a cycle that also has cost implications, not only the ongoing cost of broadband consumptions.

Operational groups. It is related with the eHealth governance structure and the relationship between groups to deliver eHealth, the programme, projects, "implementators" and final users. Operational groups must exist to deliver the strategy y groups with the skills sets to deliver the strategy with leadership and commitment; dependency here will rest on change and quality of the people who need to deliver on the multiple levels of eHealth. Operational groups have to be closer to general health service developments in particular areas to manage needs and requirements of users and ensuring smooth transitions from old to newer ways of doing things.

Direct Contact. Although it was accepted, the sense of the relation with the dependant variable in the model was controversial. There is not clear picture about what is the actual relationship, if this is matching or opposite.

There is specific evidence in patient care were alternatives were put in place that didn't work because patients prefer direct contact with health carers. There are cases like VC-based consultations and also a piece of research regarding the introduction of a new type of leg ulcer dressing in the community. Previously the generally old patients got a daily and lengthy visit at home from the community nurse. The new dressing meant one quick visit and again a fortnight later. Some patients however had damage to their ulcers, preventing healing. Turned out this was because the patients did the damage themselves; they enjoyed having the nurse come in every day and wanted to go back to that.

In general there is agreement regarding the tendency for people to want to speak or have contact with a real person may tend to mitigate against the information society, however, this effect in itself may be influenced by the way the Information Society is taken forward. For example ICT can be used to ensure the patient speaks or even video link to a real person on the phone who knows the situation, and sorts the problem out efficiently, even though they are not in a local office near to each other. In other words it would also depend on how things are done. The future may hold new ways of doing things that would get over the initial proposed direction, by producing a better outcome for people.

From a different perspective, **Direct Contact** might not be person to person, but person to group, or group to person, this in effect enables multi-disciplinary care to be used in the eHealth context of a mature information society. The assumption here is that patients can take more responsibility for their own care reducing the need for hospitalization and therefore direct contact with the health service, hence the relation with the dependant variable of the model (Information Society progress) will be opposite rather than matching as initially proposed.

It has to do also with population habits and customs and the age of the targeted collective. **Direct Contact** is a matter of a preference but also is a habit or custom.

In the same way, the factor "**Mediators**" was accepted but the sense of the relation is questionable. Initiatives like NHS24 and NHS Direct have failed delivering the benefits expected. As the number of mediators falls, the expertise they individually have is increasingly challenged and while theoretically patients can be better targeted to point of care this is not happening reliably. Fewer mediators is only a benefit if they are suitably skilled and resourced to provide accurate service.

Another controversial factor is "**Tax saving and other benefits**". The argument is that support programs based on tax savings and other benefits, because of using ICT, are an incentive to move towards the Information Society. In the case of the financial sector, for example, some discounts obtained for buying financial products or services via the Internet is an incentive to use it. In several EU countries there are tax savings or discounts for buying PCs for home or for business purposes, for implementing new innovative software, etc. But if the rationale is the greater the savings on taxes or other equivalent benefits the greater the impact for IS in NHS Fife, it requires a note of caution; there are few examples where investment in eHealth have proven to have reduced cost or tax. On the contrary most governments spend between 2-5% of GDP on eHealth because this is accepted basis service; however there is no clear savings accrued. The test could be finding the source of savings for the equivalent expenditure on eHealth. In any case the factor remains key.

Habits and customs. This should be inclusive of culture; the acceptance will be variable based upon degree of cultural acceptance, previous 'good experience' and the like, and nature of demand. There is a marked difference between a service that can provide information about a condition such as diabetic ulceration, but this information service will be unable to 'change a dressing' for this ulceration - so the limitations are set and should be key in developing future habits and customs for the Information Society.

6.3 Groups of variables.

For the purpose of the model some variables were grouped by "families" or matters. When measuring variables and correlating the results not necessarily the variables can be mathematically group without a detailed analysis as some variables could have almost a null effect if the rest of factors in the same "family" have considerable higher values.

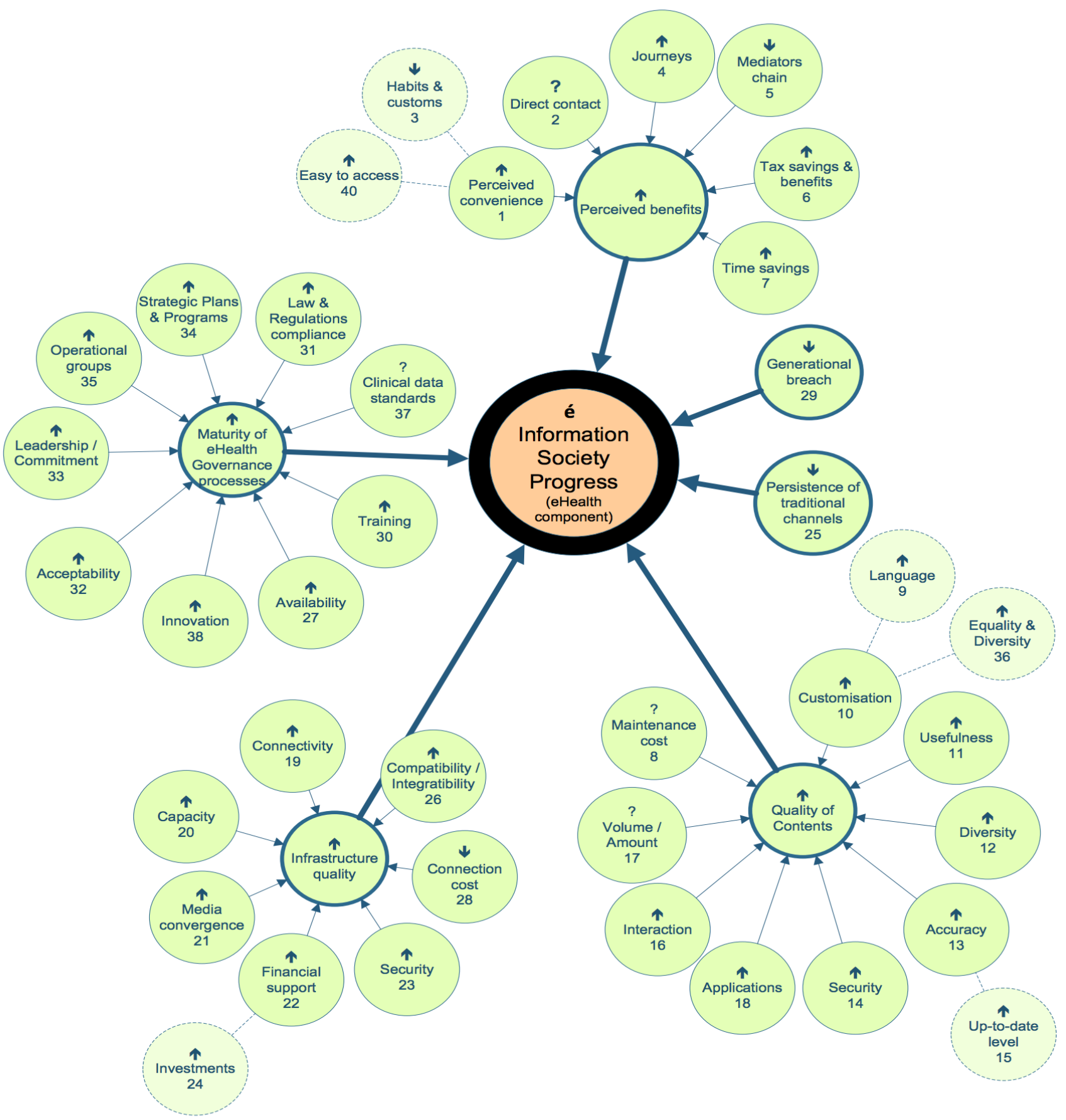
These groups are then proposed only to simplify the model but future mathematical application wil require further analysis.

Apart from the initially suggested groups (Perceived benefits, Quality of contents and Infrastructur quality) the following groups were included:

eHealth Governance, which includes all the factors related with the structures, processes, strategies an decision making related with eHealth. Variables like Strategic plans and programmes (F34), operationa groups (F35), Leadership and commitment (F33), Law and Regulations environment (F31), Acceptabilit (F32), Training (F30), Availability (F27), Clinical data Standards (F37), Security (F14) were included unde this group.

7 PROPOSED MODEL

Figure 8 Causal model after Delphi (final)



8 CONCLUSION

Although the model was accepted and seems to reflect the main aspects in the adaptation of eHealth to the Information Society, a number of variables cause controversy around the sense of the relationship, therefore further research is required to understand the dynamics behind this factor in order to take appropriate decision on eHealth.

This model is a clarifying contribution to the main aspects influencing this adaptation process, and is limited to the experience within a specific NHS Board in Scotland. Nevertheless, the reviewed literature supports the applicability of the model not only to other geographical areas but to other sectors; most of the factors are commonly referenced in research related with the Information Society in the public and private sectors.

This paper covers the main aspects, and participants' comments highlighted controversial factors, which were accepted even though the direction of the relationship was not clear. Future research will clarify these aspects.

This model will support further research work, some of them already started. An eHealth Demonstrator project was initiated in Scotland to measure the impact of eHealth Governance-related factors; the study was concluded in terms of the evaluation of the experiences of 3 NHS Boards across Scotland with different levels of eHealth Governance maturity. This piece of research is already supporting the correlation of the eHealth Governance family of factors with the perceived alignment of eHealth and the healthcare business; the study is not concluded but partial results are already available.

This model is consistent with other models available, for example the one proposed by the European Commission with the collection of SIBIS indicators, but there are other models that are referred to in this paper (SIBIS Consortium 2003).

ACKNOWLEDGEMENT

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8.4 Appendix 2: IADIS – EH 2010. Critical factors in the adaptation of NHS to the Information Society in Fife, Scotland: a multi case analysis of the eHealth Governance factor

CRITICAL FACTORS IN THE ADAPTATION OF NHS TO THE INFORMATION SOCIETY IN FIFE, SCOTLAND: A MULTI CASE ANALYSIS OF THE EHEALTH GOVERNANCE FACTOR

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ABSTRACT

Exploratory and explanatory work covering a longitudinal analysis of IT/eHealth Governance implementation as a critical factor to adapt eHealth to the information society in Scotland, with the purpose to optimize eHealth Governance decisions about a broad range of issues and opportunities that information and related technologies offer to healthcare professionals, patients, relatives and carers; in other words, citizens interacting with healthcare services in the Information Society (IS) age. The study is based on the outcome of a previous descriptive piece of work of the subject which involved an exhaustive bibliography review and a Delphi approach, to develop a proposed causal model of determinant factors involved in the national health services adaptation process to the IS. The study doesn't exhaust the understanding of the causal model, and opens opportunities for future research works to measure other identified variables in the model, so as to understand their behavior, and to develop future analysis to integrate studied factors in a unified model. The outcome of this piece of research will provide new knowledge about the actual impact of eHealth Governance on the Information Society progress, a proposed methodology to continue with a longitudinal analysis, and the incorporation of the experiences of other NHS Boards. We also give recommendations that support the successful implementation of the eHealth Governance model across NHS Scotland.

KEYWORDS

e-Health, Information Society, eHealth Governance, IT Governance, Telehealth, Telemedicine.

1. INTRODUCTION

1.1 Nature of the Problem

Health services across the UK, are making important investments and efforts to deliver the eHealth strategy, which involves more than an internal set of transformations oriented towards the implementation of an integrated care record jointly managed by patients and healthcare professionals, with embedded data security and confidentiality consented by the patient. eHealth also involves the development, innovative application and tangible implementation of information and related technologies across the healthcare service, wherever it's needed, to improve effectiveness of the healthcare for better health. It includes the use of telemedicine and clinical systems used for diagnosis and care pathways, but also policies and protocols that assure the confidentiality and security of sensitive data. eHealth involves "the provision of information, education and services to consumers, including patients and citizens" (Pagliari 2005).

The term "eHealth" conveys the need to address a broader agenda than what is implied by the term IT. eHealth encompasses much more than the deployment of computer technology. It suggests information and related technologies and governance processes in support of health and stimulates thought and discussion about the broad range of issues and opportunities that technology offers in the health care setting to both healthcare professionals and patients. This wider picture of eHealth, with boundaries above the healthcare institutions, involving patients that are also citizens, is the foundation of this piece of research. eHealth requires a transformation of the way citizens (patients, potential patients or carers) and healthcare services

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interact (Castells 2005)in other words, eHealth it is an initiative towards the Information and Knowledge Society assimilation.

1.2 Purpose

This work intends to optimize eHealth Governance decisions about a broad range of issues and opportunities that information and related technologies offer to healthcare professionals, patients, relatives and carers; in other words, citizens interacting with healthcare services in the Information Society age by providing new knowledge about the actual impact of eHealth Governance on Information Society progress, also proposing a methodology to continue with a longitudinal analysis and incorporating other health service boards experiences and setting recommendations to support the successful implementation of the eHealth Governance model across NHS Scotland.

1.3 Antecedents

This research is based on a previous work conducted since 2005 based on a literature review (Beratarbide 2008)and a Delphi exercise (Beratarbide 2010)to validate its applicability within the national health care service in Scotland. The proposed model also suggests the expected direction of the relationship between independent factors and the dependant variable: the progress of the IS within the areas under study in Scotland.

To simplify the analysis some variables were grouped in families of factors based on their proximity or relation with specific topics of interest. All the factors are fully explained in these preliminary pieces of work.

1.4 Research Questions

e-Health services are changing as the NHS is demanding more aligned information and related technologies services.

Some NHS boards are implementing IT Governance as it seems to be the answer for ensuring a better alignment between NHS business (health care) and eHealth (delivery of health care in line with the Information Society demands), but **How are NHS boards implementing IT Governance? RQ1 (Primary)**; this question summarizes a variety of concerns regarding how this process is happening, including What are the drivers in each case? How are IT Governance projects approached? Which resources and structures are involved? How long is taking the improvement process? What's the effort involved? What benefits are identified? Is it possible to identify an implementation pattern? What are the lessons learned?

A secondary question leading this research is **What is the relationship between IT Governance and the evolution of the IS from the eHealth perspective? RQ2 (Secondary)** It implies the comparison of the progress of IT Governance implementation initiatives, including indicators of maturity if available and the indicators of the IS developed by the EU observatory (eHealth subset).

2. RESEARCH DESIGN

As mentioned before, the nature of this piece of research is exploratory and can be classified as applied research using a multi-case study approach.

2.1 Bibliography Review

The subject has been already drafted and a preliminary bibliography review was conducted and presented in previous research work (Beratarbide 2008). Documentation was stored, coded and manipulated with automated tools for qualitative research (QSR International 2007).

The main areas to be considered from the ontological point of view are those relating to the subject of this research (eHealth, Information Society, IT Governance, National Health Services) and others relating to

tools, techniques, methods and methodologies involved: case studies, applied research, Business/IT alignment assessment, Information Society evolution indicators, IT Governance and related standards and frameworks.

2.2 Case Studies

Although case studies have been criticized within the research community, it has been considered to be a valid method of research and adequate for this particular study. Case studies are widely used in empiric research within business organization studies. As shown in the analysis of research strategies in business organization (Grunow 1995, 93-103), over 50% of the 204 organizational studies reviewed were based on case studies.

Case studies are also a common approach in the Information Technologies area (Benbasat, Goldstein, and Mead 1987, 369-386) as it is particularly suitable for developing new theories based on new knowledge captured by exploration of practitioners' experiences. At the present time there are multiple references available to the adequacy of case studies to develop theories, particularly in explicative studies (Bonache 1999, 123-140). Several authors and researches suggest the convenience of case studies for situations of change because are particularly focused on responding to "how" and "why" research questions like Van de Ven (Van de Ven, Andrew H. and Huber 1990). In essence, IT Governance implementation projects are based on change management approaches to move organization towards higher levels of maturity. Case studies, if conducted appropriately, can contribute positively to the development of rigorous theoretical perspective regarding business organizations (Bonache 1999, 123-140).

As a multi-case study the relevance of the cases selected has been taken into consideration. As the purpose of this research is the provision of knowledge and understanding of the way different types of NHS boards implement IT Governance, in order to develop recommendations for the implementation across Scotland, it implies that cases representative of different kinds of organizations is required. The three regional NHS boards under consideration have relevant similarities and differences that justify their selection as they allow the generalization at NHS level but ensuring internal validity on this piece of research. The criteria applied were:

- Sector/industry similarity: This study is focused on the health care sector, particularly the National Health Service
- Cultural/geographical similarities: all cases must be based in Scotland
- Scope of business services: NHS Boards in order to allow generalization as all boards provide similar services
- Organization size: different sizes (small, medium and big)
- Maturity: different starting levels of IT Governance maturity according to the CobIT maturity model.

To develop each case study, specific methods and techniques will be applied as required for better gathering of different kinds of qualitative and quantitative data, including but not restricted to:

- **Data available in the eHealth Demonstrator Project Files** (Datasec and NHS Fife 2009) **(secondary data).** The eHealth demonstrator project promoted, analyzed and demonstrated the achievements and experiences of 3 healthcare boards applying well-known IT Governance frameworks like COBIT (IT Governance Institute 2007, 196). Files include documentation related with service structure and management, audit and internal reports, performance management data (i.e. eHealth Governance). Also included were the outcomes of semi structured interviews conducted, meetings and workshops with key staff involved in IT (eHealth) Governance processes. Finally, these files contain the valuable information about the IT/Business alignment evaluation conducted as part of the project. As part of this piece of research, the methods applied during the Demonstrator Project were critically analyzed to ensure the data gathered is useful for research purposes (quality of data). The approach and instruments used are the same applied previously by Demon in the assessment of 25 Fortune 500 firms (Luftman 2000). The Evaluation Team is composed by business and IT executives and other consultants and experts involved in the implementation of the Demonstrator project.
- **Data available in public databases (Secondary data).** Statistical databases review in order to collect relevant data about the Information Society evolution, particularly from the eHealth perspective (i.e. SIBIS GPS, BISERS RPS or EUROSTAT). In the event of indicator having no relevant information

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available, we consider the collection of this data according to the SIBIS handbook and questionnaires (SIBIS Consortium 2003).

- **SAM & Governance Maturity Survey (Primary data).** In order make a longitudinal analysis of the progress of eHealth Governance, the survey that was applied as part of the eHealth demonstrator project has to be re-applied on an annual basis. Participants will be stakeholders, decision makers and people delivering eHealth across the Boards participating as indicated in the case studies selected. The principal inclusion criterion is adults within the NHS boards involved in the study who have expectations around the eHealth Programme, are eHealth decision agents or are involved in delivering the eHealth strategy at the NHS, specifically a) Executive Boards, which we understand represent the eHealth stakeholders and groups within the NHS with relevant expectations and b) eHealth strategy delivery team, including staff supporting IT, Information Services and the eHealth programme. The main exclusion criteria are people not involve in the eHealth strategy (because they are neither decision agents nor part of the delivery team at the NHS), and people covered by the AWI (Adults With Impairment) [Scotland] Act (Scottish Court 2000).

2.3 Ethics

This piece of research has been conducted under the ethics protocols and governance frameworks applicable within the healthcare service R&D (Research & Development) activity in Scotland. The study is also compliant with the ethics code of both universities supervising this piece of research.

3. CONCLUSION

The feasibility of this research was demonstrated in the antecedent studies. Cases are now being drafted, and the longitudinal survey is being conducted. The next stage of the project will be the analysis of the data obtained. However, this dataset will not be sufficient in itself: data from the SIBIS indicators (which is National) has also to be adapted for the local cases.

The outcome of this piece of research can be used to optimize decisions on eHealth Governance to improve IT-Healthcare Business alignment by understanding better how other Healthcare organizations are doing it, lessons learned and contributing to realistic approaches to deliver better aligned eHealth by:

- understanding others experiences regarding expected achievements and eHealth delivery dimensions like time, resources, triggers, facilitators and constraints
- providing new knowledge about the actual impact of eHealth Governance on the Information Society progress
- proposing a methodology to continue with a longitudinal analysis and incorporating the experiences of other health service boards
- setting recommendations to support the successful implementation of the eHealth Governance model across NHS Scotland.

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8.5 Appendix 3: eHealth Governance, A Key Factor for Better Health Care: Implementation of IT Governance to Ensure Better care through Better eHealth.

"Ethical Issues and Security Monitoring Trends in Global Healthcare: Technological Advancements"

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Implementing eHealth Governance

Chapter 6
eHealth Governance, a key factor for better health care

Implementation of IT Governance to ensure better care through better eHealth

E. Beratarbide and T. Kelsey

Edited by
Steven A. Brown and
Mary Brown

Capella University, USA

Published by IGI Global

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Elena Beratarbide
Information Engineer, CISA

"Elena helped me in implementing the business plan for IT consulting and logical security projects in all spheres of the General Administration of the Spanish State." July 12, 2009

M. Timoteo, Account Manager, Fujitsu Services Spain

Elena Beratarbide (born 1969, San Sebastián, Spain) is an eHealth researcher and a senior IT Service Manager at the NHS (National Health Service) in Fife, Scotland. Her twenty-two year career with Touché&Ross (now **Deloitte**), KPMG and Fujitsu prior to her appointment at the NHS Fife included senior Business and IT consulting, Information Systems, Software design and development and teaching, receiving **Excellence Awards** on several occasions for her professional input (2002-2005 Fujitsu).

She's playing a role transforming the NHS Fife IT support service in line with eHealth Governance best practices and, as a researcher, contributing with new knowledge and understanding of how eHealth Governance is happening across the health care organisations in Scotland and making relevant **recommendations to the Scottish Executive (2009).** Her research activity during the last 4 years on this area, has been conducted in collaboration, St. Andrews University, Polytechnical University of Valencia and the NHS in Scotland.

Beratarbide developed her carrier from a multidisciplinary approach, combining her qualifications as ***Information Engineer***, business management (**processes, methods and logistics**), Computer science (physical systems) and Certified Information Systems Auditor (CISA).

She is best known for her contribution to the **integration of new technologies within public and private organisations**, producing **strategic plans** to help **local government** adapting to **the information society**, using technology to get government and citizens closer, but also implementing and **optimising ICT** and **auditing systems** not only within the public sector but also private organisations in a variety of industry sectors in different countries.

Since 1988 when she initially published ***"Integrated Systems"*** (Venezuela), Beratarbide developed a variety of resources supporting training on both IT and business managements areas like ***"Information Quality Assessment: A Methodology for External Financial Auditors" (Venezuela, 1991), "Business management for young entrepreneurs"*** (Spain, 1995), a series of training notebooks on ***"Excel: a financial analysis approach"*** (1997), ***"Office automation"*** (2001), ***"LAN/WAN networks"*** (2001). After this stage Beratarbide started publishing more senior work in collaboration with other authors, Vicente Delás (***"IT strategies for local government"***, Spain, 2001), Pablo Borges (***"IT Governance implementation in the health sector: NHS case studies"***, Scotland, 2009) and Tom Kelsey (***"IT Governance - a key enabler of better eHealth better care"***, Massachusetts, 2009-2010).

Previous work in IT and eHealth Governance involves also her ***"Causal model of factors involved in the adaptation of NHS to the Information Society"*** (Spain, 2008) and a reviewed version after a ***model localisation through a Delphi exercise*** (Highest Standard Research Paper Award – IADIS Germany 2010) and recently a ***"Multi-case analysis of the eHealth Governance factor"*** (Germany, 2010).

Beratarbide is now preparing her next publication along with Tom Kelsey (St. Andrews University) on a ***longitudinal analysis of eHealth Governance within the NHS in Scotland*** and a ***cross-sectoral and cross-national comparison of eHealth Governance*** (Springer, 2011) coordinated by Middlesex University, UK.

Beratarbide presented her contribution on IT and eHealth Governance in conferences like ITSMF UK, NHSScotland, AXIOS and IADIS.

"Tom is a leading world expert in medical and biomedical research. His results have not only increased our awareness of important aspects of human fertility, but also stimulated important research projects across the globe." July 18, 2010

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Kelsey started his career in Logistics Management, involved in sourcing, deploying and evaluating Resource Planning systems for multinational corporations such as North American Philips, Acatos & Hutcheson plc and SA Uniconfis. Having a Bachelors Degree in Mathematics from Heriot-Watt University, Edinburgh, Kelsey returned to academia in 1995 to take a Masters Degree in Numerical Analysis & Programming at the University of Dundee, followed by a PhD in Computational Mathematics at the University of St Andrews, graduating in 2000. Kelsey then obtained funding for postdoctoral research at St Andrews into formalised computer algebra in conjunction with NAG Ltd., followed by a postdoctoral research position studying symmetry-breaking methods in Constraint Satisfaction Problems (an NP-hard class of problems – such as planning, scheduling and resource allocation - that often arise in industrial and commercial settings). After a year working as a Teaching Fellow, Kelsey was promoted to Senior Research Fellow and given University funds to undertake further studies into Constraint Satisfaction and Bio-medical Modelling. In 2006 Kelsey was appointed to a tenured position at the University of St Andrews, as part of a £1.3 million grant from the UK Engineering & Physical Sciences Research Council (EPSRC) covering interdisciplinary research into Computational Mathematics. Kelsey is currently a co-investigator on a further EPSRC award into modelling and abstraction themes in Constraints research, and is an active member of the prestigious Centre for Interdisciplinary Research in Computational Algebra (CIRCA) based in the schools of Mathematics and Computer Science at the University of St Andrews.

In addition to his University work, Kelsey is Technical Director of the Wallace-Kelsey Research Foundation, a charitable trust that funds investigations into the fertility of survivors of childhood cancer. Kelsey is a member of the International Society for Computational Biology (ISCB), the British Machine Vision Association, and the Royal Society of Medicine. He is on the executive board of the NHS Scotland Managed Clinical Network governing paediatric oncology in Scotland.

Kelsey has published extensively in high-impact journals such as Public Library of Science One; Human Reproduction; The International Journal of Radiation Biology, Oncology & Physics; and Reproductive Biomedicine Online. His work relating ovarian volume to human age at menopause, his calculation of the Effective Sterilising Dose of radiation for human females, and his publication of the first model of human ovarian reserve from conception to the menopause have led to extensive international media interest, with news reports on the BBC, NBC, Fox, CNN, etc. And news articles and features in the Times, the Scientific American, the Wall St Journal, Nature News Update, Le Monde, El Pais, etc. Kelsey is currently working with researchers from Glasgow, Edinburgh and Montevideo on studies that link the Wallace-Kelsey model of ovarian reserve to other reproductive indicators such as serum Anti-Muellerian Hormone (AMH) levels, ovarian volumes, and numbers of eggs harvested during in-vitro fertilisation cycles.

Kelsey has given invited talks at major international conferences, symposia and meetings. Recent examples include talks at the Asian Symposium on Computer Mathematics in December 2009, and the ISCB Latin America meeting in March 2010. Kelsey will be a keynote speaker at the Reproductive Function and Dysfunction conference being held in September 2011 (the XVth International Development and Function of Reproductive Organs conference series).

eHealth Governance, a key factor for better health care

Implementation of IT Governance to ensure better care through better eHealth

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National Health Service, Scotland
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Abstract

In this chapter we develop a set of recommendations for aligning eHealth with healthcare strategies. After introducing the key concepts we describe and discuss IT governance as a key enabler of successful alignment. We present outcomes from a study conducted in Scotland, and compare & contrast our preliminary results with those from similar studies in other countries. This analysis forms the basis of our set of recommendations, the most important of which are (a) to employ a well-known and well-developed IT governance standard, (b) to ensure that the healthcare organisation has a high level of readiness for the transformation towards strategic alignment, and (c) to utilize experts to direct and monitor both the organisational change and the eHealth alignment.

We want to stress the results presented in relation to perceived eHealth-NHS alignment are preliminary, even though we don't expect to obtain significant deviations compared with the results presented in advance on this chapter.

Keywords

eHealth, IT Governance, Telehealth, Telemedicine, IT Management, Health Informatics, IT/Business alignment, National Health Service, Information Society

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INTRODUCTION

The central claim of this chapter is that eHealth governance is a key factor for improved health services. Many people involved in some way with patient and health care would disagree with this claim, since IT is not always seen as one of the main components of health services, or at least is not perceived to be as crucial as, say, clinical factors. IT in the health sector is commonly regarded as a support for people to help other people. However, there is an expectation that eHealth will become more and more important in the delivery of modern health care, in areas such as preventative and curative health care, mobility, telemedicine and virtual healthcare. eHealth is expected to improve the health service in the future, adding value for practitioners, patients and carers, researchers and government in different stages of the health care journey. These expectations are introducing new pressures to ensure successful delivery of eHealth; this can be obtained by implementing IT governance approaches based on proven best practices, not only to get assurance but also to show how these expectations are to be realised.

Adopting IT Governance can help health care organisations delivering eHealth; it requires commitment and support at all levels across the health care boards. This is a medium to long term process that involves series of improvement cycles that are transitions requiring careful management of the organisational change involved.

Successful delivery of eHealth in this highly demanding scenario not only requires commitment but also determination and investment that involve all types of health care organisations, together with other stakeholders, such as patients, carers, researchers, suppliers of health informatics and government.

In countries like the UK and others in the European Union, where the health care service is mostly provided via central and local public funds, there is a risk that eHealth won't get the level of investment required to grow at an acceptable pace, as it is competing for resources with other elements of the care system which are traditionally seen as more important for patient care. Moreover, eHealth is also commonly regarded as a net investment with a negative financial return. The good news is that this is only a narrow view of the whole financial picture. eHealth can be seen as one of the best candidates for funding in a competitive financial environment by demonstrating returns on investments based on savings in other areas of the health care system by implementing eHealth solutions.

IT governance standards and methodologies are used in non-healthcare industries and enterprises to provide a careful alignment of IT technologies and capabilities with the business goals of the enterprise. Levels of alignment can be measured; plans for improvement can be devised and implemented, with a monitoring framework in place to ensure a culture of continuous improvement. In this chapter we show how these standards and methods can be applied within a healthcare environment. We demonstrate the use of IT governance for eHealth to improve the alignment of eHealth with organisational targets, together with a monitoring process that measures what has been achieved, not only from the eHealth service balance scorecard point of view, but also working with Finance Departments to measure eHealth contribution to specific health care savings. This, then, is the challenge for eHealth: how best to adopt IT Governance for eHealth so that the necessary alignment is ensured, and so that measurable and predicted savings can be achieved.

After this introduction we present some fundamental concepts involving eHealth, health informatics, ICT, Information and Knowledge. Unfortunately there is no global consensus on many of these definitions and concepts, which increases the complexity of any attempt to "sell" eHealth in competitions for funding – or, indeed, to demonstrate expected levels of savings. It is difficult for all the involved stakeholders to accurately represent their positions without using a common speech.

Using this foundational terminology we go on to present the importance of getting alignment between eHealth and the goals of Health Care Organisations (HCOs). We also discuss the perceptions of some public boards, comparing and contrasting with the perceptions other industries and countries regarding IT-Business alignment. We then analyse the drivers, triggers, catalysts and conditions that determine the "momentum" to implement IT Governance, and describe the standards, frameworks and tools that can be useful when implementing IT Governance, based on the experiences across different health care organisations. We then relate some lessons learned from our experience in Scotland of implementing IT Governance as part of a demonstrator eHealth project. The aim of this project is to assess the approaches, tools and recommendations needed to roll out the IT governance in other health care boards across Scotland. Some of these are clearly applicable to other industries and to health care in countries having different models of health care funding to that of the United Kingdom. The final section of the chapter is a summary of these recommendations, with notes regarding their wider applicability.

LET'S TALK EHEALTH.

IT Governance in the health sector is a controversial topic as the boundaries between IT, information, eHealth, health informatics, ICT and health care are not crystal clear. An important factor is the lack of consensus between groups of professional who traditionally talk in either business, clinical or technical speech.| We first describe the independent concepts of health care and ICT, and then associated these through the definition of "Health Informatics". This will be added on to, so as to build a wider view of what eHealth is understood to be for our purposes. Then we describe IT Governance in general, and this is contrasted with and compared to eHealth Governance.

HEALTHCARE & HEALTHCARE SYSTEM

We start with the observation that health care is one of the fundamental human rights as recognized through the Universal Declaration. This may be overly philosophical in the context of this book, but it certainly establishes relevant foundations to sustain the **importance of eHealth to deliver fundamental human rights**: both health care, and also the **right to receive equal access** to public services. eHealth is a key element for the successful delivery of these fundamental rights.

Health care also embraces different organizations and services to promote health, either by curing, preventing or by way of palliative interventions for individuals or groups of population (World Health Organisation, 2009).

A **Healthcare system refers** to those structures, processes, people and other resources such as financial and information which are involved in the delivery of health care to specific groups within the population. Better performance is focused on three main areas: health, satisfaction of population expectations and finance, particularly funding and savings (World Health Organisation, 2009).

There are different models of healthcare systems across the world, and the variations are determined by the groups of the population targeted and the funding methods involved by combining private and public resources, such as taxes, insurance, donations, volunteer effort and direct payment.

ICT

For most people ICT or Information and Communication Technologies are related to electronic equipment, like computers or routers, which are used to manage data. This is far from the actual depth of the concept. The most controversial aspect involves the understanding of what "technology" means. It is an innovation process by application of knowledge, both new and existent, both scientific and non-scientific, to practical scenarios (Goodman, C., 2004). It may include tools and products, but also intangibles like processes, methods, techniques, systems or any other organisational structure.

By developing this concept is it possible to prepare a definition of ICT that approaches the concept from the innovation point of view, as an application of knowledge into the information and communications field. In this sense ICT involves related tools and products, like hardware or software, processes like ETL[1] architecture design, software development, systems design or SOA (service oriented architecture) implementations, between other processes, methods and related techniques involved in any of the information, communication and related technologies fields.

HEALTH INFORMATICS

Health Informatics is a mix of sciences: information, telecommunication, computing and health. It involves tools usually associated with ICT but also a wider spectrum of related sciences that influence the new ICTs. Examples include radiology ICT enabled tools that are influenced by sciences related with digital images, and laboratory ICT enabled tools that are influenced by applications of chemistry. There are multiple links between other sciences and Health Informatics.

Health Informatics is regulated by different organisations in different regions of the world, such as the IMIA (International Medical Informatics Association) which has existed since the 1970s. More recently, newer bodies are taking an important role in regulating this field like the European Federation for Medical Informatics, the Office of the U.S.

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[1] ETL refers to Extract-Transform-Load (Kimball, R., 2002)

National Coordinator for Health Information Technology (ONCHIT), the U.S. Certification Commission for Healthcare Information Technology (CCHIT), the Asia Pacific Association for Medical Informatics (APAMI) and the Australian College of Health Informatics (ACHI), between many others.

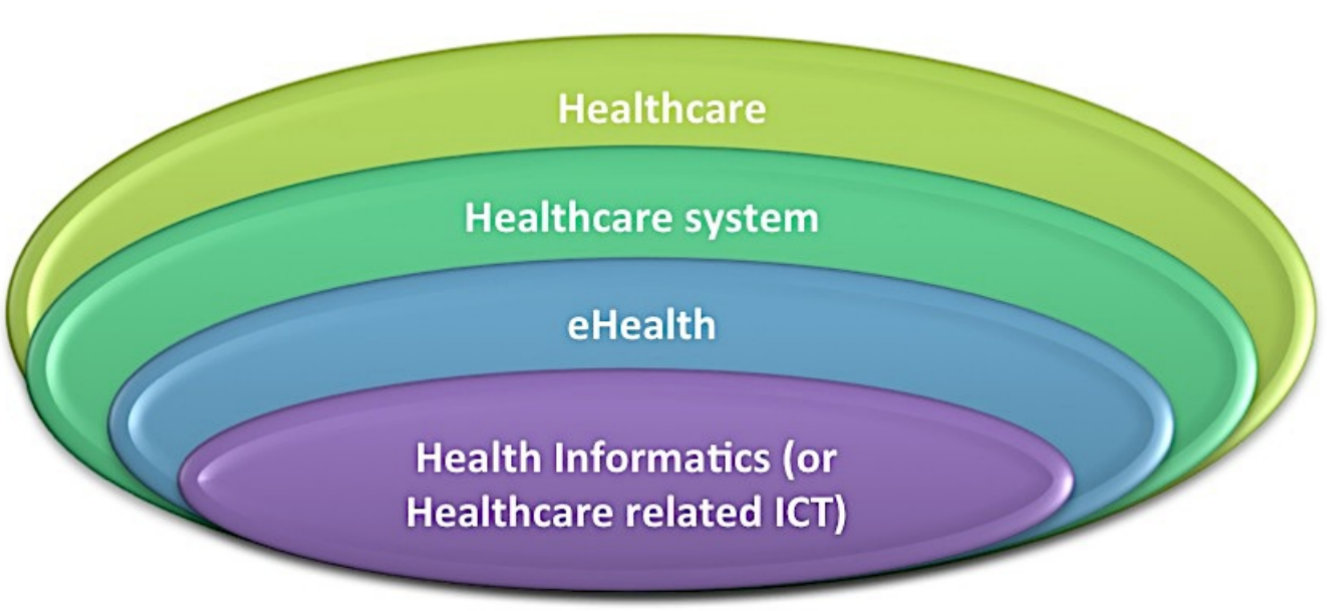

Figure 1 Relation between fundamental concepts involved in eHealth

EHEALTH

eHealth is an innovation process for the delivery of better healthcare by creative applications of information and communication technologies. It is a **process** rather than a structure or just a technology.

eHealth involves innovation and organisational change, as it requires the identification of creative ways to adapt technologies and methods already available and applied in other arenas for use within the healthcare field. Many technologies are well-understood and are available for multiple applications; it is a matter of applying what already exists to improve the healthcare value chain. Samples of these innovations are the applications of wireless, internet or laptops to get more mobility not only for practitioners but also patients, carers, executives, etc. These innovations are broadly implemented across health care organisations, but there are other, more specific examples. Such as scanning applied to electronic documents for patient records, integration middleware for integrated patient history, teleconferencing or GPS for remote diagnoses, or virtual worlds to replicate experiences and learn from healthcare virtual networks. **These innovations, together with the practice of effective delivery of these innovations into actual healthcare organisations, is eHealth.**

eHealth subsumes a number of other concepts like mHealth (mobile devices applied to telemedicine), teleconferencing (remote conferencing ICT enabled), KmHealth (knowledge management), TeleHealth or TeleMedicine, eCare, PAS (Patient Administration Systems), PACS, SCI, EPR (Electronic Patient Records). The number of such examples increases more innovations are designed and implemented within the eHealth process.

IT AND EHEALTH GOVERNANCE

Governance is the set of management or leadership processes used by people structures to take decisions, grant power to make decisions happen and monitor results and performance. These structures can take different forms of socio-political or economical *government,* in the broader sense of this term. This approach to Governance as a concept is broadly supported (Dignam, A., 2006) including the World Bank and the IMF[2] (Kaufmann, D., 2000).

The natural purpose of governance is to provide assurance to all stakeholders that things will go as expected, in other words: that the results achieved will be in line with the decisions taken.

In the wider sense, governance implies a macro management or leadership process to make socio-political and economical decisions followed by the government structures put in place to achieve those decisions. From the healthcare perspective it implies the whole range of decisions taken by societies to deal with the healthcare issues of different collectives.

By analogy, using the above definitions related with Healthcare and Healthcare System, we can explain what Governance means within the context of the health care system: a process to ensure results are achieved in line with a set of taken decisions related with the direction, fundamental rules and structures established by each HCO or healthcare Board to move the healthcare system as a Corporations in that direction.

This analogy can be applied to develop the IT and eHealth Governance concepts. The difference strives on the scope of the decisions taken within the spheres of influence and accountability of each of these sub-structures of the healthcare system.

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[2] IMF (International Monetary Fund)

eHealth deals with innovation and organisational change to ensure creative ways to get the most of information and related technologies and methods within the healthcare field. In this sense, eHealth Governance is the process to ensure this happens in line with the healthcare Board strategy in place. eHealth can involve Information Governance, IT Governance and Project Governance between others.

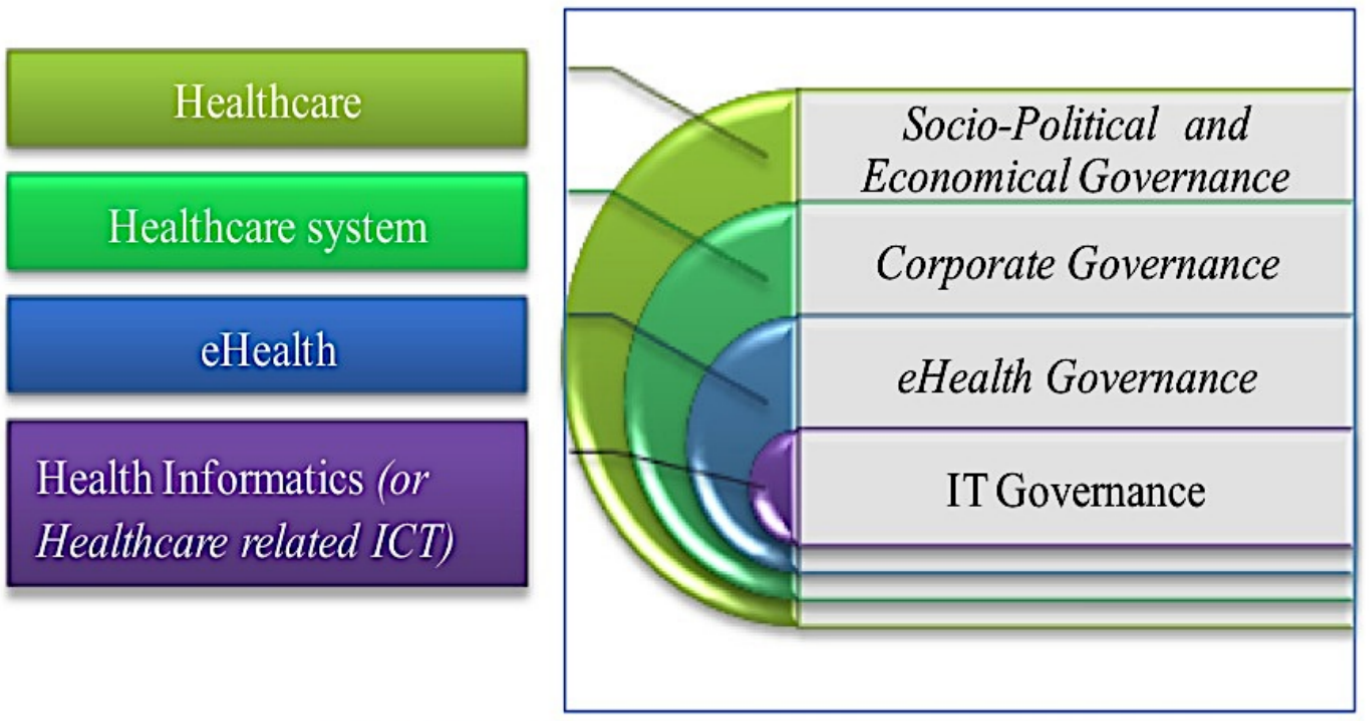

Figure 2 Relation between Governance and Healthcare concepts.

Throughout this chapter, we have adopted the approach presented by Mårten Simonsson and Pontus Johnson in their effort to consolidate a vast literature available around this concept (Simonsson, M., 2006). They suggest that IT governance is about taking IT related decisions and implementing them by using Governance practices and resources.

In terms of frameworks for IT Governance implementations, we considered CobIT® as a reference throughout the study presented in this chapter. CobIT® was developed by ITGI, the IT Governance Institute which promotes original research and case studies that executives can refer to in their IT Governance duties (ITGI, 2009).

The CobIT© framework presents the elements involved on IT Governance in terms of "dimensions": goals, processes, people, information (data), applications, technology and facilities (infrastructure).

CobIT present specific reference models for each relevant IT Governance process describing the following aspects of Governance maturity (Hardy, G., 2006):

- Awareness and communication
- Policies, standards and procedures
- Tools and automation
- Skills and expertise
- Responsibility and accountability
- Goal setting and measurement

EHEALTH AND HEALTH SERVICE ORGANISATION STRATEGIC ALIGNMENT.

As Prof. Luftman outlined in a recent interview, there is no one thing IT can do for the business, there is a bunch of things IT can do (Kontzer, T., 2009).

In this section we share the lessons learned from a project implementing IT Governance in the Health Sector in Scotland, and the activities indicated that allow us to succeed in getting better alignment of ICT within HCOs, in other words, to improve eHealth.

Studies conducted over the last decade coincide in identifying the lack of alignment between IT and the business strategy as a common issue for most of the organisations consulted.

Since 2000, surveys like the HIMSS (Health Information and Management Systems Society) on information technology (Tschida, M., 2000) show this misalignment as one of the most important concerns of executives. This finding has been reinforced by later studies such as Silvius' business & IT alignment theory (Silvius, A., 2007), the most recent HIMSS 2008 survey (Hiner, J., 2008), the "IT Governance Global Status Report 2008" (PriceWaterhouseCoopers, 2008) and finally the CIO Insight and SIM surveys (Kontzer, T., 2009).

Although the ITGI report shows some positive figures regarding the actual level of IT-Business alignment, it concludes that there is still room for improvement. According to this report, 62% of the organisations consulted world-wide consider their actual level of alignment to be at least good, and 19% consider it to be very good. These are not isolated results. Along with these recent surveys, there are also multiple references in other formal studies and conference proceedings reflecting the need to improve the alignment of ICT with the business. The reason why CIOs and CEOs are concerned about aligning IT with the business is because "good alignment translates into increased

innovation and revenue" as Prof. Luftman recently stated in relation with the latest SIM survey results (Hoboken, N., 2008).

Healthcare organizations have similar concerns. This has been broadly expressed during the last few years in studies from the UK (Muir, R., 2007), New Zealand (Bolevich, Z., 2009), Australia (Eysenbach, G., 2008), India (Khandelwal, A., 2006), and Canada (Causi, S., 2009).

This view has been corroborated by a survey we conducted within the NHS Scotland eHealth Demonstrator Project for IT Governance implementation (Scottish Government, eHealth Programme, 2009). As part of this project a series of workshops were held to discuss lessons learned, strategic alignment and perceived benefits with the main stakeholders involved in the implementation of IT Governance in three National Health Service Boards in Scotland selected for this demonstrator exercise. Boards participating were close geographically and culturally, but have different structures, goals and priorities; also are different in terms of processes in place and resources. In this way we obtained an insight from three different but related case studies.

People involved in the workshops came from the relevant eHealth departments of the three Boards involved.

We employed a reduced version of the Luftman survey to drive the discussion within the workshops exploring the following areas:

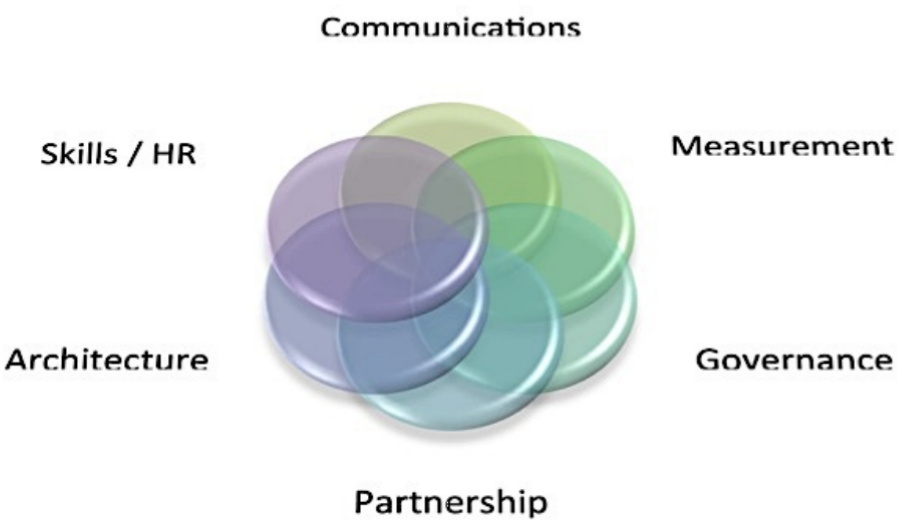

Figure 3 Dimension of eHealth - HCO alignment. Based on the six criteria proposed by Luftman.

These are the same areas defined by Luftman in previous studies (Luftman, J., 2000); but we adapted a subset of the original statements provided for each area in order to adjust the survey instrument to the workshop format.

The adapted instrument is shown in Figure 4.

The responders provided a level of agreement with each statement from strongly disagree (1) to strongly agree (5). Responses were obtained both from individuals and from groups of individuals who were providing a collective view as an outcome of the workshop discussions. Moreover, the responses were classified by the following groups of interest representing different perspectives within the organisations involved:

- **Business perspective**, involving the perception of the HCO side, not only from the clinical or patient-related services point of view, but also from administration and other corporate services.
- **eHealth perspective**, involving the point of view of the senior management level of eHealth related departments
- **Independent perspective**, usually provided by the external consultant(s) and the local facilitators or project coordinators with a global picture of the project and the organisation, after reviewing the IT Governance maturity across the Board.
- **Process owners,** either eHealth related managers or eHealth process owners. The processes owners invited to participate on each workshop depended on the scope each Board implemented their own IT Governance initiative. In any case, the assessment was based on the processes suggested by CobIT©.

The results presented in the following section are a comparison between the collective and individual views expressed by these informed interest groups. This analysis will show who within the NHS Boards recognise the benefits and the need to improve IT/eHealth Governance, and also which of this groups can see IT Governance and CobIT as a potential solution to achieve the expected benefits, including better alignment IT-HCO. Finally we'll contrast and compare the level of adoption of CobIT within the HCOs involved.

Perception of Business-IT alignment

Adapted and abbreviated version of the Luftman survey instrument

Area of alignment : Communications
1. Business and ICT speak the same language
2. Business and ICT management have a shared vision of the role of ICT in enabling business strategies
3. Business management has a good understanding of the impact of ICT on the business
Area of alignment : Partnership
4. Business and ICT planning and management processes are tightly connected and integrated
5. Innovations in ICT are taken into account when determining the business strategy
6. Your organisation fosters a clear business ownership for ICT projects
Area of alignment : Architecture
7. Strategic business/ICT alignment processes at a centralised level are in line with strategic business/ICT alignment processes at a decentralised level
8. Business processes are adequately supported by ICT
9. Your organisation systematically determines the impact of new ICT investments on existing business processes, systems and infrastructure
Area of alignment : Value Measurement
10. Your organisation is able to clearly demonstrate the value for its ICT investments
11. New ICT investment and enhancement spend is prioritised against business strategy
12. The performance of new ICT investment projects is regularly monitored and benchmarked against strategic objectives
Area of alignment : Governance
13. ICT performance management impacts budget allocation
14. There is transparency in the levels of authority and responsibilities for making decisions with respect to ICT projects
15. There is transparency in the levels of accountability for outcomes for ICT projects
Area of alignment : Human Resource
16. Your organisation is able to minimise the resistance to change that comes with new ICT projects
17. Your organisation fosters a clear stakeholder management for ICT projects
18. In your organisation key-Users participate in the design and development of new ICT systems

OVERALL PERCEPTION OF ALIGNMENT.

The analysis is based on the maturity level adapted by Luftman from the CMM model (Luftman, J., 2000) presenting five levels of alignment maturity as follows, starting from a previous Level 0 for those scenarios where nothing in place to manage the process:

	Level	Hint
1	Initial / ad-hoc	Initial consideration is given to process management
2	Committed Process	The process is repeatable, but depends on individuals for its success
3	Established Focused process	The process is defined and documented
4	Improved/Managed Process	The process is managed and measurable.
5	Optimised Process	The IT process is integrated with the business process

Figure 4 Aspects included for an abbreviated format of the Luftman instrument assessing perception alignment.

The results of the alignment assessment conducted as part of an eHealth Demonstrator Project, shown the overall perception was that eHealth and the NHS Boards are in the earlier stages of the alignment process, which is consistent with the outcome of the IT Governance assessment conducted in these Boards as part of the implementation of the CobIT©

framework. This result is interesting as demonstrates in some degree that both instruments, the Luftman survey and CobIT©, using different approaches arrive to similar conclusions, at least at a higher level. As these instruments work with different sets of questions, statements and controls, at a lower level, the conclusion are difficult to compare in later stages of the assessment, but at least the results are consistent if we are looking for a view at a glance of the overall maturity of the IT Governance (CobIT© assessment) in the organisation or the level of alignment between eHealth/IT and the HCOs/Business (Luftman SAM Survey).

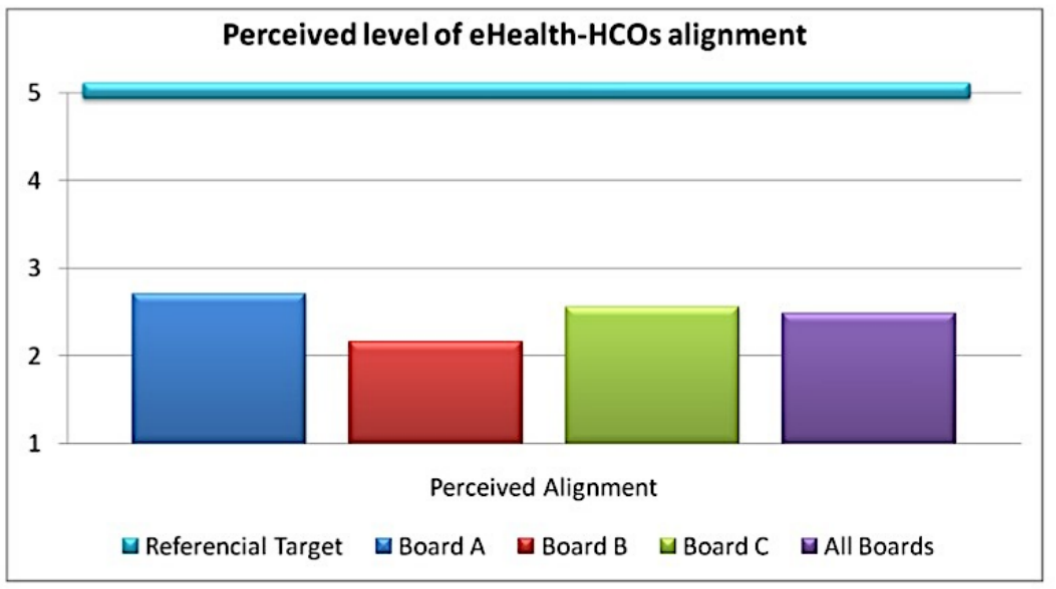

Figure 5 Perceived level of eHealth-HCO alignment

This corroborative result also indicates that the instrument worked even when applied within the relatively small groups of participant in the eHealth Demonstrator workshops.

In general terms the NHS Boards consulted perceived the level of alignment is at some point between a "Committed" (Level 2) and an "Established" (Level 3), but seems to lay closer to Level 2 than 3 (

Figure 5), mainly because to be considered in a specific level all the relevant aspects of compliance need to be

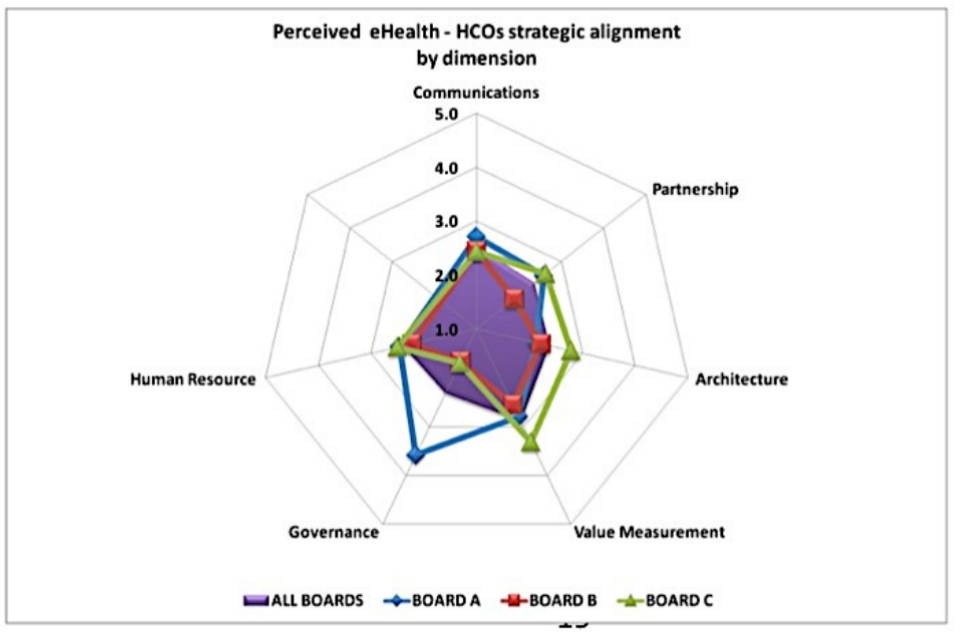

Figure 6 Alignment perceptions detected within some NHS Boards in Scotland, 2009

achieved. The only area in which a large variation in perceptions was found was "governance" (Figure 6) indicating the wide differences in the degrees of awareness of governance issues and standards across the boards.

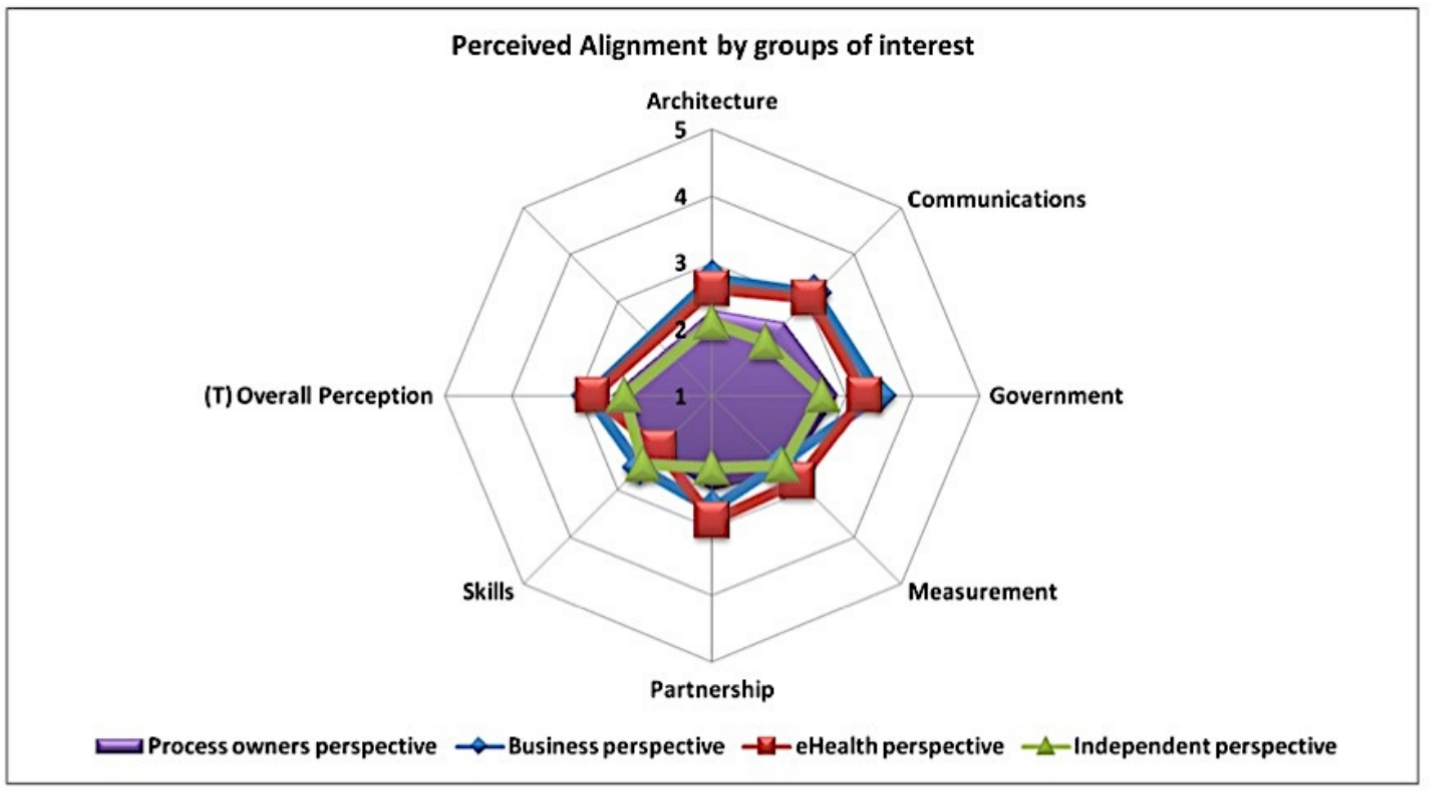

Figure 7 Perceived alignment by groups of interest (radar view).

When we consider the perceptions of groups of interest (Figure 7 and Figure 8) we see repeated evidence of a trend for those who are responsible for – rather than observers of, or workers within an area, to have a higher perception of alignment levels. Moreover, this higher level is still, for the most part, between levels 2 and 3, indicating that no role-group has a perception of highest alignment levels, and that those who work within eHealth on a day-to-day basis perceive a lower alignment, between 1 and 2 in most of the dimensions. In general, independents' perspective is stricter, setting the lowest levels of perceived alignment with the exception of the skills dimension, where despite of coinciding with other groups regarding lack of consistency across functions are more optimistic identifying emerging skills across the Boards, as required by eHealth departments nowadays as value service providers

The areas where alignment is better perceived, in general, are Governance, Communications and Architecture. The areas considered more misaligned are measurement, partnership and skills.

As mentioned before, the business/eHealth perspective tend to be more optimistic in terms of alignment than process owners or independents; these ones are more rigorous and severe in their perception, perhaps

because it was influenced by the outcome of detailed assessments conducted using CobIT© throughout the Boards.

Nevertheless, the overall perception across the Boards and groups of interest remains between level 2 and 3; the higher the level of management the better perception of alignment but, in any case, no quite distant from other groups perceptions.

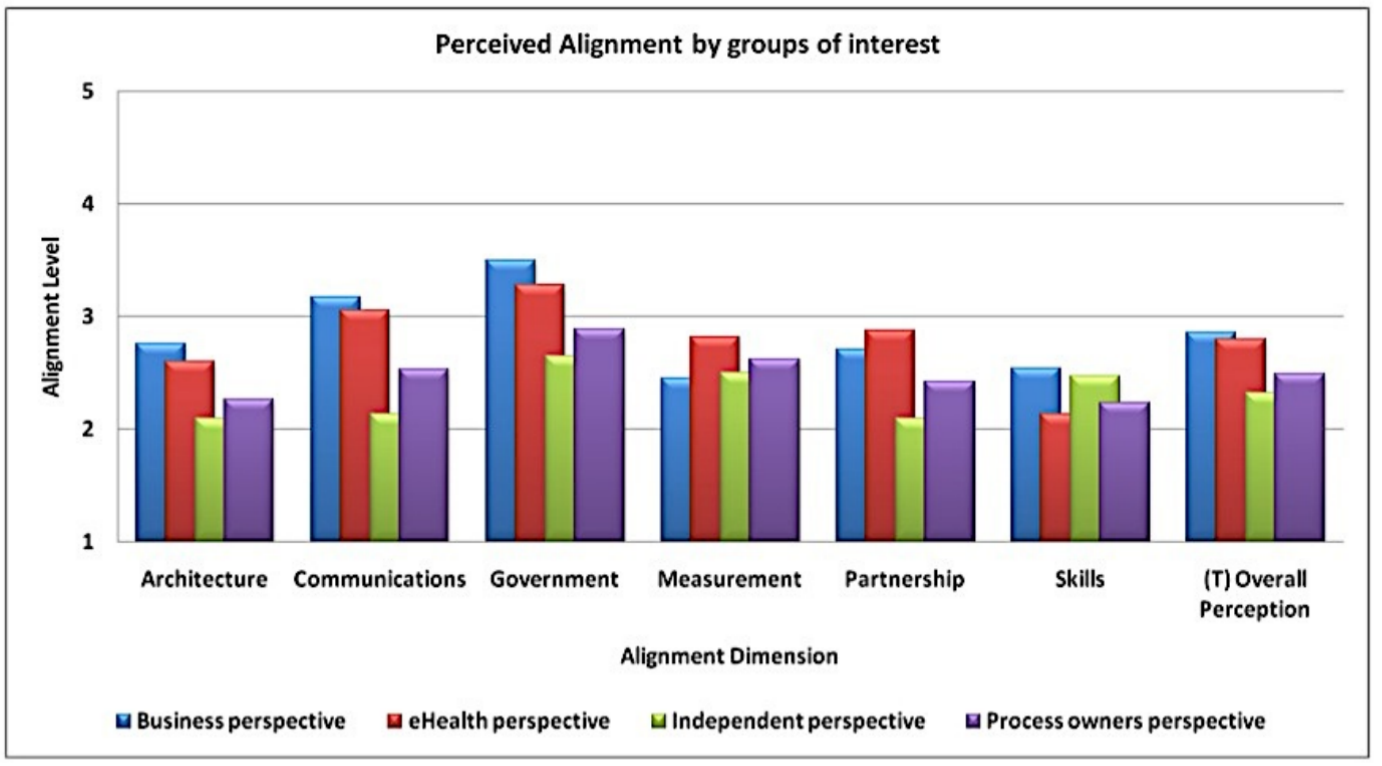

Figure 8 Perceived alignment by groups of interest (bars view).

The transition from level 2 to level 3 from the six dimension reviewed progress as shown in Figure 9, giving explicit definitions of the limitations and differences between the two levels.

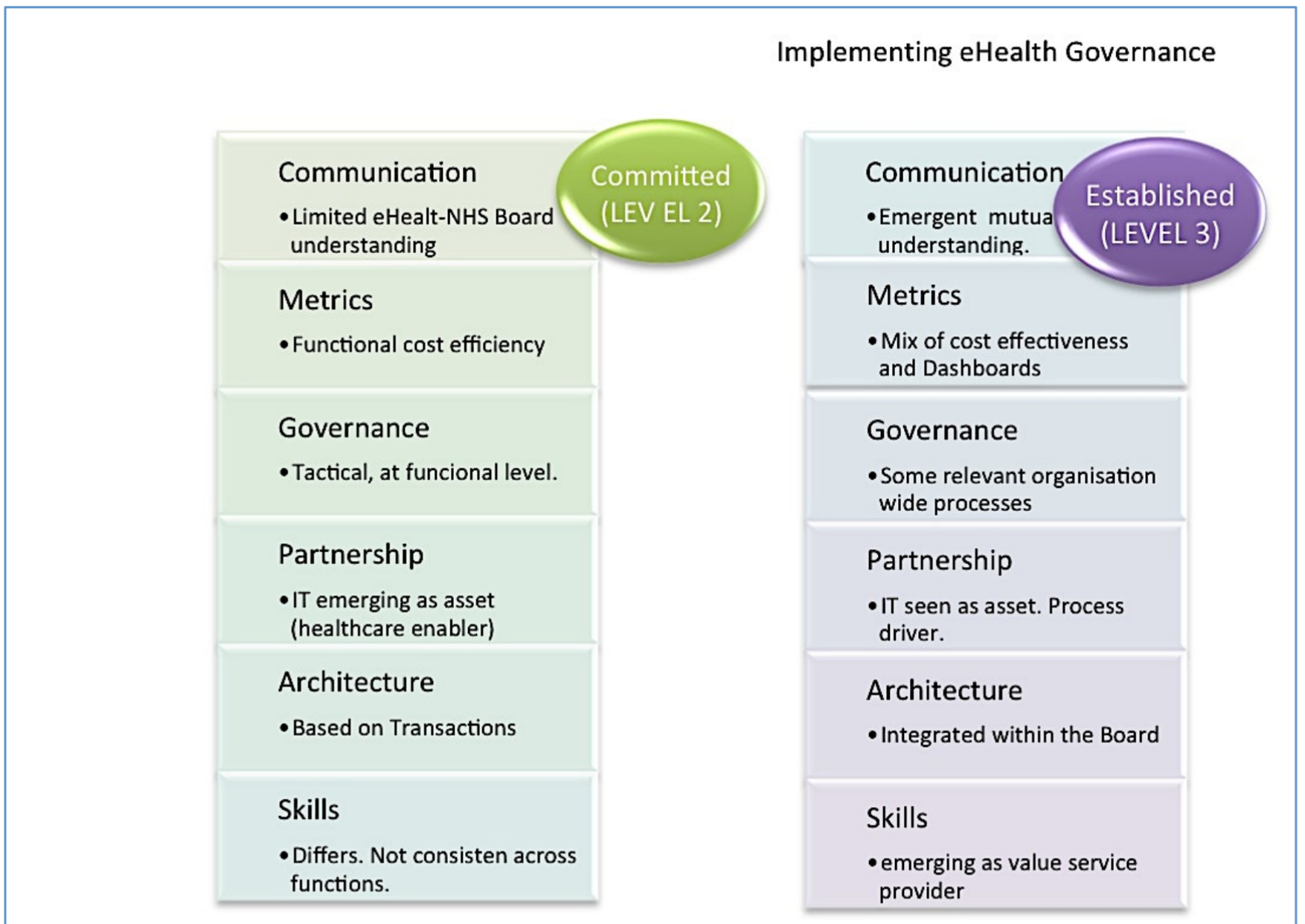

Figure 9 Example of some characteristics of the level of alignment perceived within the NHS based on the Luftman proposed dimensions of alignment.

IT GOVERNANCE STANDARDS, FRAMEWORKS AND TOOLS.

Now that we have motivated a link between the perceptions of misalignment and low levels of governance, we present a more detailed exposition of different standards, frameworks and related tools suitable for IT and eHealth Governance. We compare their scope and benefits, with emphasis on their possible application in the health sector.

There are many IT-related management frameworks, methodologies and standards in use today. None of them, on their own, forms a complete IT governance framework and there are significant overlaps between and across them, but they all have a useful role to play in assisting enterprises to manage and govern their information and related technologies more effectively. The international standard for IT governance is the recent ISO/IEC 38500 which has only been available since 2008. There are several widely-recognised, vendor-neutral, third

party frameworks that are often described as 'IT governance frameworks'. Important examples include:

* ITIL®, or IT Infrastructure Library®, was developed by the UK's Office of Government Commerce as a library of best practice processes for IT service management. Widely adopted around the world, ITIL is supported by ISO/IEC 20000:2005, against which independent certification can be achieved.

* CobIT®, or Control Objectives for Information and related Technology, now in version 4.1, was developed by the United States' IT Governance Institute. CobIT is increasingly accepted as good practice for control over information, IT and related risks. Its guidance helps organizations implement effective governance over enterprise-wide IT. In particular, CobIT's Management Guidelines component contains a framework for the control and measurability of IT by providing tools to assess and measure the enterprise's IT capability for the 34 identified CobIT processes.

* ISO17799, now embedded within ISO27002 and supported by ISO27001, (both issued by the International Standards Organization in Geneva), is the global best practice standard for information security management in enterprises.

We have employed the CobIT framework throughout this study, since it encompasses both the continual improvement approach of ITIL3 and the security standards of ISO17799, whilst also providing support and compliance with for the UK National Information Governance standard.

THE FRAMEWORK: COBIT®

CobIT® is an international framework for IT Governance which can be applied to any enterprise, including health care organisations that encompasses the most relevant IT related standards (i.e. ISO/IEC and ITIL), some of them already adopted across the HCO.

It was selected as part of the eHealth Demonstrator project at the NHS in Scotland due to its wide implementation over the world, but also because it is supported by comprehensive automated tools and the availability of certified professionals to help with its implementation. There are multiple successful previous experiences all over the world, some of them documented and available for reference.

In the particular case of the eHealth Demonstrator project, some Boards are internally and externally audited using CobIT framework as well, and also at further monitoring and improvement stages.

CobIT presents good practices across all areas of eHealth services including the management of the eHealth programme, information services and IT, and provides a set of recommendations to comply with best practices in terms of:

- Which processes need to be improved
- How mature each process is (5 levels presented in a maturity model)
- What's required to achieve the desired level of maturity filling the gap
- What activities need to be performed on each process
- Who should be responsible for/accountable/consulted/informed on each process (RACI charts)
- Performance metrics at different levels (at eHealth strategy, processes and activities levels) that allow the enterprise to know how far it has come along the path towards process maturity and eHealth alignment.

Figure 10 IT Governance model based on CobIT® applied to eHealth at NHS.

THE STAGES IMPLEMENTING IT GOVERNANCE WITHIN THE HEALTH CARE ORGANISATIONS

The stages adopted to implement IT Governance across the Boards participating in the eHealth Demonstrator project were fundamentally identical in an attempt to learn from the experience and make recommendations in the event of future roll out across other healthcare Boards. Figure 11 shows the basic stages adopted, following a common improvement cycle approach.

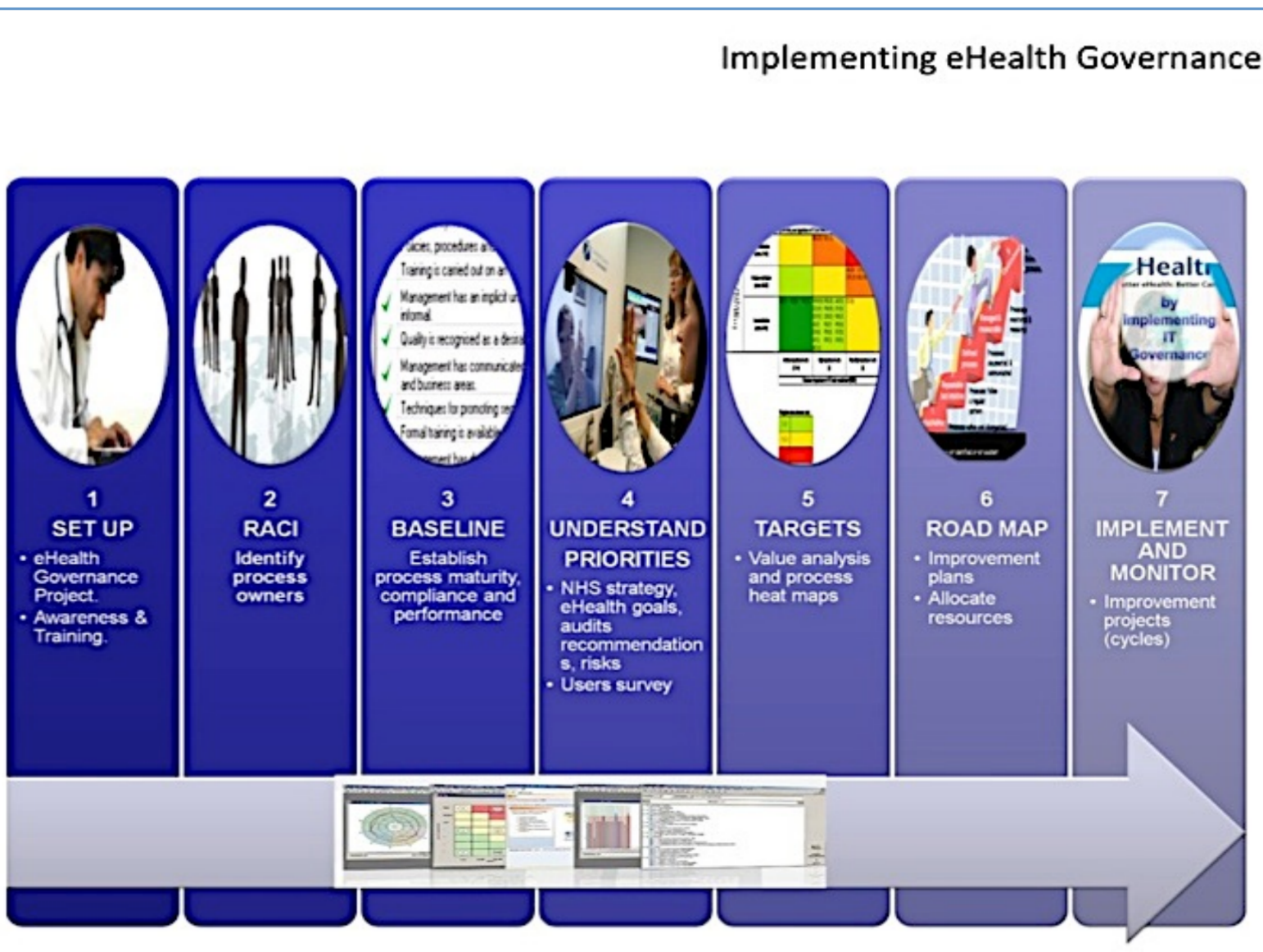

Figure 11 Stages implementing IT Governance in the NHS based on CobIT®

THE EHEALTH GOVERNANCE MOMENTUM.

We now describe what motivated the adoption of formal approaches to eHealth Governance in different HCOs in order to set conclusions and recommendations that can be applicable to other health organisations.

In particular, we explore the drivers, expectations and assumptions involved in this process at NHS Scotland as part of the eHealth Demonstrator Project.

DRIVERS

The Boards involved identified the following main drivers when deciding to implement formal eHealth Governance frameworks:

- Perception of limited alignment between eHealth service and Health Care needs along with organisational pressures to achieve more and quicker alignment.
- More demanding health care.

- Limited contribution of eHealth at Health Board level and vice versa, usually
  eHealth not being seen as part of the NHS value chain but as a health care support instrument.
- Boards often play a passive role in ensuring the organisation gets the most of eHealth.
- Audit recommendations to improve documentation and formal processes in some areas.

EXPECTATIONS

These factors were perceived to be the benefits delivered by eHealth Governance by the involved stakeholders, before the implementation took place.

PRIMARY EXPECTATIONS

- To become more efficient, as funding restrictions are commonplace
- Demonstrate that eHealth is doing things in the right way and according to best practices.
- Ensure (by governance) and demonstrate (by measuring achievements) positive returns on eHealth investment.
- Improve audit outcomes, both internal and external.
- Improve customer satisfaction and communicate it throughout the Board. By customers we mean all actors or stakeholders involved in health care who benefit directly or indirectly from eHealth.
- Set the required systems and processes in place to improve the customer experience.
- Deliver common and standardised services in a consistent manner, ensuring the experience is repeatable.

SECONDARY EXPECTATIONS

- Formalise eHealth processes.
- Achieve agreed service levels (SLAs)
- Implement audit recommendations.
- Improve Human resource utilisation within the Service Desk.
- Manage IT Risks.
- Measure where HCOs are compared to industry standards and IT best practices.
- Help specific areas to operate in a standardised way, mainly after a series of changes in the evolution of the NHS Trust.

- Standardisation of practices across the Department. Repeatable processes in place.
- Improve quality and service performance (demonstrate).

ADVERSE ASSUMPTIONS

We detected established assumptions about eHealth and eHealth Governance held within the NHS, but frequently shared across other HCOs. Many of these preconceived ideas are obsolete and act as barriers to the successful matching of the high expectations for a modern healthcare system. Important examples include:

- eHealth (IT) supports health care but is not a clear part of the value chain. It is not perceived as an element that is transforming but supporting healthcare.
- The health service has to be provided with or without eHealth; healthcare is the priority and eHealth is less important, is secondary.
- Rigour inhibits the creativity and skills required by eHealth innovations.
- Best practices are bureaucratic and time and resources consuming. NHS Boards therefore cannot afford it.
- Collaboration between Boards: using synergy to achieve better or quicker results is idealistic; each Board has to look after itself, move forward and quickly react to satisfy a highly demanding and unpredictable healthcare; there is no time or resources for other approaches even if they are interesting. Collaboration is time and resources consuming, thus NHS Boards cannot afford.
- NHS (or our Board) is different; these approaches don't apply to us.
- We know what we have to do; it's just that we don't have time and resources to do it.

LESSONS LEARNED.

Based on analysis of the NHS Scotland eHealth Demonstrator project, we monitored the changes in expectations throughout the IT Governance implementation, identifying what worked and what didn't work in these three different health care boards. This forms the basis for our suite of recommendations for successful eHealth Governance at the health board level and governmental levels.

The key factors for successful outcomes are shown in Figure 12.

Figure 12 Key success factors to implement eHealth Governance.

The exact balance of these factors to give the best outcome depends on variables such as board structure, scope of services under consideration, existing and planned infrastructure and personnel capabilities. However, there are a number of common observations and findings that are recommended for any future implementation of eHealth Governance in Scotland. Since these recommendations are independent of funding model and political environment, we present them as global recommendations for governments and health care organisations in any modern democracy.

READY-STEADY-GO

In the following, we use the term HCO to signify any health care organisation (local, regional, or national; public or private) but this term can be replaced throughout by any organisation providing centralised services related to eHealth and/or eHealth Governance, such as local, regional and national government departments. For these latter organisations,

each recommendation should be taken as a facilitator for helping HCOs implement eHealth Governance; the recommendation is therefore external rather than internal.

TOP 10 RECOMMENDATIONS FOR EHEALTH GOVERNANCE

1. Investigate what other HCOs are achieving and check what eHealth Governance can do for your HCO. eHealth Governance can make a difference.
2. Sell it across your HCO: eHealth Governance can help to improve eHealth. Remember that better eHealth is designed to lead to better care. Design and deliver a campaign to raise awareness and readiness of your HCO. Remember that eHealth Governance is not only about technologies but how to get the most of the Information and related IT by adding value to patient care. It involves the whole organisation and implies an organisational change. It is more complex to deal with organisational change than pure technology, so sell it before anything else, the more the organisation buys it the easier to implement. In this context, organisation means people who have to be convinced of the benefits or at least in a position to support the transition towards better eHealth Governance.
3. Adopt a framework for IT (eHealth) Governance. Select a framework widely implemented across the world and supported by professionals and tools. Our experience at NHS in Scotland suggests CobIT but there are other frameworks and standards that can be applicable. ITIL is progressing in an interesting and wider approach more aligned with new approaches to service oriented architectures applied to Healthcare than previous versions. Ensure the skills, knowledge and tools to support the implementation of the selected framework are easily available in your HCO environment. Check the framework selected is not focussed only in a particular dimension of Governance, for example security or a specific part of the service, but that encompasses all the processes involved in eHealth. Moreover, the central aim of the framework should be alignment of IT with eHealth strategies and eHealth with the Healthcare business.
4. Adopt automated tools to support eHealth Governance. Particularly tools with an embedded knowledge base so the implementation can produce quicker results, demonstrate the benefits and re-enforce the transition towards better eHealth Governance. Nowadays, tools tend to offer a platform from which to develop what the organisation requires. It is good in terms adaptation to the HCO preferences but is time and resource consuming. There are tools in the market offered with a knowledge base that collects other organisations expertise so it is easier

and quicker to start with and get results. The availability of this embedded knowledge can make a difference to succeed implementing eHealth Governance. Check tools assessed by professional bodies. For example, but is not the only one, the ISACA is specialised in IT Governance and offers links and assessments of different tools supporting CobIT© and other related standards, frameworks and guidelines.

5. Provide local support and advice on eHealth Governance to help process owners, particularly but not exclusively, in the earlier stages.
6. Get the benefits of synergy and collaboration. Use central expertise and participate actively within opportunities for sharing the experience with other HCOs.
7. Be creative to encourage continual internal collaboration and synergy to learn from your own experience and tune your new way of working as a team, as an organisation. Involve all stakeholders from the outset.
8. Do not underestimate the amount time and resources required at the earlier stages. Run a pilot to better understand how eHealth Governance works and the organisational change implications for your HCO.
9. Show the results. Monitor the progress in your HCO and create opportunities to show it across the HCO.
10. Try to get a certification (i.e. ISO/IEC 38500) or at least show your audit result prior to and after any process improvement cycle implemented in your HCO.

We believe that it is vital for governmental agencies and funding bodies to provide support, central external advice, central training facilities, and a central knowledge repository at the earliest possible stage. This is because successful implementation at the HCO level is greatly assisted by expert assistance with the concepts, techniques and organisational changes involved: readiness is key. There is an obvious synergy in this situation: early support from the centre leads to quicker and more cost-effective eHealth improvements, giving both financial and health care benefits to the entire community.

We also concur with earlier findings of Luftman from similar studies that management commitment and project buy-in are also vital. This hardly needs to be stated, since eHealth Governance involves planned organisational change in all cases, and all best management practices for these changes apply. In fact, the main complexities of eHealth Government involve the organisational transitions, with the ICT aspects

playing a secondary part. Hence any effort spent in improving the readiness of the HCO, getting commitment at all levels, preparing a detailed project plan and managing expectations is worthwhile. This can be best achieved, in our opinion, by initially focussing on a small number or core processes, rather than attempting an implementation over multiple, broad areas.

In summary, our findings are motivated by an initial study of perceptions of alignment levels, followed by a demonstrator project involving three HCOs; they coincide with, and extend, the findings of previous studies of this type, including that of Luftman. Our recommendations apply in most political and socio-economic models and describe the key enablers of eHealth Governance implementation.

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8.6 Appendix 4a: CobIT® Maturity Assessment and Continual eHealth Governance improvement at NHS Fife

COBIT Focus Volume 4: October 2012 p. 6-9

Information Systems Audit and Control Association (ISACA)

Full paper: Appendix 4

http://www.isaca.org/Knowledge-Center/cobit/cobit-focus/Pages/COBIT-Focus-Volume-4-October-2012.aspx

Come join the discussion! Elena Beratarbide will respond to questions in the discussion area of the COBIT (4.1 and earlier)—Use It Effectively topic beginning 22 October 2012.

COBIT Maturity Assessment and Continual e-Health Governance Improvement at NHS Fife

By Elena Beratarbide, CISA, Pablo Borges and Donald Wilson

The NHS is the National Health Service trust that provides public health care services across the UK. NHS Fife[1] is the corresponding public health care provider within the Fife region in Scotland, UK, covering a range of services from primary care to acute services, involving community hospitals across the region.

NHS Fife began working with COBIT® in 2007, led by the need to ensure that its e-health services were aligned with NHS's national and local strategies, along with internal pressures to improve security, audit outcomes and compliance with recognized standards.

Until 2007, NHS Fife had been focused on Information Technology Infrastructure Library (ITIL) as a best practice standard for IT service management. ITIL v2, the version available at the time, lacked the overall vision of a continual improvement process—something that COBIT provided. This vision incorporated all relevant processes from the service strategy to operations, establishing the improvement cycle in terms of level of maturity, how to progress within the improvement path for processes and activities, and how to measure progress.

NHS Fife understood that COBIT provides a higher-level framework that allows for working with a process vision, encompassing some IT governance processes not covered by ITIL, such as strategic planning, risk management, quality management and internal control. The decision to integrate the organization's previous efforts with ITIL with the COBIT framework allowed for a more efficient management of resources, particularly in a climate of greater-than-ever efficiency-savings pressures and increasing clinical and non-clinical e-health demand.

NHS Fife supported the implementation of COBIT with the Meycor COBIT® Suite, which was particularly helpful for establishing a baseline, developing improvement plans, selecting metrics and tracking the improvement cycles designed for each targeted process.

In 2008, the NHS Fife initiative evolved into an e-health COBIT demonstrator project, which aimed to show results after applying COBIT to three different NHS boards in Scotland and the UK, and to present conclusions and recommendations to the e-health directorate of the Scottish government for consideration across other NHS boards.

To get support from the Scottish government (e-Health Programme), NHS Fife needed to demonstrate results achieved from the earliest stages. In 2005, NHS Fife started restructuring the IT department based on ITIL recommendations, which included implementing clear service delivery, service support functions and managers for key ITIL processes, while maintaining infrastructure support teams. In 2006, a new IT change support manager, who already worked with COBIT, was appointed and introduced the framework into NHS Fife. The quick results related to IT change management convinced the head of the department to extend the improvement model to other key processes, and within a year, a further two NHS boards joined the project, which aimed to demonstrate results and to develop a set of recommendations for other NHS boards facing the same challenges and considering the adoption of e-health governance best practices.

From the NHS Fife perspective, the targets for a COBIT implementation were to:

- Understand the priorities toward establishing a mature process for e-health to engage and align with the NHS Fife strategy
- Reduce risk and improve security
- Improve internal and external audit outcomes

- Establish a continual improvement model of working that is sustainable, and demonstrate results
- Achieve COBIT level 3 maturity for all key processes within a year

The implementation of COBIT was divided into two phases. Phase one involved training the key process owners from the e-health team on IT governance, COBIT® 4.0 and Meycor COBIT tools. Phase two involved:

- Raising awareness of IT governance across the e-health team
- Further training on the COBIT framework and Meycor COBIT tools
- Identifying all relevant process owners and responsibilities (**figure 1**)
- Reviewing in-depth the existing processes, producing a baseline of the current situation
- Selecting pilot processes according to the priorities for the organization. This selection was based on a heat map of critical processes from the NHS Fife priorities perspective (**figure 2**), including the expected value of improving the process for NHS Fife, audit recommendations, risk and the results of the assessment baseline (**figures 3** and **4**).
- Developing improvement plans. Each process owner was in charge of producing improvement plans, with further assistance provided by a COBIT expert. The latter was only required during the initial training—until the method was established in the team.

Figure 1—Example of Adapted RACI Chart

COBIT PROCESS	CONTROL OBJECTIVE	COBIT ACTIVITIES	Support Manager	Manager	CCR Manager	Services TL	Support TL	Architect	TL
DS8	1.2	Create classification (severity and impact) and escalation procedures (functional and hierarchical)	A/R	C		C	C		R
DS8	2.1/2.2	Detect and record incidents/service requests/information requests	A	C					R
DS8	2.3	Classify, investigate and diagnose queries	A	C		R	C	C	R
DS8	3.1/3.2 4.1/4.2	Resolve, recover and close incidents	A	I		R	C	R	R
DS8	2.3	Inform users (e.g., status updates)	A	I			C		R
DS8	1.3/5.1	Produce management reporting	A/R	I	I		I	I	R

Source: NHS Fife. Reprinted with permission.

Figure 2—Value Analysis: Heat Map Based on Aggregated IT and Business Goals Importance

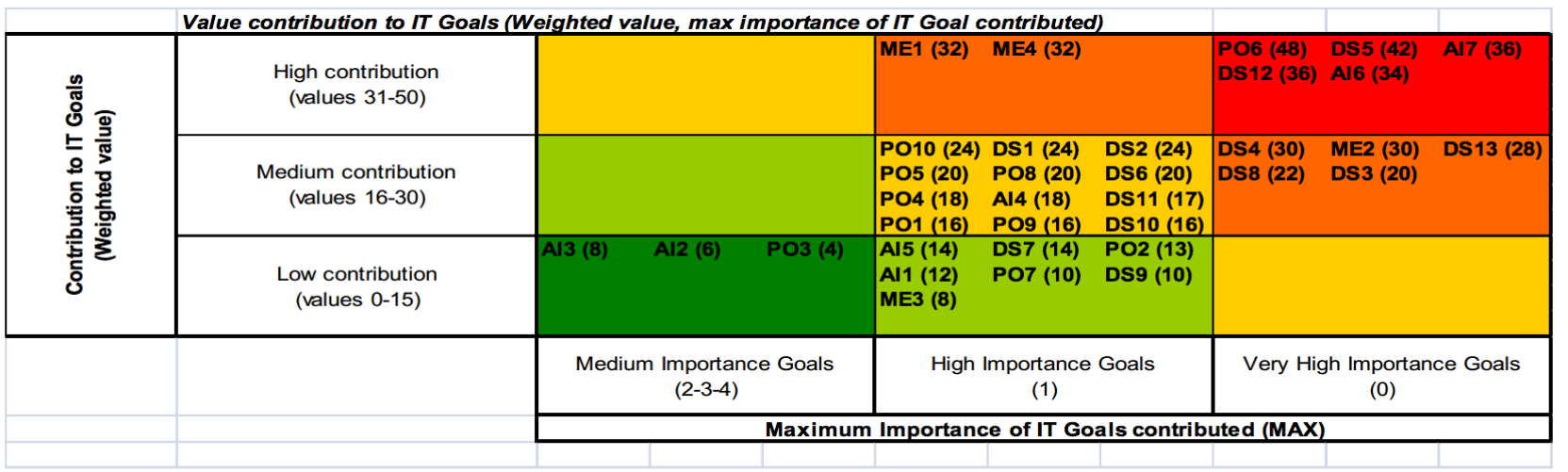

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Figure 3—Maturity Assessment (2008 Baseline)

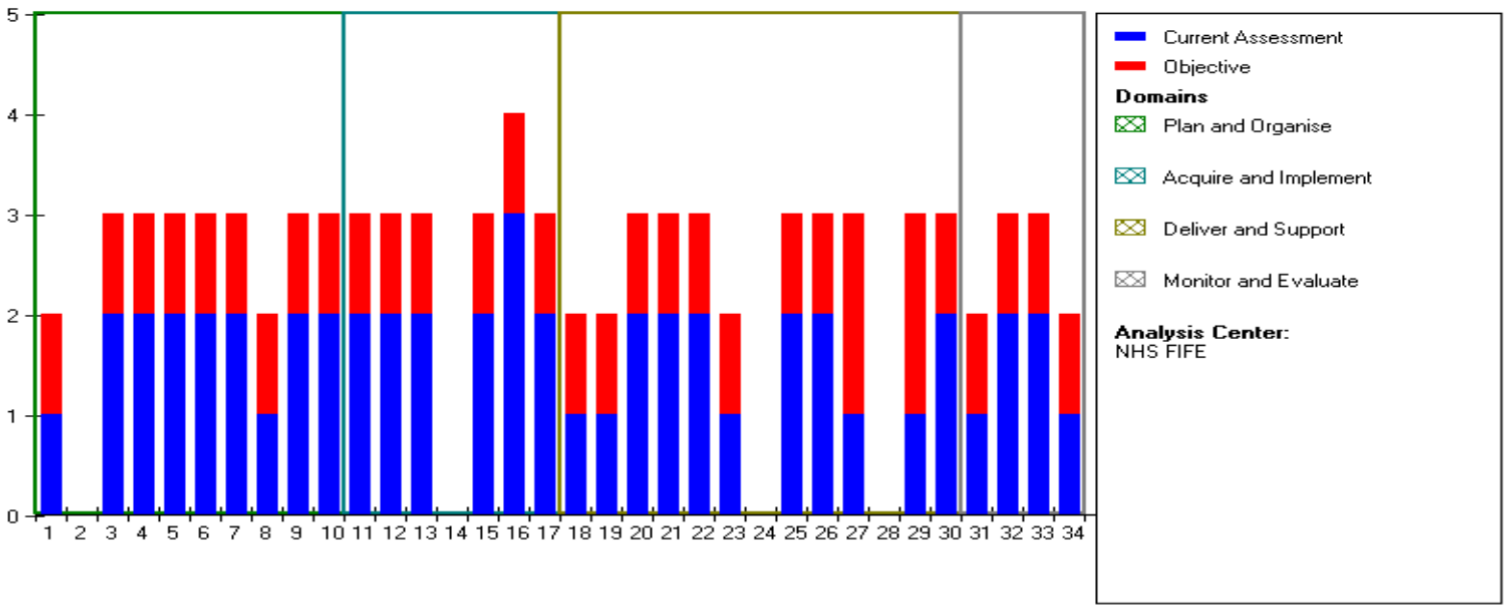

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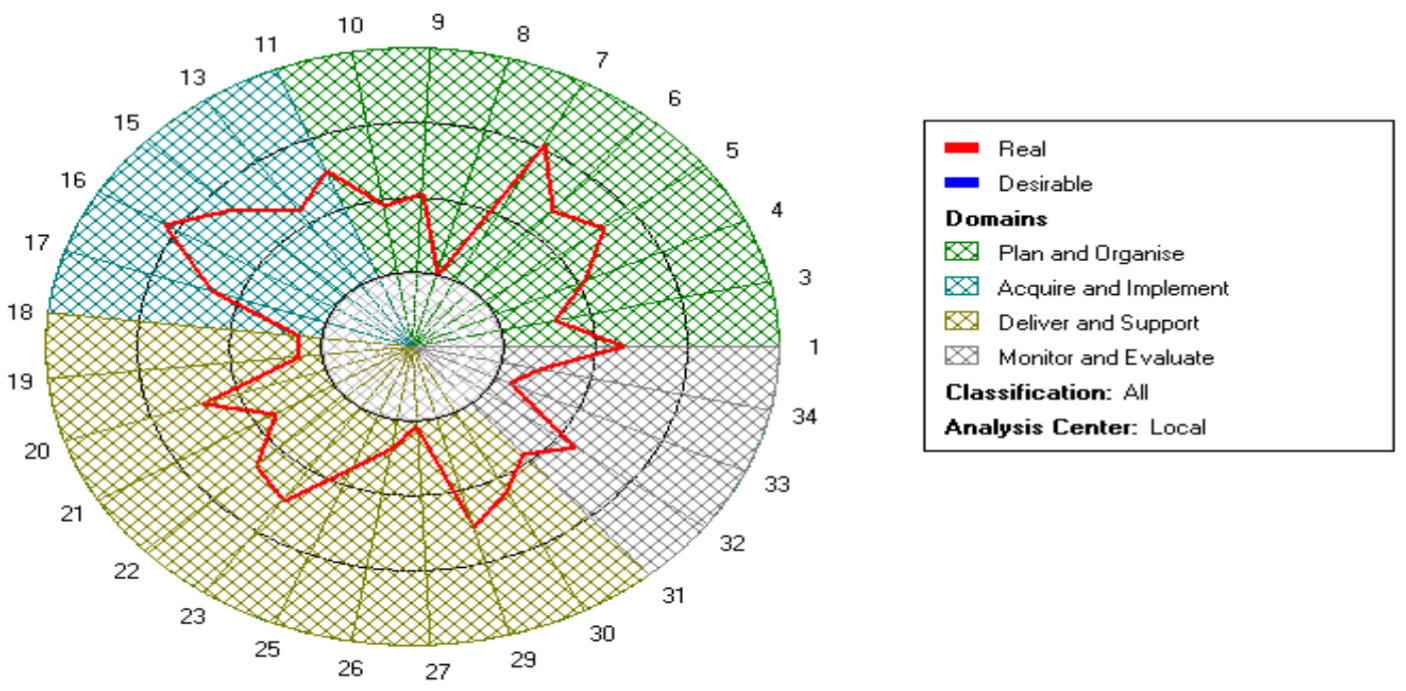
Figure 4—Control Objectives Compliance (2008)



Source: NHS Fife. Reprinted with permission.

- Applying an IT department user-satisfaction survey to demonstrate changes in perceptions through a series of improvement cycles
- Carrying out an assessment after three, six and 12 months, which involved measuring the achieved level of maturity and putting on a series of lessons-learned workshops with key stakeholders and process owners
- Disseminating the results

In 2010, the change management process was externally audited, showing an achievement of a high, level 3 (incipient level 4) maturity. This result represents one of the highest scores and quickest improvements obtained for processes externally audited within the e-health practices at NHS Fife.

The improvements to the change management process also resulted in a series of improvements in linked processes, e.g., service desk and incident management, change and configuration, service level management, security management, and business continuity.

Since 2010, NHS Fife's e-health infrastructure achieved ISO 27001 certification (in January 2012) and developed a corporate framework for IT governance, which involves a recognition of the importance of IT governance regardless of whether the IT service is provided by the e-health infrastructure department or another department (currently within NHS Fife there is a federated archetype). E-health governance is positively influencing the expansion of the use of COBIT across other processes linked to e-health services within NHS Fife, but residing outside of the e-health infrastructure team, e.g., within the e-Health Programme, information services and other federated IT services.

Looking Forward

At the present time, the e-health infrastructure team is focused on consolidated metrics and establishing relevant dashboards suitable for specific needs, particularly support team management (e.g., service desk, desktop, systems, applications, network, general practitioners IT support, telecommunications), but also dashboards for specific process management service level agreements (SLAs) and security. This constitutes a step toward level 4 maturity in other critical processes.

With the release of COBIT 5 and an especially challenging e-health delivery programme for the forthcoming years in NHS Fife, the organization is focusing even more intently on meeting stakeholders' expectations and reviewing the e-health governance structure of NHS Fife to ascertain how to make the best use of the additional features, especially the principle of meeting stakeholder needs.

Elena Beratarbide, CISA

Is an experienced IT consultant and security auditor for Touché & Ross (Deloitte), KPMG and Fujitsu. Beratarbide is the e-health manager for the National Health Service (NHS) in Fife, Scotland, UK. She is also an active e-health researcher in collaboration with the computer science department of St. Andrews University (Scotland, UK), the Business Management Department—DOE of the Polytechnical University of Valencia (Spain), Capella University (USA), Middlesex University (UK) and the NHS.

Pablo Borges

Is an experienced IT consultant, working in IT governance projects across the Americas and Europe since 2006. Borges leads multidisciplinary teams to drive improvement in IT processes aligned with best practices, combining frameworks such as COBIT and ITIL with quality standards, such as ISO 27001, to design tailor-made solutions that suit business needs. He specializes in continual improvement projects and provides support in areas including information security, risk management, business continuity, major incidents and change management.

Donald Wilson, CITP

Is head of e-health and has served the NHS in Fife , Scotland, UK, for 15 years. He began his career in the electronics and computer technology field with Scottish Water and Motorola. Wilson is an active member of the e-Health Leads Group, which provides a link between NHS Boards and the Scottish Government e-Health Programme at a management level, and is key to the successful implementation of projects at the NHS board level.

Endnotes

[1] **NHS Fife web site**

Research Update

Recently Released COBIT 5 Publications

- ***COBIT® 5 for Information Security***

Upcoming Fourth Quarter Releases for COBIT 5

- ***COBIT® Process Assessment Model (PAM): Using COBIT® 5***
- ***COBIT® Assessor Guide: Using COBIT® 5* and Tool Kit**
- ***COBIT® Self-assessment Guide: Using COBIT® 5* and Tool Kit**
- ***Securing Mobile Devices Using COBIT® 5***
- ***Securing Sensitive Personal Data or Information: Using COBIT® 5 for India's IT Act***
- ***COBIT® 5 Foundation-level Training***
- ***COBIT® 5 Process-level Training***
- ***COBIT® 5 Implementation-level Training***

For more information on COBIT publications and training, visit the COBIT 5 page of the ISACA web site.

8.7 Appendix 4b: NHSScotland Annual Conference. Poster: eHealth Demonstrator Project (CobIT)

The Scottish Government

eHealth

Better eHealth: Better Care

By implementing IT Governance

NHS Lothian · NHS Borders · NHS Fife · NHS SCOTLAND

1. Background

How can we ensure eHealth provide what NHS is demanding?
How to lead improvement on eHealth service areas?

Led by the above questions, NHS Fife has incorporated ITIL as a Best Practice standard for Service Management and has started working with CobiT as a higher level framework that allow working with a process vision, encompassing IT Governance processes and Business alignment.

An eHealth Governance Project has been established in 2007 within NHS Fife. Fife's work has been reviewed by NHS Borders and NHS Lothian who committed to participating in a joint programme of work to improve eHealth Governance across these regions, getting the best from collaborating alongside.

In the scope of an eHealth Demonstrator, these regions carried out an IT Governance project in 2008-2009, funded by the Scottish Government. The outcomes of this experience are presented in this poster.

The approach to eHealth Governance using COBIT is unique within NHS Scotland.

2. Motivations

There is desire within all three organisations to demonstrate measurable improvement in the performance of eHealth taking account of:

- Organisation goals
- eHealth Goals
- Risks
- Audit Recommendations
- User satisfaction

Why we're doing this? What are the benefits of implementing IT Governance?

- Improved aligning with NHS objectives
- To fulfil NHS's demands for better returns from IT investments
- To meet regulatory requirements, and comply with internal and external audits
- To mitigate increasingly complex eHealth related risks
- To increase the business value of Information Technology
- For monitoring and improving critical IT services/activities
- For cost optimisation by following standardised approaches
- To ensure IT services meet quality, fiduciary and security needs
- To improve the efficiency of eHealth services
- To enhance collaboration between eHealth boards, regarding best practices, proven methodologies, experiences, and knowledge in specific eHealth areas.

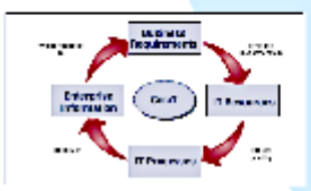
3. CobiT

Control Objectives for Information and related Technology (COBIT®) it's an internationally adopted Framework for IT Governance, representing the consensus of industry and experts. It provides good practices across a domain and process framework presenting activities and resource management in a manageable and logical structure.

These practices help optimising IT value and business alignment, minimise risk, ensure service delivery and provide a measure against which an IT Department can benchmark.

CobiT is composed of:

- 4 Domains and 34 process covering from strategic to implementation, service delivery, and monitoring.
- A maturity model for each IT process; to assess the situation, define target levels, and fill the gaps.
- Control Objectives: to help attain IT objectives and deliver the services the needed by the enterprise.
- Activities and Responsibilities chart (RACI)
- Performance measurement and metrics.



4. Methodology

CoBiT framework is used as the foundations of the project and to guide the implementation by following the IT Governance roadmap.

The framework is used in all project phases, from identifying needs, envisioning the solution, planning the solution, and finally through the implementation.

Meycor CoBiT software tools (provided by Datasec) are widely used for helping and supporting all the phases and activities to be taken, assuring tighten to a formal methodology and maximizing productivity.

ITIL and CoBiT complement each other and work together to achieve eHealth Governance goals. Other best practices extracted from PMI, Risk and Security Management (ISO 27002), among others are also used.

External consultancy services support the delivery of the project, contributing with expertise, continuous training on CobiT and the software tools, and leading the implementation roadmap for achieving the desired results.

The three boards collaborate sharing documentation and knowledge on different domains, getting the best of this synergy.

5. Outcomes from the project

The Demonstrator project most remarkable achievements are:

- Defined the foundations so that NHS boards can continue the effort later with a determined autonomy level implementing IT Governance.
- It provided a baseline, highlighting the gaps in comparison with the best practices.
- Assessed eHealth alignment with the organisational goals, risk culture, value delivery, and audit requirements.
- Defined an eHealth Improvement path to follow, regarding core services and processes considered critical for the organisation.
- Created fluent communication and collaboration channels within and between eHealth boards to share experiences & knowledge thus leading to synergise efforts.
- Supplied realistic time and effort estimates on the works to come.
- Created structures to measure performance and goals attainment in different processes and areas.

The three boards are strongly committed and will continue the IT Governance project beyond the Demonstrator experience, collaborating and pushing forward eHealth improvement path established.

6. Keys to success

As lessons learnt and key factors to succeed to highlight:

- Strong management commitment at different levels is a must
- Be aware of the long term challenge and effort, analyze your readiness
- Evaluate options for long term funding sources
- Prepare the ground for the project, sell the project internally and get commitment
- Manage realistic expectations!
- Appoint a dedicated resource with the right profile for the knowledge transfer
- Provide a local facilitator with good knowledge of the organisation
- Awareness campaign, training, training, and more training; this is critical
- Stick to the methodology and take advantage of the software tools
- Don't overestimate the effort for Project Management
- Help from external consultants is needed at the first stages
- Carry out a Pilot process to help you see the development in full and estimates
- Focus on few critical areas/processes to start the improvement plans
- Create good monitoring structures to track progress and tackle issues
- Have the ability to incorporate the tasks into the normal daily operations
- See the long term benefits an aim for them!

Contact details

Demonstrator project funded by The Scottish Government

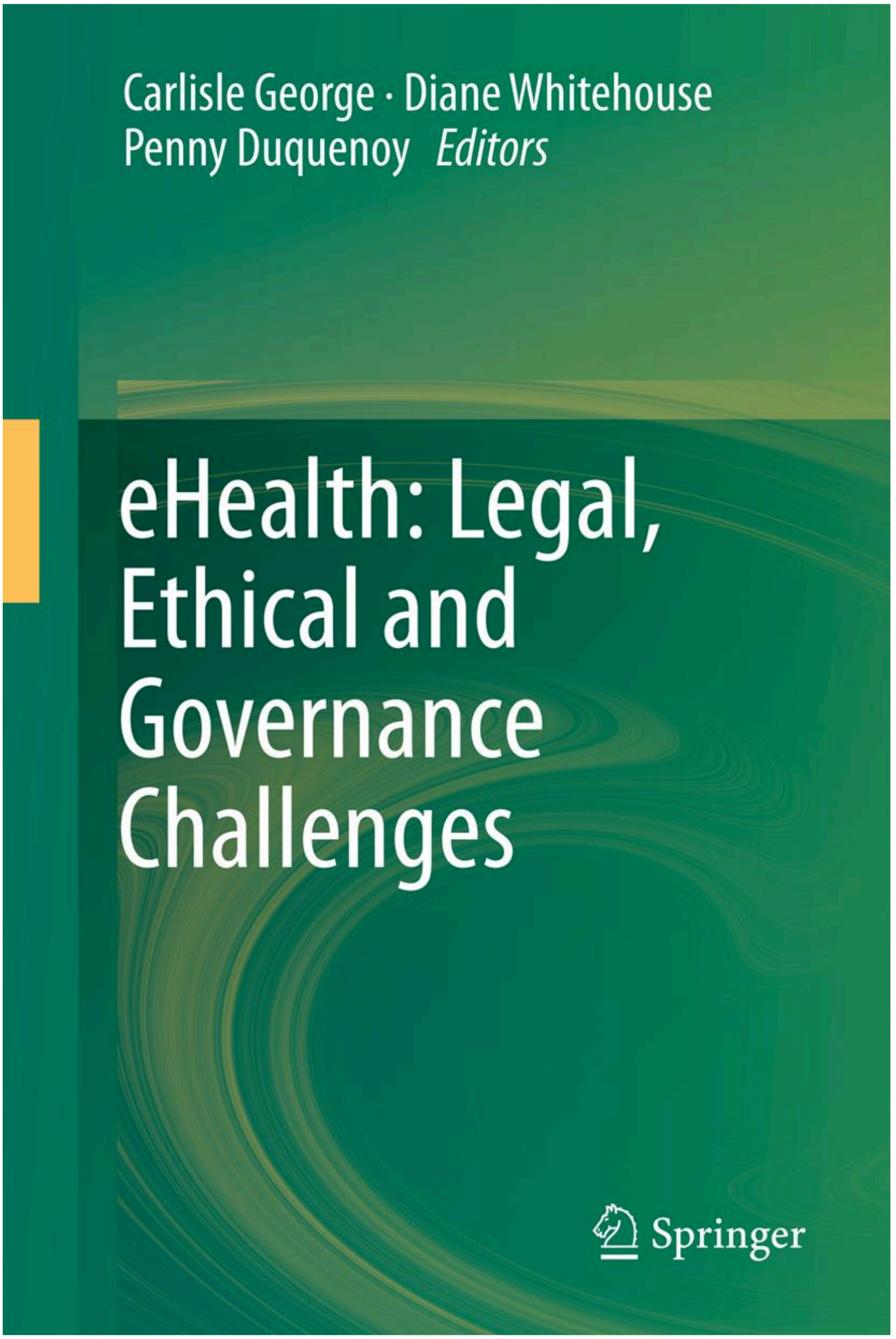
8.8 Appendix 5a: eHealth Governance in Scotland: A Cross-Sectoral and Cross-National Comparison

eHealth: Legal, Ethical and Governance Challenges (2013)

Chapter 13. p. 299-327

DOI 10.1007/978-3-642-22474-4_13

Full paper: Appendix 3


Carlisle George · Diane Whitehouse
Penny Duquenoy *Editors*
eHealth: Legal, Ethical and Governance Challenges
Springer

Springer

eHealth: Legal, Ethical and Governance Challenges (2012)

Editors: ***Carlisle George***, *Principal Lecturer and Barrister, Middlesex University, UK*
Diane Whitehouse, *eHealth Consultant, The Castlegate Consultancy, UK*
Penny Duquenoy, *Principal Lecturer Middlesex University, UK*

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***Flora Giorgio**, Policy officer, ICT for Health Unit, European Commission, Belgium*

Elena Beratarbide

Information Engineer, CISA

"Elena helped me in implementing the business plan for IT consulting and logical security projects in all spheres of the General Administration of the Spanish State." July 12, 2009

M. Timoteo, Account Manager, Fujitsu Services Spain

Elena Beratarbide (born 1969, San Sebastián, Spain) is an eHealth researcher and a senior IT Service Manager at the NHS (National Health Service) in Fife, Scotland. Her twenty-two year career with Touché&Ross (now **Deloitte**), KPMG and Fujitsu prior to her appointment at the NHS Fife included senior Business and IT consulting, Information Systems, Software design and development and teaching, receiving **Excellence Awards** on several occasions for her professional input (2002-2005 Fujitsu).

She's playing a role transforming the NHS Fife IT support service in line with eHealth Governance best practices and, as a researcher, contributing with new knowledge and understanding of how eHealth Governance is happening across the health care organisations in Scotland and making relevant **recommendations to the Scottish Executive (2009).** Her research activity during the last 4 years on this area, has been conducted in collaboration, St. Andrews University, Polytechnical University of Valencia and the NHS in Scotland.

Beratarbide developed her carrier from a multidisciplinary approach, combining her qualifications as ***Information Engineer***, business management (**processes, methods and logistics**), Computer science (physical systems) and Certified Information Systems Auditor (CISA).

She is best known for her contribution to the **integration of new technologies within public and private organisations**, producing **strategic plans** to help **local government** adapting to **the information society**, using technology to get government and citizens closer, but also implementing and **optimising ICT** and **auditing systems** not only within the public sector but also private organisations in a variety of industry sectors in different countries.

Since 1988 when she initially published ***"Integrated Systems"*** (Venezuela), Beratarbide developed a variety of resources supporting training on both IT and business managements areas like ***"Information Quality Assessment: A Methodology for External Financial Auditors" (Venezuela, 1991), "Business management for young entrepreneurs"*** (Spain, 1995), a series of training notebooks on ***"Excel: a financial analysis approach"*** (1997), ***"Office automation"*** (2001), ***"LAN/WAN networks"*** (2001). After this stage Beratarbide started publishing more senior work in collaboration with other authors, Vicente Delás (***"IT strategies for local government"***, Spain, 2001), Pablo Borges (***"IT Governance implementation in the health sector: NHS case studies"***, Scotland, 2009) and Tom Kelsey (***"IT Governance - a key enabler of better eHealth better care"***, Massachusetts, 2009-2010).

Previous work in IT and eHealth Governance involves also her ***"Causal model of factors involved in the adaptation of NHS to the Information Society"*** (Spain, 2008) and a reviewed version after a ***model localisation through a Delphi exercise*** (Highest Standard Research Paper Award – IADIS Germany 2010) and recently a ***"Multi-case analysis of the eHealth Governance factor"*** (Germany, 2010).

Beratarbide is now preparing her next publication along with Tom Kelsey (St. Andrews University) on a ***longitudinal analysis of eHealth Governance within the NHS in Scotland*** and a ***cross-sectoral and cross-national comparison of eHealth Governance*** (Springer, 2011) coordinated by Middlesex University, UK.

Beratarbide presented her contribution on IT and eHealth Governance in conferences like ITSMF UK, NHSScotland, AXIOS and IADIS.

"Tom is a leading world expert in medical and biomedical research. His results have not only increased our awareness of important aspects of human fertility, but also stimulated important research projects across the globe." July 18, 2010

W. Hamish B. WALLACE MB.BS., MD (Lond)., FRCP (Edin)., FRCPCH., FRCS - CATSCAN Clinical Lead, Royal Hospital for Sick Children, Edinburgh, UK.

Tom Kelsey (born 1961, Aylesford, England) is a senior research fellow at the School of Computer Science of the University of St Andrews in Scotland. His primary research interests are in Bio-medical Modelling, Medical Informatics, and Computational Mathematics.

Kelsey started his career in Logistics Management, involved in sourcing, deploying and evaluating Resource Planning systems for multinational corporations such as North American Philips, Acatos & Hutcheson plc and SA Uniconfis. Having a Bachelors Degree in Mathematics from Heriot-Watt University, Edinburgh, Kelsey returned to academia in 1995 to take a Masters Degree in Numerical Analysis & Programming at the University of Dundee, followed by a PhD in Computational Mathematics at the University of St Andrews, graduating in 2000. Kelsey then obtained funding for postdoctoral research at St Andrews into formalised computer algebra in conjunction with NAG Ltd., followed by a postdoctoral research position studying symmetry-breaking methods in Constraint Satisfaction Problems (an NP-hard class of problems – such as planning, scheduling and resource allocation - that often arise in industrial and commercial settings). After a year working as a Teaching Fellow, Kelsey was promoted to Senior Research Fellow and given University funds to undertake further studies into Constraint Satisfaction and Bio-medical Modelling. In 2006 Kelsey was appointed to a tenured position at the University of St Andrews, as part of a £1.3 million grant from the UK Engineering & Physical Sciences Research Council (EPSRC) covering interdisciplinary research into Computational Mathematics. Kelsey is currently a co-investigator on a further EPSRC award into modelling and abstraction themes in Constraints research, and is an active member of the prestigious Centre for Interdisciplinary Research in Computational Algebra (CIRCA) based in the schools of Mathematics and Computer Science at the University of St Andrews.

In addition to his University work, Kelsey is Technical Director of the Wallace-Kelsey Research Foundation, a charitable trust that funds investigations into the fertility of survivors of childhood cancer. Kelsey is a member of the International Society for Computational Biology (ISCB), the British Machine Vision Association, and the Royal Society of Medicine. He is on the executive board of the NHS Scotland Managed Clinical Network governing paediatric oncology in Scotland.

Kelsey has published extensively in high-impact journals such as Public Library of Science One; Human Reproduction; The International Journal of Radiation Biology, Oncology & Physics; and Reproductive Biomedicine Online. His work relating ovarian volume to human age at menopause, his calculation of the Effective Sterilising Dose of radiation for human females, and his publication of the first model of human ovarian reserve from conception to the menopause have led to extensive international media interest, with news reports on the BBC, NBC, Fox, CNN, etc. And news articles and features in the Times, the Scientific American, the Wall St Journal, Nature News Update, Le Monde, El Pais, etc. Kelsey is currently working with researchers from Glasgow, Edinburgh and Montevideo on studies that link the Wallace-Kelsey model of ovarian reserve to other reproductive indicators such as serum Anti-Muellerian Hormone (AMH) levels, ovarian volumes, and numbers of eggs harvested during in-vitro fertilisation cycles.

Kelsey has given invited talks at major international conferences, symposia and meetings. Recent examples include talks at the Asian Symposium on Computer Mathematics in December 2009, and the ISCB Latin America meeting in March 2010. Kelsey will be a keynote speaker at the Reproductive Function and Dysfunction conference being held in September 2011 (the XVth International Development and Function of Reproductive Organs conference series).

eHealth governance in Scotland:

a cross-sectoral and cross-national comparison

Eng. Elena Beratarbide, CISA

National Health Service, Scotland

Dr. Tom Kelsey, PhD

University of St. Andrews, Scotland

Abstract

This study is built on the proposition that alignment between business and information technology (IT) through eHealth governance has a positive effect on healthcare performance and effectiveness. We present some theoretical foundations and the outcome of healthcare organization case studies in Scotland, comparing and contrasting the situation of eHealth governance with IT governance in other industry sectors and countries. This study is a contribution towards a better understanding of how IT governance is happening. We propose practical recommendations for healthcare executives to optimize eHealth governance decisions on a broad range of issues and opportunities that information and related technologies offer to healthcare professionals, patients, relatives and carers; in other words, citizens interacting with healthcare services in the Information Society.

Keywords

eHealth, Health Informatics. Information Society, IT, IT governance, IT Management, IT/Business alignment, National Health Service, Telehealth, Telemedicine

3.1 Introduction, motivation and concepts

eHealth governance is IT governance in the healthcare sector. This is a controversial topic as the boundaries between eHealth and IT are not crystal clear. However, the governance of both eHealth and IT to achieve alignment, between IT and the business (or healthcare organisation) involves the same processes, metrics and tools. Through eHealth governance, the healthcare organisation can ensure effectiveness of its eHealth strategies, which involve the application of information and related technologies to healthcare. In the remainder of this section we explain why eHealth governance is important and we give examples of existing studies from the literature.

3.1.1 Nature of the problem

Health services across the UK are making important investments and efforts to deliver eHealth strategies and the subsequent eHealth Programmes developed by each of the four National Health Service (NHS) Boards[1]. In Scotland, this involves an internal set of transformations oriented to the implementation of an integrated care record jointly managed by patients and healthcare professionals, with embedded data security and confidentiality consented to by the patient. It also incorporates the development, innovative application and tangible implementation of information and related technologies across the healthcare service, wherever they are needed, to improve effectiveness of healthcare for better health. It includes the use of telemedicine and clinical systems used for diagnosis and healthcare pathways, but also policies and protocols that ensure the confidentiality and security of sensitive data. eHealth involves "the provision of information, education and services to consumers, including patients and citizens" (Pagliari, 2005).

The term "eHealth" conveys the need to address a broader agenda than that implied by the term IT. eHealth encompasses much more than the deployment of computer technology. It involves information and related technologies and governance processes in support of health. It also stimulates thought and discussion about the broad range of issues and opportunities that technology offers in the healthcare setting to both healthcare professionals and patients. This wider picture of eHealth, with boundaries beyond the healthcare institutions, which involve patients who are also citizens, is the foundation-stone of this piece of research. eHealth requires a transformation of the way citizens (patients, potential patients or carers) and healthcare services interact (Castells, 2005). In other words, eHealth is a vehicle for progressing towards the Information and Knowledge Society.

But why are we interested in eHealth governance? The NHS in the UK is under enormous pressure to achieve efficiencies in a number of areas, and not only financially. Inefficiencies across units and functions impact on financial inefficiency but also, and more importantly, on poor patient and social care. Is it possible, or even desirable, to achieve the efficiencies that the NHS is looking for without IT and healthcare units working in partnership, in harmony (Luftman, 2000) and sharing targets and risks?

---

[1] The UK has four home countries which each has its own national health service for which it is independently responsible.

This chapter aims to answer this question by contrasting and comparing expectations and experiences of healthcare organizations with other sectors across the globe in terms of eHealth governance and eHealth/healthcare alignment. The main reason for interest in this area is the need for healthcare organizations (HCOs) to understand how to provide assurances that eHealth will be efficient enough to satisfy healthcare needs and expectations, not only from internal stakeholders' points of view but those of patients, carers and any citizens that have expectations concerning healthcare. We want to understand how eHealth governance is taking place. Numerous questions are involved. We list them here. How are NHS Boards implementing IT governance? What are the drivers? How are IT and eHealth governance initiatives being approached? Which resources and structures are involved? How long is the improvement process taking? What is the effort involved? What benefits are identified? Is it possible to identify an implementation pattern? What are the lessons learned?

3.1.2 Previous studies

This research is based on a study conducted between 2005 and 2010, which involved a comprehensive literature review (Beratarbide, 2008) and a Delphi exercise (Beratarbide, 2010a) to propose a causal model of determining factors involved in the adaptation of National Health Services to the Information Society with a particular focus on Scotland. This chapter refers mainly to the outcome of the eHealth Demonstrator project co-sponsored by the Scottish Executive and three NHS Boards in 2008-2009 (Datasec and NHS Fife, 2009). Its purpose was to understand the impact of Control Objectives for Information and related Technology (COBIT) on improving eHealth governance within the NHS in Scotland, and to extract recommendations for further guidance and advice across other NHS Boards.

Other studies have been analyzed to compare and contrast the situation in other industry sectors and countries as detailed Annex 1. Referenced studies provide a vision of the situation within a large range of industry sectors that include, but are not restricted to:

- Financial services
- Government and public sector
- Healthcare and pharmaceutical
- IT/telecom
- Leisure/Entertainment, food and beverages
- Manufacturing and chemicals
- Retail.

The geographical scope of the comparisons and studies analyzed provide information from all over the world 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.

3.2 Scottish study

Our results are based on extensive measurement and analysis of IT/eHealth governance in Scotland from 2006 to the present. After a comprehensive literature review and a preliminary Delphi study, three Health Boards participated in a comparative evaluation of their current IT/eHealth governance practices. A full description is given in the proceedings of the IADIS eHealth 2010 conference (Beratarbide, 2010b,c).

3.3 Cross-sectoral and cross-national comparisons on eHealth governance

eHealth governance is about decisions around eHealth projects, budget and investments. It also involves identifying or allocating ownership of eHealth technology. This is an adaptation of the IT Governance concept used in the Strategic Alignment Maturity SAM assessment approach (Luftman, 1996). It is also is supported by other authors like Henderson and Venkatraman (1996) and Sledgianowski and Luftman (2005) although, in these cases, it is applied to multiple sectors and not only healthcare.

The SAM model suggests key IT governance practices and strategic choices that, when carried out together, enhance IT and business alignment.

The areas to take into account when analyzing governance as suggested by Luftman and Sledgianowski are also applicable within eHealth. They mainly involve:

- Healthcare strategic planning with eHealth involvement and vice versa
- eHealth structure
- Chief information officer reporting level
- eHealth budgeting and investment management
- eHealth steering committees (frequency, formality and effectiveness)
- eHealth projects prioritization and integration via eHealth programme.

We also analyzed the impact of other components of business-IT alignment, as these are key to determine the best approach to implement eHealth governance within each organization. Elements such as communications, competency and value measurement, partnership, skills, scope and architecture influence the approach to be taken by each healthcare organization.

3.3.1 eHealth Governance Drivers and triggers

Within the NHS in Scotland, the main drivers to initiate a formal IT governance initiative were the need to achieve savings through efficiencies, which implies a better use of IT investments but also, conversely, the growth of pressures for compliance with best practices and standards via either internal or external audits (Datasec and NHS Fife, 2009).

Chief information officers within the NHS (better known as Heads of eHealth, IT or information management or technology) also needed to demonstrate good IT performance and the value that IT is adding to healthcare. Chief information officers were concerned about the negative effect that poor alignment with the healthcare strategy has, not only from the healthcare perspective but also within their own areas of accountability. The fact that other boards were achieving improvements on this area after adopting well-known IT governance frameworks meant that the Scottish Executive was interested in feedback about experiences in this area, being open to co-fund pilot studies within the NHS Boards, and encouraging other chief information officers to join the venture and adopt a similar approach.

Situation in other industry sectors and countries.

Studies comparing the 2006 and 2008 status of IT governance, indicate that interest is not only present but increasing (58%) globally across all industry sectors (ITGI, 2008). South America represents the biggest potential for improvement in IT governance (only 27% of its organizations have or are planning to have IT governance implementations). In global terms, retail and manufacturing sectors seem to be less keen to implement this form of governance.

An interesting observation is that organizations with lower percentages of interest in the implementation of IT governance initiatives indicate high scores on their own perception of alignment (ITGI, 2008). Our interpretation, from the triggers point of view, is that organizations that have a self-perception of functioning well feel less pressure for or interest in improvement initiatives.

Within Europe, the average alignment scores are not significantly different between different countries, sizes, turnovers and business strategies (Cumps et al., 2006). The alignment maturity average is around 57% within a fairly normal distribution; consequently for the vast majority of Western Europe organizations there is considerable room for improvement of IT. Other studies suggest that 64% of the organizations in Europe are at some stage of the IT governance implementation process (ITGI, 2008) and nearly 80% recognize the potential for improvement. This is consistent with our proposition: the main trigger to improve IT governance is awareness of the need to do it.

Studies in South Africa (Evans, 2004) indicate that the main reasons for information and communication technologies project failures supporting business are a lack of understanding of the real business needs and poor expectations management, which also suggests that this is an important issue that triggers actions for improvement. This is demonstrated by other studies in which an estimated 40% of the IT projects failed to yield a positive return (Watters, 2004), while organizations are making huge investments in IT to secure or maintain competitive advantages (Applegate et al., 2003). This situation is not sustainable. It provides a reason why some organizations trigger necessary changes involving new visionaries to provide strategic IT direction and coordinate IT activities at the corporate level. There is further corroborating evidence from the study based in New Zealand (Bowen *et al.*, 2007). A national survey also shows IT and business alignment as the top concern for USA companies (instiLink, 2008). A study across different industry sectors in Australia concluded that organizations may expect better results from their IT investments and capabilities if there are good IT governance processes and mechanisms in place (Marshall and Mckay, 2003).ithin the NHS in Scotland, there was a need to achieve savings through efficiencies and, on the other hand, pressures for compliance with best practices and standards via internal and external audits (eHealth Demonstrator Project files). Other healthcare organizations studies reflect similar pressures: in the United Kingdom, NHS Trusts and hospitals have to make radical changes, often at a fast rate, to their operations and processes, and require IT to be responsive (Patel, 2003). Studies in the USA refer to pressures as the current strategic imperative for large hospitals to improve economies by driving higher volumes of output at a faster speed through physically consolidated or limited capacity (Samarth, 2007). This study also reinforces the expectation that an alignment will indicate that business value is being gained from IT investments.

But this is not the only source of pressure. A study in Swiss hospitals (Krey et al., 2010) shows how critical IT governance is becoming to achieve alignment and efficient investments. The study also points to external and internal pressures to become aligned with the introduction of Diagnosis Related Groups in Europe by 2013 (Krey et al., 2010). These pressures are triggering the search for methods and practices to solve operational planning and optimization of IT processes. The study in Swiss hospitals also shows how some particularities of healthcare organizations, in terms of

legal restraints and increasingly heterogeneous IT systems, are just two aspects which make the healthcare sector a sensible field in which to contemplate the implementation of IT governance.

Standards compliance has been identified in a number of studies as a trigger (or at least a source of pressure) towards IT/eHealth governance. This has been identified within the NHS in our study, but also within the Swiss hospitals (Krey et al., 2010) where 47% of the hospitals have not yet implemented any governance standard (45% implemented ITIL and 8% COBIT). A trigger to improve IT governance within the financial sector in Belgium, specifically the need to comply with standards such as the Sarbanes-Oxley Act, was also identified (De Haes, 2008). A study in the healthcare sector in Portugal points to ITIL and ISO/IEC 38500 as a focus of attention to achieve better IT/eHealth performance (Velez et al., 2009).

A multi-sectoral study of 208 companies in Austria, including healthcare organizations, points towards eBusiness/eHealth requirements as a trigger to focus attention on IT governance (Bernroider, 2005). This is similar to the case of an international chemicals manufacturer (Sledgianowski and Luftman, 2005) where a new business strategy programme was put in place after a collapsed merger plan had left the company facing several challenges. In this case we also can see the pressures that follow organizational restructuring, and the need to find visionaries who would not miss the opportunities offered by emerging technologies to enable a new business strategy.

Aggregated reports (Steuperaert, 2004; Steuperaert, 2008) suggest that chief information officers already acknowledge the need for better IT governance practices. These studies include organizations in North and South America, Europe and Asia-Pacific with a mixture of industry sectors: manufacturing sector, government/public sector, IT/telecoms, financial services and retail. These reports suggest that in large organizations IT governance practices are already in place, although they do not use this particular term to describe them. In the organizations that participated in the survey, 93% of business managers recognized the importance of IT for delivering business strategies and expressed concerns about the operational problems they experience. At the same time, 80% of chief information officers appreciated that better governance of IT is required. Other studies report outsourcing as a vehicle for better alignment once the internal IT service failed to support the business efficiently (Shamekh, 2008).

Our interpretation of theses cases is that IT/chief information officers are exposed to high pressures to improve IT governance, not only for alignment purposes but also to reduce operational issues, particularly when outsourcing is an option for business managers. This observation is equally applicable within the healthcare sector.

3.3.2 eHealth Governance structures, roles and decisions

The current state of NHS Boards ICT/eHealth units analyzed results from a series of transformations over many years moving from centralized to decentralized back to centralized or semi-centralized structures. Wide impact eHealth/ICT decisions (the ones that affect all NHS Boards across Scotland) are centralized at national level (NHS Scotland, Scottish Executive) and involve primary care, community and acute services. Each NHS Board has its own eHealth delivery approach; some boards have specific structures to deliver the programme while other Boards have assigned this responsibility to existing units. At the present time NHS Boards are moving towards a federated eHealth model where a corporate eHealth body is accountable for prioritizing eHealth matters and allocating resources (i.e. large projects and security related aspects). Usually compulsory common policies and standards are established.

Some healthcare units have implemented IT solutions suitable for their own needs, but approval has to be granted centrally. It is still common practice to procure IT systems, before they are considered from a corporate perspective. To minimize security and continuity risks, there are controls in

place to analyze the impact on the infrastructure before it is implemented. This situation does not allow boards to make the most of their IT investments. The overall infrastructure procurement costs are higher due to duplication, and there are increasing maintenance and support costs and a reduced agility to change according to the complexity of the IT infrastructure base.

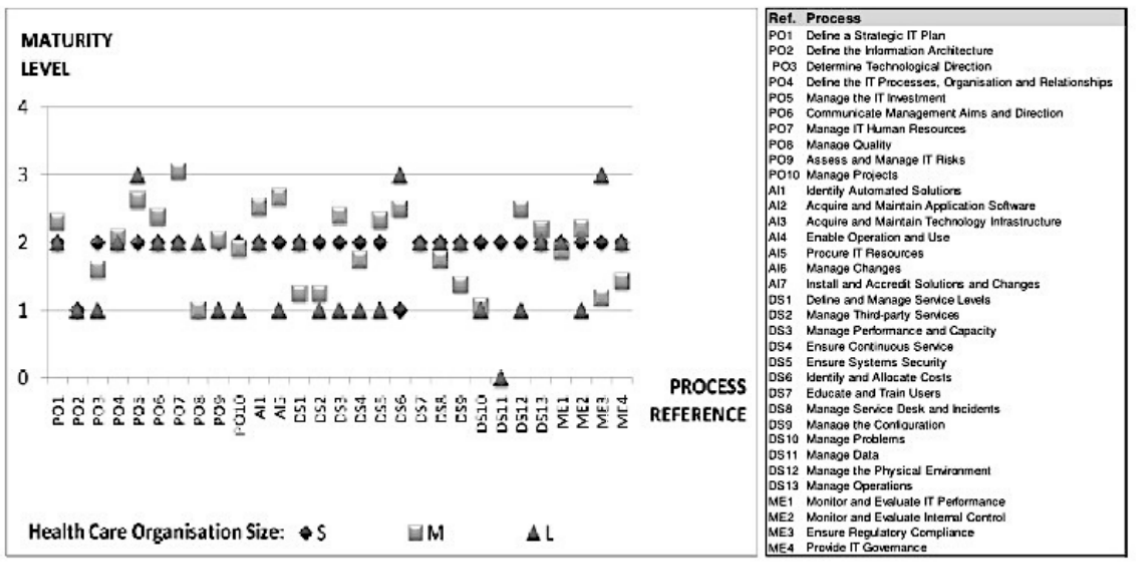
Decisions regarding the overall ICT/eHealth architecture and infrastructure priorities are taken using different structures (i.e. ICT Steering Committees, Senior Management Groups, Heads of either information technology or information management, Information Services, eHealth Programme) participating at Executive Board Meetings and eHealth matters are regularly included in the agenda. Change Advisory Boards are present in some boards. The scope is restricted to IT implementation and coordination endorsement. eHealth project scrutiny is normally conducted at senior management level.

The overall perception across the NHS Boards under study is that IT/eHealth governance is not mature (Fig **1**) with most of the relevant processes situated between levels 1 (Ad Hoc) and 2 (Repeatable but intuitive) on a scale of 0 to 4 of maturity as per the COBIT® framework (IT Governance Institute, 2007).

For the purpose of this study the data has been classified per IT Governance process, using the classification proposed by COBIT© and per type of organisation: small, medium or large based on the following criteria:

Table 3.2.2.1. Classification of boards under study.

Criteria	Small HCO	Medium HCO	Large HCO
eHealth/IT staff	±50	±80	±200
HCO employees	±4.000	±8.000	±28.000
Sites	±40	±90	±280
Bed (Acute specialities)	±350	±800	±2500
Population	±112.000	±360.000	±778.000



Ref.	Process
PO1	Define a Strategic IT Plan
PO2	Define the Information Architecture
PO3	Determine Technological Direction
PO4	Define the IT Processes, Organisation and Relationships
PO5	Manage the IT Investment
PO6	Communicate Management Aims and Direction
PO7	Manage IT Human Resources
PO8	Manage Quality
PO9	Assess and Manage IT Risks
PO10	Manage Projects
AI1	Identify Automated Solutions
AI2	Acquire and Maintain Application Software
AI3	Acquire and Maintain Technology Infrastructure
AI4	Enable Operation and Use
AI5	Procure IT Resources
AI6	Manage Changes
AI7	Install and Accredit Solutions and Changes
DS1	Define and Manage Service Levels
DS2	Manage Third-party Services
DS3	Manage Performance and Capacity
DS4	Ensure Continuous Service
DS5	Ensure Systems Security
DS6	Identify and Allocate Costs
DS7	Educate and Train Users
DS8	Manage Service Desk and Incidents
DS9	Manage the Configuration
DS10	Manage Problems
DS11	Manage Data
DS12	Manage the Physical Environment
DS13	Manage Operations
ME1	Monitor and Evaluate IT Performance
ME2	Monitor and Evaluate Internal Control
ME3	Ensure Regulatory Compliance
ME4	Provide IT Governance

Fig 1. **Maturity of processes based on a baseline assessment within the NHS in Scotland. Each dot represents a process assessed on each of the organisations participating. Processes are referenced according to COBIT naming conventions.**

Further details on specific findings that relate to the eHealth governance process are shown in the following figure. Organizations are also classified as small, medium or large according to their size for analysis purposes only.

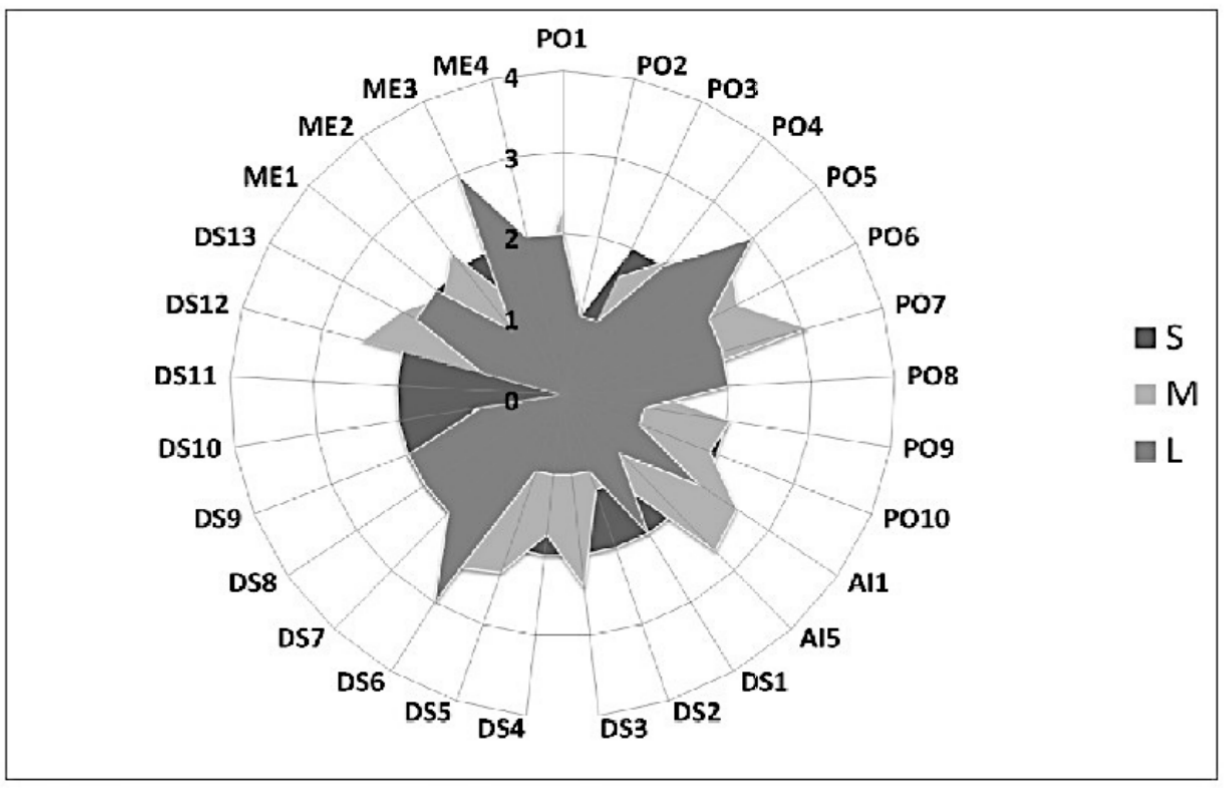


Fig 2. Scatter graph of eHealth governance processes maturity based on a COBIT® baseline assessment within the NHS in Scotland.

Situation in other industry sectors and countries.

We observed federated decentralization of IT units and a desire on the part of organizations to find an appropriate, yet different, model in several studies and sectors: chemicals manufacture (Sledgianowski and Luftman, 2005), healthcare organizations in Scotland (Datasec and NHS Fife, 2009) and also in other countries like in the USA, for example in a study of Boston hospitals (Samarth, 2007) or in Ohio (Smaltz *et al.*, 2007). Further studies within the public sector (Tan, Cater-Steel, Toleman, and Seaniger, 2007) reflect decentralized options.

In essence, a federated eHealth Governance archetype means decisions are taken by a central body or unit that is comprised by representation of different groups or units, each of which retains management of its own internal affairs. The central body is typically conformed by unit

managers, chief executives and IT. In opposition, descentralised archetypes involve decisions are taken independently throught the organisation, for example by each business unit or key process owners, but could also involve high levels of anarchy if decisions are taken at user level (individuals or small groups of users).

Federated decentralization involves a combination of both archetypes, and it is also the tendency observed in this study. This approach involves centralized IT decisions for architecture strategy with decentralization of implementation based on central rules.

Within the healthcare sector, studies show a mixture of eHealth governance archetypes. As with our study within the NHS in Scotland, decisions related with IT infrastructure strategies, principles, corporate IT architecture, corporate application needs and IT investment prioritization tend to be centralized either at a business or an IT "monarchy" archetype. In this context, a monarchy archetype involves radical centralization at the top of the decision making layers within the organisation or by IT, respectively.

Findings from studies within hospitals in Scotland, Boston and Ohio concur on this aspect. It is interesting to note the common finding that specific healthcare units – not only radiology but also other traditionally highly empowered healthcare units like medical records, anaesthetics or theatres – tend to operate IT governance in a more feudal style. In IT governance, feudal archetypes imply that IT decisions are taken at business unit level with no involvement of corporate IT. This "feudalist" approach is commonly applied to aspects like IT principles, IT architecture and application needs. Feudal approaches are also seen in areas that expect customized versions of common applications in a hospital environment, such as appointment or document management systems. In these cases, business units can be empowered to procure and implement applications to a limited extent.

Regarding accountability for decision making, multi-sectoral and cross-national studies suggest this is a "moving target" (Keyes-Pearce, 2002). Depending on the IT/eHealth governance archetype adopted, decisions are taken at different levels.

There is no conclusive evidence of a lack of clarity on accountability for IT decisions, priorities and outcomes. However, some studies indicate it is an issue (Keyes-Pearce, 2002) – specifically in large complex organizations (Bowen et al., 2007). Other studies indicate a clear separation of roles and responsibilities between business and IT (Krey *et al.*, 2010) (although this particular study acknowledges that only 39% of the hospitals involved in the study have defined processes in place). Although IT/eHealth Strategy Committees are a common practice (Bowen et al., 2007) (Smaltz et al., 2007) (Datasec and NHS Fife, 2009) (Patel, 2003) (Sledgianowski and Luftman, 2005) (Silvius, 2007), there are contradictory results. A 2010 Swiss study with a base of 141 hospitals shows that the vast majority of healthcare organizations do not have a strategy committee in place, and half of those that do have adopted informal approaches (Krey et al., 2010). The need to streamline lengthy decision-making processes has also been identified (Keyes-Pearce, 2002) (Datasec and NHS Fife, 2009).

3.2.3 Communications

Communications – within the eHealth governance context – are about a mutual understanding between IT and other healthcare areas through exchanges of information. Differences can be found in the quality of the information and in the way organizations communicate.

Communications maturity average within the Scottish NHS Boards' studies is located at SAM level 2, but smaller organizations perceived their level to be closer to 2 while larger organizations tend to be closer to Level 3 in a transition point between "Committed" and "Established". They are crossing

internal boundaries that include other organizations and boards (i.e. local, national and central government, general practices, the police and related social agencies).

In cultural terms, in all cases communication is encouraged organization-wide and it is expected that managers lead the process. eHealth related communication is mainly focused on reporting the status and coordination of projects. Within the Scottish NHS there is a perception that business and ICT management have a good degree of shared vision of the ICT role in enabling healthcare strategies and the impact on healthcare. However, there are shared concerns regarding managers and clinicians not speaking the same language as ICT and vice versa. We observed that within smaller organizations there is a perceived greater distance.

Situation in other sectors and countries.

Studies across different sectors and countries highlight the importance of communications between business and IT in order to facilitate alignment (Luftman, 2000), (Silvius, 2007) (Cumps et al., 2006) (ITGI, 2008) (Keyes-Pearce, 2002) (Shaffer et al., 2007) (Chan and Reich, 2007). These studies allocate communications to areas related to knowledge sharing, formality/informality of the communication style and culture within the organization, and also reporting and active participation in IT/eHealth governance-related structures.

In global and multi-sectoral reports, communications between business and IT are slowly improving (ITGI, 2008). This is remarkably more proactive and agile in the IT/Telecom sector. Results also suggest that the level of understanding is growing, although quite slowly (ITGI, 2008). In general terms **communication** is at a transition point between SAM level 2 (committed) and level 3 (established).

A study of companies in Australasia suggests that IT governance was more effective in large complex companies when chief executive officers understand both IT and the business, so as to identify better IT opportunities to add value (Bowen *et al.*, 2007). Moreover, IT participation on Strategic Steering Committees improved the ability of executives to understand technology opportunities and issues (Patel, 2003) (Marshall & Mckay, 2003) (Bowen et al., 2007) (Samarth, 2007) (Smaltz et al., 2007).

Several studies show the importance of sharing knowledge openly and using informal channels (Patel, 2003) (Beimborn et al., 2007) (Bowen *et al.*, 2007) (Evans, 2004) (Sledgianowski and Luftman, 2005). Within the chemical sector the focus is on pervasive, agile, face-to-face communications. Conversely, for healthcare, the emphasis is on communication "when and as needed" and minimizing travel and face-to-face meetings when possible. Staff meetings to discuss business/IT initiatives are organized twice a year in the chemicals sector; for healthcare, they are held on monthly/bi-monthly basis. Other members of staff are kept up-to-date via department/team meetings. In some Boards other topic groups meet (i.e. ICT projects, eHealth and/or IT Change Advisory Boards , Primary Care Steering Committees). Formal reporting is shown in all the studies under review.

Different mechanisms are in place to improve or facilitate communications; in some studies IT strategies are communicated through the intranet (with an educational intention) and by senior managers (Bowen et al., 2007) - in this case to ratify their commitment, but also through teleconferences (Sledgianowski & Luftman, 2005) and Office Communication Systems[2] (Datasec & NHS Fife,

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2 These are Office Communication Systems other than traditional phone systems (i.e. instant messaging, voice or video over Internet protocol).

2009). Some studies confirm issues with ineffective communications (Bowen et al., 2007), although the important role of good communications for effective IT/eHealth governance is generally recognized. Both in the health sector and in the chemical sector the need for a cultural change to improve communication was observed (Sledgianowski & Luftman, 2005) (Velez et al., 2009) (Evans, 2004).

3.2.4 Competency/value measurement

The situation in terms of SAM level of Value Measurement maturity is equivalent across the boards, and is situated at a high level 2. Practices do not vary substantially, having service level agreements between IT and business units and the offering of a portfolio of services. Formal Operational Level Agreements OLAs are either not in place or are not formalized within the NHS organizations under study. Service levels are formally reported but practices are not consistent across the healthcare Boards. Specific measurements of the contribution of IT/eHealth to the business profits or healthcare in the case of healthcare organizations, quality, efficiency or productivity are not yet implemented.

Regarding evaluation of IT investment, within the NHS Boards studied these practices are at an early stage and the actual healthcare benefits have not yet been measured. Some post-project implementation reviews are conducted, but are usually ICT-focused rather than healthcare value-driven. Although benchmarking is appreciated as a good practice to help achieving improvements, there is no indication in any of the cases analyzed that the NHS Boards are ready to implement it in the short term. Across the Boards there is a consistent perception that new ICT investments and enhancements are prioritized over business strategy, although they recognize that it might be relatively difficult to demonstrate the value of these investments. Performance of new ICT investment projects is not regularly monitored and benchmarked against strategic objectives.

Situation in other sectors and countries.

The situation across sectors is similarly situated at early stages of maturity (commonly level 2 of SAM or Capability and Maturity Model (CMM). Formal IT evaluation processes occur but rather infrequently in many organizations (Farbey, Land, and Targett, 1993). Chief information officers seem to be clear on the need for demonstrating value for any proposed IT investment, but practices to achieve this vary across organizations, regardless of industry sector or country.

Within the healthcare sector, there are studies that indicate the majority of healthcare chief information officers struggle to demonstrate IT value with real-time quantifiable metrics (Krey *et al.*, 2010) (Datasec and NHS Fife, 2009). Organizations tend to use different and combined sets of metrics to measure their IT operational performance and overall value to the business. This situation is in line with recommendations made by other studies (Schwarz and Hirschheim, 2003) (Willcocks, 1992).

Some specific practices are independent of industry sectors or countries. The main practices to measure and manage IT value are[3]:

- **Business cases** are adopted either to articulate business needs, facilitate active participation of different stakeholders and professionals views, or to measure results during implementation of projects as well as post-implementation. This is also applied along with project management practices and metrics. Business cases are probably adopted because they are easier to implement than other IT metrics (Marshall and Mckay, 2003) (Samarth, 2007) (Shaffer et al., 2007).
- **Portfolio management**: (De Haes, 2008) (Marshall and Mckay, 2003) (Bowen et al., 2007) (Cumps et al., 2006) (Samarth, 2007) (Shaffer et al., 2007).
- **Service level management**: Although the degree of formality on SLAs and OLAs is not consistent across the studies. OLAs are less common that SLAs, at least in a formal format. (Samarth, 2007) (Krey et al., 2010) (Silvius, 2007) (Velez et al., 2009) (Evans, 2004) (Shaffer et al., 2007)
- **Project management** (De Haes, 2008) (Marshall and Mckay, 2003) (Bowen et al., 2007) (Patel, 2003) (Samarth, 2007) (Velez et al., 2009) (Evans, 2004) (Smaltz et al., 2007)
- **Financial metrics (i.e. Cost-benefit analysis, return on investment)**: (Marshall and Mckay, 2003) (Bowen et al., 2007) (Cumps et al., 2006) (ITGI, 2008) (Samarth, 2007).
- **Post-implementation reviews** are either related to project closure, system deployments or lessons learned sessions (Marshall and Mckay, 2003) (Beimborn et al., 2007) (Bowen et al., 2007). Although some studies point to the fact that the importance is recognized, it is not routinely done. Within small or limited-resource organizations, this practice is relegated as it is perceived as quite resource consuming. It was also identified as an indicator of a lack of management commitment to continuous improvement (Bowen *et al.*, 2007). Moreover, the benefits of a reduced practice that considers only the time and budget aspects of implementation are inadequate in showing the actual value of IT investments.
- **Risk assessments** (both financial and non-financial) (Bowen et al., 2007). Moreover, risk management is one of the four most importance practices for IT governance according to a global and multi-sectoral survey (ITGI, 2008). It is applied, at least informally, in the vast majority of the organizations (Marshall and Mckay, 2003) (Bowen et al., 2007) (ITGI, 2008) (Krey et al., 2010) (Shaffer et al., 2007).
- **Other practices** like Enterprise Resource Planning or Balanced Scorecard are less frequently adopted. Balanced Scorecard is present in fewer than 30% of organizations (ITGI, 2008) all over the world, but some studies indicate that Balanced Scorecard is gaining popularity in healthcare organizations (Cumps *et al.*, 2006) (Datasec and NHS Fife, 2009) (Marshall and Mckay, 2003). Within the healthcare sector IT metrics are not extensively implemented (Datasec and NHS Fife, 2009) (Krey et al., 2010).

IT value is identified as a moving concept from the purely financial angle, i.e. cost-benefit analysis, to a more "consumer direction" approach involving risks, opportunities, competitiveness, uncertainty and intangible aspects (Serafeimidis and Smithson, 2000). A common challenge faced by organizations is the formulation of appropriate metrics for benefits and performance at either IT or business level for their IT investments (Bowen et al., 2007). Basic metrics like "on-time" or "within-budget" are easier to implement and so can be easily adopted, but actual business benefits are a wider concept, and are far from common practice regardless of sector or country (Bowen *et al.*, 2007). Other studies found that organizations that only use return on investment as a measure will obtain less alignment that a combination of practices, such us return on

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[3] While most of the practices identified are described briefly, in some cases only useful citations are referenced as these are common concepts broadly documented and embedded in the business management and IT fields.

investment, cost-benefit analysis, Total Cost of Ownership (TCO) and Balanced Scorecard (Cumps *et al.*, 2006).

Worldwide and cross-sectoral studies show that half of the organizations apply, or plan to apply, IT value principles. Yet they are not necessarily familiar with the specific terminology and frameworks (ITGI, 2008). Studies also corroborate that the lack of knowledge, skills and expertise are the main obstacles to the adoption or improvement of actual value delivery management, along with uncertainty about the actual outcome of the different practices and metrics available. It is not obvious what are the best practices and metrics to use, nor how easy they are to implement (ITGI, 2008).

Cross-national and cross-sectoral studies highlight the benefits of involving champions in their projects to ensure better returns (Bowen et al., 2007) (ITGI, 2008) (Silvius, 2007) (Smaltz et al., 2007) (Shaffer et al., 2007). Some studies also show the strong dependency of value delivery with mature levels of communication and partnership. It is seen as essential that lower level operational groups work together to transfer strategic goals into daily business routines (Beimborn et al., 2007) (Bernroider, 2005) (ITGI, 2008) (Patel, 2003) (Samarth, 2007) (Krey et al., 2010) (Shaffer et al., 2007).

3.2.5 Partnership

We have adapted SAM concepts to the eHealth context: Partnership involves eHealth and healthcare organizations working together at all levels and stages, from the design and governance of the initiative to implementation and evaluation. It is of key importance to understand and identify common interests, and to develop a trustworthy mutual dependency, not only by sharing risks and responsibilities but also resources and benefits. Partnership in the eHealth context is based on a synergy between ICT-Information-Healthcare. Each of these three components (ICT, information and healthcare) provides complementary support to the other, promoting harmonization and creating the right balance to maximize the actual value of eHealth investments. Good partnerships require good communication, respect and trust.

Within the NHS Boards analyzed, there is shared perception that in general terms that healthcare and ICT planning and processes are not as tightly connected and integrated as is desired. The healthcare strategy is developed by taking into consideration ICT innovations to a certain degree, but it is still quite narrow. Analyzing each NHS Board case in detail (Scottish Government, 2009), a common inhibitor in all three cases was that IT has a less equal role in strategic planning than in clinical units. Therefore the healthcare organization is missing the opportunity to improve healthcare via ICT innovation. Another common – but equally significant - inhibitor across the NHS Boards is the lack of internal skills, resources, structures and processes to monitor IT innovations and to strategically assess and proactively determine opportunities for better healthcare. The identification of ICT innovation opportunities for each specific board is performed using informal and ad hoc approaches. Some of the practices in place involve:

- Following central recommendations, for example as suggested by the NHS Scotland.
- Replicating the approaches and experiences of other NHS Boards or closely related public and government organizations. Meetings are regularly arranged with other organizations to share ideas and experiences.
- Identifying opportunities through pre-sales presentations, professional conferences and equivalent forums and channels.

Within the NHS Boards analyzed, there are limited internal skills and resources available to conduct comprehensive evaluations of new technologies and to assess and demonstrate the actual

benefits for healthcare of implementing such innovations; this process is reactive (rather than proactive) in general terms.

Some, but not all, boards have designated eHealth Programme resources, although when they have specialized resources for assessing innovations and justifying value, they are infrequent and clearly insufficient. This situation negatively affects the early adoption of innovations and hence delays the materialization of benefits for healthcare (Datasec and NHS Fife, 2009). In cases where Boards have a designated eHealth Programme and PMO, eHealth projects are more holistic, with multidisciplinary views being incorporated that lead to a partnership approach to deploy "healthcare solutions" rather than "IT Systems". There is still room for improvement, since not all stakeholders participate at the early stages of an initiative. This can compromise the whole outcome by relevant risks not being considered at the earliest opportunities. Some projects are seen as an imposition rather than a partnership journey.

NHS Boards tend to be quite hierarchical and communications rather formal. This restricts the benefits of informal communication and social networks to develop good partnerships. There are indications of a cultural change in this matter, but it will take some time until NHS Boards grasp the benefits of agile and informal, organization-wide, networking for successful eHealth implementations.

Situation in other sectors and countries.

Regardless of country or industry sector, it is widely recognized that governance requires fluent, effective, formal and informal people-to-people links. It requires a steady process of people networking, intense cooperation and a continuous forward momentum. This has been reported not only in global and multi-sectoral studies (Marshall and Mckay, 2003) (Bowen *et al.*, 2007) (Bernroider, 2005) (Evans, 2004) (ITGI, 2008) (Marshall & Mckay, 2003) (Silvius, 2007) (Shaffer et al., 2007) but also within specific sectors and countries (Beimborn et al., 2007) (Cumps et al., 2006) (De Haes, 2008) (Krey et al., 2010) (Samarth, 2007) (Krey *et al.*, 2010) (Velez *et al.*, 2009). All the studies under review report that IT/eHealth governance is set at CIO level (Shaffer *et al.*, 2007). This level responsible for the development of relationships with key players to ensure that a satisfactory degree of alignment is achieved via IT strategy.

In terms of maturity of partnership, within the financial sector in Belgium there are indications of high levels of maturity, including informal meetings between business, IT executives and senior management (De Haes, 2008). It is interesting to note that the IT strategy committee is not at the board of directors level, seemingly in contrast to good practice recommendations. However, this does not seem to affect the positive scores in terms of effectiveness of their partnership approach.

Research based on a large and complex German financial company (Beimborn *et al.*, 2007) suggests that high levels of partnership are required to get assurance of appropriate IT usage, since interactions between IT and business units form a very important part of the company's success. These interactions exist at all levels, from strategic to daily business. This partnership practice was valuable for transferring knowledge and understanding across and between business units and IT teams. The positive effects of a shared understanding and knowledge approach has been noted in almost all the studies under review, implying that it is a positive cross-national and cross-sectoral factor.

Within the chemical sector, there are studies indicating that partnership is also relatively mature, moving from a high Level 2 to a low SAM level 3. Within the NHS Boards analyzed this aspect requires substantial improvement to move it from a low level 2.

A multi-sector study in Australia shows how ideas for IT investment come from business rather than IT units, apart from common infrastructure projects. IT and business units are responsible for preparing business cases with guidance and advice from IT. Once approved at higher strategic levels, the implementation becomes a joint venture between IT and business with designated sponsors. Partnership involvement happens in the very early stages, and finishes only after post-implementation reviews driven by the business sponsors (Marshall and Mckay, 2003).

Healthcare is a particularly human-focused sector. Hence, sponsors are quite focused on "human" activities rather than IT, while IT managers and chief information officers are quite aware of the associated risks linked with high levels of eHealth project failures. Cross functional interaction is therefore crucial, as is sharing knowledge and understanding, but experiences in different countries within the health sector support the idea that the IT role is still not balanced with respect to other forces that influence strategies, decisions and implementation plans. They represent a risk of failure to deliver high quality eHealth (Datasec and NHS Fife, 2009) (Krey et al., 2010) (Samarth, 2007) (Velez et al., 2009).

Global and cross-sectoral studies show a positive increment in the incorporation of IT in board agendas, and a direct correlation between this and how important IT is perceived to be within the organization to achieve strategic goals (ITGI, 2008).

3.2.6 Architecture

This element involves governance of eHealth architecture with the aim of supporting healthcare in a flexible and transparent way for end users (e.g. patients, clinical and non-clinical staff). Authentication, encryption, innovations for telemedicine or intra-office communications, integration, mobility, reusability, storage, telemedicine and wireless are common decision areas for healthcare organizations to optimize IT infrastructure.

We summarize the areas suggested by Luftman as architecture components within the boards that participated in the study:

a. **Sophistication of main systems**. Electronic communications between different healthcare units, users and third parties (i.e. accident and emergency updates sent via NHSmail to general practitioners regarding patient visits to the service). The next stage is active coordination, which means that one system triggers an automated action in another system (e.g. when a new doctor creates an NHSmail account, the system automatically triggers a register of the user within the Identity Integration System which aggregates identity-related information from multiple data-sources). The final level of sophistication is cooperation such that two healthcare units, for example an NHS Board or a general practice and the NHS Scotland share common goals and use similar performance measures to evaluate the performance of their inter-organizational activities (Premkumar, 2000) (i.e. details about treatment provided to patients to be reimbursed by the NHS). Within the NHS Boards studied there is a combination of sophistication of systems, although electronic communications are extensively implemented, active and multi-organization coordination is still quite limited.
b. **Integrated standards.** Within the NHS there is a central body which coordinates appraisals and approval of information but not the development of standards (the Information Standards Board), which has representatives from regulators, industry and vendors, NHS (via Information Centres and the NHS Data Standards and Products[4]) and also representation of other countries' experiences.

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4 NHS Data Standards and Products is part of the NHS Connecting for Health (www.connectingforhealth.nhs.uk)

Standards available cover framework, domains (i.e. datasets), contents (i.e. records) and processes. Standards, once approved, are available for all the NHS community but their application relies on each Board's self-determination so that compliance is not compulsory at the present time (although there are some standards particularly endorsed in areas of records content, demographic datasets, NHS unique patient identifier or SNOMED CT[5]). Currently, there is no single standard that is enforceable or broadly adopted across the NHS: a transition stage exists, particularly vis-à-vis the NHS unique identifier and single electronic patient record. This stage is complicated and the final outcome will not be seen within the short- or medium-term.

c. **Architectural integration.** Although the theoretical benefits are recognized within the boards, the actual degree of integration achieved and the plans on this area are significantly limited. Current efforts have been promoted by NHS Scotland towards unique patient identification, integrated electronic patient records, "centralized" identity management and recommendations for specific integration technologies that might benefit boards in their efforts and investments towards better degrees of integration. Despite this, the achievement is quite limited and integration is implemented on an *ad hoc* basis when and as required. Some boards are now implementing integration technologies to support management and clinical dashboards.

d. **Infrastructure transparency and flexibility.** In general terms, for the NHS Boards studied, most of the changes within the infrastructure have direct impact on end-users. This often involves IT downtimes, training for users, and also redesigning/adapting processes. Flexibility is limited as a result of this; healthcare units have a high degree of self-determination regarding which application best suits their particular needs. Patient care routes require flexible applications that can be adapted to different healthcare particularities. Lack of such flexibility can result in a larger applications catalogue, requiring support and maintenance with consequent additional cost. Integration technologies layers seem to be the response to the complexities of NHS IT infrastructure, offering a feasible way to approach interoperability within pervasive heterogeneous systems. It is worth noting that a medium-sized board can deploy up to 160 different systems. Not all of these involve patient related data, but they still need to be integrated and flexible, as their use might impact indirectly on patient care (i.e. authentication and identity management of clinical staff).

e. **Management of emerging technologies.** The NHS Boards studied recognize the need for, and benefits of, monitoring emerging technologies, although implementation is *ad hoc* and usually isolated. Technology decisions sometimes lead to contradictory interests and plans. The role of a technical architect is commonly present within the boards, but staffing levels are limited. It is very unusual to find a dedicated team that performs this function, but *ad hoc* support can be obtained via NHS Scotland or the Scottish Executive eHealth team, which also provide guidelines and advice regarding technologies that may be beneficial if adopted across the Boards.

In general terms, the perception of the boards is that there is room for improvement in the way healthcare processes are being supported by ICT: levels of maturity varied from *ad hoc* up to a high SAM 2 (repeatable but intuitive) almost reaching level 3. Centralized and decentralized alignment processes are not consistent across the boards or even within single boards; healthcare units operate independently although, in general, all boards are making important efforts to centralize the strategic alignment process and raise the scope to a level that involves all eHealth stakeholders. In any case, once boards take the decision to implement new ICT, the

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5 SNOMED CT – Systematized Nomenclature of Medicine Clinical Terms (http://www.connectingforhealth.nhs.uk)

impact is assessed to some degree, but this should include higher quality feasibility analysis, and incorporate risk and total cost of ownership (TCO) details.

Situation in other sectors and countries.

There is no indication that a particular country or sector is systematically determining the impact of new ICT investments on their specific business processes better than other sectors or countries. What seems to be clear is that each particular IT governance approach influences the IT architecture (Samarth, 2007) in different ways, and that the level of IT architecture maturity is generally at level 2 which is consistent with our findings within the NHS in Scotland. Some common trends have been identified:

- "Buy" model preferred to customized internal developments (but not as a sole option)
- Corporative data via data integration or centralization
- Process integration (at different degrees)
- Enterprise-wide architectures for corporate infrastructure.
- Local applications for specific business needs, but based on standard processes and data architecture (at different degrees). The healthcare sector normally has localized applications, not only within the UK but in other countries (Samarth, 2007), although there is a growing tendency to move from "healthcare unit silos" to standardization. Some studies suggest ongoing efforts across countries to consolidate duplicated applications and to streamline infrastructure within hospitals (Krey et al., 2010).

IT architecture to support process integration is adopted more often within the private than public sector, and is less implemented within the healthcare sector than other industries. Those healthcare organizations adopting Electronic Patient Records (EPR) are facing precise implementation issues,for example, the integration is not end-to-end since the EPR does not flow throughout the whole clinical pathway). The financial and telecommunication sectors are at the forefront of process integration.

3.2.7 Skills

Practices like secondments, cross-training, shadowing, coaching, rotation, and personal development plans are common throughout the NHS Boards, particularly since the NHS Knowledge and Skills Framework was implemented as part of the Agenda for Change pay system (Department of Health, 2004).

During the SAM assessment, most of the Boards perceived that key-users participated in the design and development of new ICT systems. They also agreed that their specific board did not foster clear stakeholder management for eHealth projects, and that the board had difficulties minimizing the resistance to change that is typically associated with eHealth projects.

As with partnership, within healthcare, there tends to be an unbalanced participation of clinical and IT staff in decisions related to eHealth. It is difficult to establish if this is a cause or a consequence of a lack of specific eHealth-related skills. Boards with eHealth programmes, involving teams with an enhanced set of skills (more oriented towards healthcare processes as opposed to purely IT skills), found that eHealth project delivery was more effective. With the existing pressure to achieve savings, senior managers have to face the partnership challenge described in section 3.2.5 and lead the process: enhanced multidisciplinary skills are needed to achieve the efficiencies eHealth can deliver, but there is also a need for mature eHealth governance practices and skilled teams to make this happen.

Situation in other sectors and countries.

In the financial sector, knowledge transfer via partnership demonstrated a high influence on success.

A lack of skills within the healthcare sector has been reported in several studies (Vandenbulcke, 2006) (Datasec and NHS Fife, 2009): this is a shared issue across sectors and countries. Global reports indicate that a lack of knowledge and expertise is a major obstacle to the achievement of the value of IT investments (ITGI, 2008).

In the healthcare sector, there are specific studies that suggest that "IT governance has not permeated sufficiently into the executive management of many hospitals, especially the public ones" (Krey et al., 2010). This points towards a lack of understanding, skills, and/or experience within the chief information officers/IT Management layer as a reason for this (particularly if we take into account that IT governance is – according to a Gartner study – something driven at chief information officers level across sectors and countries (Shaffer et al., 2007). In a study involving 141 Swiss hospitals, 86% of the managers could not explain their IT governance arrangements, re-directing further questions to other staff members (Krey et al., 2010).

The healthcare studies show high scores for career opportunities but relatively low levels of maturity for inter- and intra-organizational learning (Krey et al., 2010) (Datasec and NHS Fife, 2009). Some public boards (e.g. the NHS in the UK) are implementing standard frameworks to harmonize jobs and related skills and expertise, and to improve personal development via Personal Development Plans, NHS Knowledge and Skills Framework, or their equivalents.

Some studies indicate problems not only with skills/expertise but staffing issues in general, which involves getting the right team sizes to support IT projects and operations with holistic approaches (ITGI, 2008). It is interesting that security issues are now seen in all sectors to be of less concern than staffing and skills/expertise (ITGI, 2008).

A multi-sectoral study in South Africa also points out that the lack of confidence in IT is not focused on technology but on IT professionals (Evans, 2004), who are seen as "strange" and as "part of the problem". Blaming IT professionals if IT projects fail is probably unfair if success requires partnership from the early stages. This observation seems to be more a perception than a fact. Global studies, however, recognize that there are staffing and skill issues that refer not only to IT personnel but, from a holistic view, to all the people involved in delivering business value from IT investments.

It is expected that in the future decisions regarding the staff, skills and expertise required to ensure business/IT alignment will change, since IT and IT governance is growing in importance all over the world (Shaffer et al., 2007) (ITGI, 2008).

3.3 Discussion, conclusions and recommendations

We have compared and contrasted IT governance-related studies that cover all continents and most of the industry sectors while maintaining a focus on healthcare organizations across the globe. The comparisons involve low and high performers in terms of business/IT alignment, and a variation of IT governance approaches and frameworks. Hence, we are confident our conclusions are likely to be applicable to other environments.

3.3.1 The challenge of alignment

The majority of organizations, healthcare or not, are dealing with the alignment challenge regardless of their size, industry sector or country, and even regardless of their business strategy. This is a challenge across the globe: our analysis suggests that the majority of organizations (about 80%) have an alignment level of less than 3. The challenge is to get the majority of organizations above level 3. This will take time, investment, changes in strategies, use of international standards, and many other measures. Healthcare in Scotland has an alignment level below 2. The benefit for Scotland from this analysis, is that specific areas for improvement are identified, together with an indication of how hard it is to achieve and maintain higher levels. By performing similar assessments and comparisons, NHS Scotland's techniques can be used to speed up the improvement process for organizations in other sectors or countries by learning from the experiences of others.

3.3.2 Drivers and triggers

Organizations are looking for alignment for different reasons, but these can be summarized as:

- A need to demonstrate value of IT investments.
- A mandate to achieve accounting/audit compliance or regulations (i.e. Sarbanes-Oxley, Basel 2, Data Protection Act).
- Increased pressure to fix operational IT/eHealth issues and to provide better internal IT/eHealth service (since the pervasive use of technology has created a critical dependency on IT, while IT-related problems persist).
- A transformation of the role of IT from supporting or utility service provider to strategic business enabler.

Triggering initiatives towards either implementing eHealth/IT governance or improving its maturity are situations in which the organization faces a significant challenge which may be related with competitiveness, but also with internal efficiencies, savings, the need to demonstrate better value of IT investments, or compliance with standards and good practices. Organizational changes are also a main trigger, particularly when these involve new visionary chief executive officers and chief information officers who see the opportunities that IT/eHealth offers to the business/healthcare, and hence the need for improved IT/eHealth governance practices.

3.3.3 IT/eHealth Governance interest

The need for better alignment is focusing interest on IT governance, along with the need to balance competitive priorities and resources. IT governance is high on the agenda, and interest is growing with time across both continents and industry sectors. It is gratifying to observe that different studies report that healthcare organizations are making eHealth governance an important part of their sphere of activity across the globe.

3.3.4 IT/eHealth Governance status

eHealth governance within the NHS is in its infancy. The situation across sectors and countries seems to be similar in terms of maturity: at a transition point between SAM level 2 (committed organization) and 3 (established process). Within healthcare, the bare bones are in place but there is plenty of room for improvement towards the stage that healthcare organizations obtain positive effects from eHealth governance and can build sustainable alignment. This situation is understandable since the implementation of structures is perceived to be easier than processes.

3.3.5 IT/eHealth Governance approach

IT governance is being set up using a variety of approaches: structural, process-based, and relational. The best results are achieved with combinations of these elements. What seems to be a common denominator is that IT governance is championed mainly by chief information officers (40% of organizations), followed by chief executive officers (25%) and, finally, chief financial officers (9%) (ITGI, 2008).

3.3.6 IT/eHealth structures

The level of centralization/decentralization of IT governance varies across companies, regardless of industry sector and country. The size, culture and geographical/functional distribution of the organization all influence the approach taken by each enterprise. We observed that a federal IT governance tendency for healthcare organizations, with some feudal silos. These silos exist 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 one in four companies currently adopting this approach (instiLink, 2008), probably because there are multiple studies which suggest that federal styles best supports organization-wide IT architectures and processes (Samarth, 2007) (instiLink, 2008).

3.3.7 Standards

The frameworks and standards implemented by organizations and enterprises vary, but the following are most commonly mentioned: COBIT (30%), ITIL (5% of the healthcare organizations surveyed) and ISO (9000, 17799 and 38500). Within the healthcare sector COBIT and ITIL are most commonly mentioned.

3.3.8 Perceived IT Governance level

How IT/eHealth governance is implemented influences not only IT/eHealth value delivery but also the IT/eHealth architecture, communications, partnership and IT/eHealth related skills within the organizations. In general terms, these aspects are also situated in a transitional point between level 2 and 3, which is consistent with the level of perceived IT governance within organizations. Differences between countries and industry sectors are subtle; studies suggest a reasonable bell shape with approximately 20% of the organizations at level less than 2 and a further 20% at level more than 3.

3.3.9 Recommendations

Although it might not be a direct outcome of our study, our overall recommendation is that IT/eHealth governace should be focused on continual improvement cycles and achiving more with less

resources by continual elimination of waste (Womack, 2003)[6]. This approach might sound overlay generalist but is essential in order to create value from IT/eHealth and ensure the necessary improvement happens consistently. Most of the best practices in the area, like COBIT, are based on this principal.

Further recommendations are presented by their relevance to organizational or governance (decisions related) aspects and are classified by their location within the organisation level of influence as strategic or tactical.

a) Strategic organizational:

i. eHealth/IT governance is about people and collaboration. Organizations should encourage a combination of formal and informal communication and social-networking to achieve better collaboration and knowledge sharing, leading to better understanding not only of mutual needs but also issues and particulars of IT/eHealth initiatives.
ii. IT/eHealth responsibility should be a board level position.
iii. Levels of accountability for ICT/eHealth decisions, projects and outcomes should be improved wherever possible. Transparency should be a target (particularly but not exclusively from the financial perspective), as well as shared responsibility for alignment.
iv. Preparation of the IT/eHealth team for IT/eHealth governance (from both skills and cultural perspectives) is essential. Staffing issues are high on the list of IT related issues all over the world, above even IT security at the present time.
v. The organization should have – or be actively developing – the skills, structures, processes and relationships required to enable a group of people to identify innovative ways to use IT/eHealth strategically.

b) Tactical organizational:

i. The establishment of an eHealth Steering Committee (or the equivalent for other industry sectors) with balanced representation of business and IT views is recommended. This Committee should balance corporate and business unit IT priorities, handle related investment decisions and agree strategic principles, including the IT/eHealth architecture.
ii. The chief information officer and the chief executive officer should be IT/eHealth visionaries.
iii. If it is not already the case, organizations should consider having the chief information officer report to the chief executive officer (rather than the chief financial officer, for example). This would gain collective agreement to shift control of IT/eHealth where the enterprise believes it to be more advantageous. Decision-making should be changed from imposition to agreement.

c) Strategic governance:

i. The public healthcare sector, which is globally under increasing budgetary pressure, should consider carefully the value of IT investments in healthcare, and the negative effect of cutting investments on business/IT partnership mechanisms; if this happens healthcare organizations will regress to IT support models rather than moving forward with IT as a healthcare enabler, with negative impact on the realization of eHealth benefits for healthcare.

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[6] In the LEAN context, waste is refereed to any activity that consumes resources but creates no value.

ii. IT/eHealth governance should be used as a powerful tool to make the most of IT/eHealth investments. Organizations at the early stages of adoption should take on a well-known framework to help them through the process.
iii. IT/eHealth should be used as a business enabler and to systematically assess the impact of IT/eHealth investments on the enterprise.
iv. Regardless of the organization's business strategy, it should be ensured that the IT/eHealth strategy is fully aligned.
v. Good relational mechanisms should be developed initially, followed by adaptation of the structures for better alignment (i.e. federal archetypes; only justifiable silos), with IT governance based on processes: streamlined processes should be easier to implement.

d) Tactical governance:

i. Business cases can be used to ensure that all relevant views are considered, that risks are managed from the very beginning, and that actual business benefits are estimated prior to financial IT/eHealth investment. Finding champions to lead the business cases is important.
ii. Federal archetypes for IT governance are preferred. The need for sustaining IT governance silos should be questioned (if they exist); they should be simplified and centralized if there is no real benefit from the silo archetype.
iii. Managed and targeted expectations for IT/eHealth are desirable, using SLAs and OLAs as much as possible, and communicating IT/eHealth performance in business language.
iv. If IT governance is not providing expected results, an audit of which business problems are impacting negatively on how IT/eHealth governance is being approached in the organization should be carried out.

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Annex 1

The column "Scope" indicates the number of organizations included in the study.

Table 1 . Sources consulted to compare the situation of IT governance across industry sectors and countries.

SCOPE	INDUSTRY SECTOR	COUNTRY	SOURCE
4	Financial Services	Belgium	(De Haes, 2008)
6	Multi-sectoral (Retail, Pharmaceutical, Manufacturing, Financial Services, Leisure/Entertainment, Food and Beverages)	Australia	(Marshall and Mckay, 2003)
1	Credit Cooperative	Germany	(Beimborn, Franke, Wagner, and Weitzel, 2007)
1	Industry sector not disclosure. Large organization. Multi-divisional.	Australia and New Zealand	(Bowen, Cheung, and Rohde, 2007)
641	Multi-sectoral (Consumer and Industrial Products and Services, Financial Services, Technology, Information, Communication and Entertainment , Public Sector, Healthcare and Pharma)	Belgium, France, UK, Germany, The Netherlands, Italy and Spain.	(Cumps, Viaene, Dedene, and Vandenbulcke, 2006)
1	Healthcare (British National Health Service-NHS)	UK	(Patel, 2003)
208	Multi-sectoral (Trace 23%, Manufacture 21%, Construction 21%, Logistics 8%, Information 5%)	Austria	(Bernroider, 2005)
750	Multi-sectoral	Global	(ITGI, 2008)
1	Healthcare	USA (Boston)	(Samarth, 2007)
3	Healthcare	UK (Scotland)	(Datasec and NHS Fife, 2009)
141	Healthcare	Switzerland	(Krey, Harriehausen, Knoll, and Furnell, 2010)
7000	Multi-sectoral (Manufacturing 36%, IT/Telecom 17%, Government /Public sector 20%, Financial services 11%, Retail 8%, Other 10%)	Global	(ITGI, 2004)
1	Healthcare	Portugal	(Velez, Rebuge, Silva, and Gomes, 2009)
231	Multi-sectoral	USA	(instiLink, 2008)
5	Multi-sectoral (Public, Education and Financial Services)	The Netherlands	(Silvius, 2007)
67	Multi-sectoral	South Africa	(Evans, 2004)
80	Multi-sectoral (Financial, Insurance, Manufacture, Logistics and Government)	Global	(Keyes-Pearce, 2002)
2	Healthcare	USA (Ohio)	(Smaltz, Carpenter, and Saltz, 2007)
25	Multi-sectoral	Global	(Luftman, 2000)
57	Healthcare	Global	(Shaffer, Rowsell-Jones, and Runyon, 2007)
-	Multi-sectoral	Global	(Chan and Reich, 2007)
-	Multi-sectoral	Global	(Brown and Grant, 2005)
1	Chemicals	Multinational	(Sledgianowski and Luftman, 2005)

8.9 Appendix 5b: MED-E-TEL, Luxemburg.

Med-e-Tel 2011

Electronic Proceedings

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The International eHealth, Telemedicine and Health ICT Forum for Educational, Networking and Business

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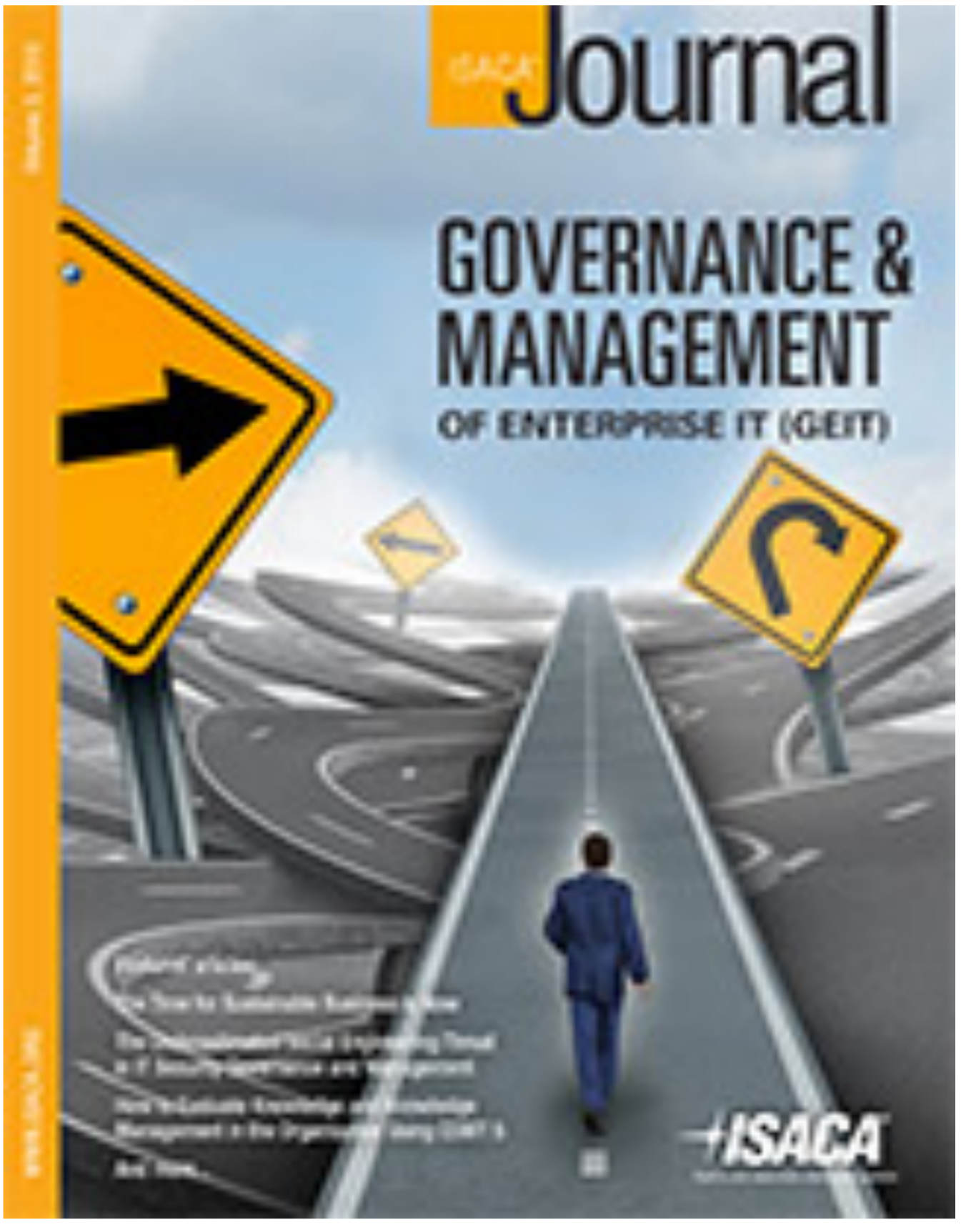

Feature

Strategic Alignment and E-health Governance

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Go directly to the article:

E-health is important because health is one of the most important things for every human being, current health care models are not sustainable, and, hence, there is a need to find more efficient ways to achieve better health across the entire population for years to come.

From the health care service perspective, e-health plays an essential role. It is perceived as crucial for high-quality and cost-effective health care. It is faster, provides more and better information (when and where it is needed), reaches remote areas of the population and is secure. In short, e-health promises to be a great solution to the current sustainability issue.

Conversely, getting the expected benefits from e-health has been difficult to demonstrate. This is the point where e-health governance can help in achieving expectations.

There has been rising interest in adopting e-health governance frameworks to obtain reassurance that investments return the expected results in health care. However, how e-health governance is implemented within health care is poorly understood; equally misunderstood is the actual impact e-health governance has on linking health care structures and resources with local and national health care strategies—in other words, in achieving strategic alignment.

This article introduces a recent comprehensive technical report on e-health governance. The report explores the application of well-known frameworks (e.g., COBIT® and ITIL) within the National Health Services (NHS) in Scotland and their impact on e-health governance maturity and strategic alignment with health care. The report mainly presents results of a longitudinal study conducted since 2008 within Scottish health care organisations, but also offers cross-national and cross-sectoral benchmarking.

As a result, it offers an adapted and simplified instrument to swiftly measure e-health governance and strategic alignment maturity levels.

The conclusions of the study suggest that there is a potential strong statistical correlation between e-health governance and strategic alignment; however, more data are required to confirm the initial findings. Thus, it is recommended that the longitudinal analyses continue over the coming years to determine the actual correlation ratio. Further research is also required to understand the influence the rest of the strategic alignment model (SAM) dimensions have and to determine how e-health 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 health care organisations (HCOs) is also provided.

WHAT IS BUSINESS-TO-E-HEALTH STRATEGIC ALIGNMENT?

Business-to-e-health strategic alignment follows the model proposed by Henderson and Venkatraman.[1] This model has been extensively used in business management, including Luftman's experiences within Fortune 500 companies.[2]

Business-to-e-health strategic alignment refers to applying IT within health care in harmony with the HCO's strategies, goals and needs. Achieving alignment maturity involves IT and HCO strategies evolving jointly, in an integrated way and in harmony.

WHAT IS E-HEALTH GOVERNANCE?

There is not unanimous consensus on what e-health is, nor what governance entails; however, for the purpose of this article, e-health governance is defined as the act of governing e-health, which involves decision making as well as e-health management.[3] Beyond this concept, governance is also the art of assurance, which becomes relevant because of the need for greater results accountability in the best interest of all health care stakeholders.

The World Health Organization (WHO) defines e-health in terms of the efficiency of using information and communication technologies (ICT) in health care,[4] whilst the European Commission (EC) defines e-health more broadly as "the use of modern information and communication technologies to meet needs

of citizens, patients, healthcare professionals, health care providers, as well as policy makers."[5]

In a survey, 93 random individuals in a hospital were asked about how they identify themselves with five e-health vision statements.[6] Sixty-one percent identified e-health with empowering patients and health care professionals to link devices and technologies towards the personalised medicine of the future—integrating smarter, safer and patient-centred e-health services into the patient's life.

Nineteen percent thought of e-health as helping people realise their best possible health through digital technologies.

Ten percent suggested e-health will, through the active engagement of patients and health and social care professionals, provide innovative technology at the point of demand. With enthusiasm, e-health will support and deliver accessible solutions that will facilitate secure access to relevant and accurate information in order to provide the best quality of care and improved health.

Another 10 percent suggested e-health is a way for establishing innovative health care in the region (in this case, Scotland) for the 21st century.

E-health has different connotations, but for the purpose of this article, it is defined as presented by eHealth Industries Innovation Centre (eHI2) Swansea University (Wales, United Kingdom), because of the express mention to the association between e-health and people living in digital societies:
E-health is a different way of pursuing healthy lives. E-health implies people living in digital societies using information and communication technologies in favour of better health: health care professionals, patients and care givers, as well as citizens involved in their own or their family's health care.[7]

THE VALUE OF E-HEALTH GOVERNANCE

Is it worth spending time, resources and efforts on e-health governance? For some, common sense suggests a clear yes as a response; for others, it is not as clear because implementing e-health governance good practices, frameworks and standards requires time, resources and huge transformational efforts in most HCOs.

The results of the study (available in the ISACA® Knowledge Center at *www.isaca.org/monitoring-progress-on-ehealth*) support conclusions on how immature organisations are in this matter.

As stated earlier, e-health is important as it is a potential solution for the sustainability of future health care systems. There is an expectation in digital societies that ICT will contribute to better health care. It is expected that e-health innovations contribute to providing quality and cost-effective solutions for 21st century health care challenges,[8] especially considering aging populations, increasing long-term conditions, obesity and alcohol-related issues, along with the costs of preventable hospital admissions if prescription medications were taken correctly.[9] Furthermore, e-health is considered key to achieving sustainable health care, especially in collaborative cross-border spaces.[10]

Despite e-health being considered key for sustainable health care, many e-health initiatives have failed,[11, 12] and HCOs commonly find themselves caught between the organisational pressures for delivering e-health and organisational resistance to new ways of functioning.[13]

Success with implementing e-health initiatives varies significantly according to experiences, as reported to the NHS.[14, 15] Some of the downsides are related to delays, over expenditures or budget deficits, poor quality of outcomes, and effectiveness on health care,[16] which are consistent with the average ICT project's implementation statistics.[17]

After a series of disappointing e-health implementations, there is rising interest in e-health/IT governance[18] as a vehicle to provide assurance to all stakeholders to whom e-health programmes deliver the expected benefits.[19] This interest also derives from the appearance of greater pressures in HCOs for compliance with best practices, standards and regulations.[20]

It is expected that interest will continue rising in the coming years since investments on e-health continue to grow at an average rate of 12-16 percent per year and a global e-health market worth an estimated US $23 billion is expected by 2017.[21] Despite this, and the expectations of successful e-health implementations at strategic levels in health care organisations, e-health governance is still very much just a chief information officer (CIO)/IT director issue.[22] This is a widely reported international occurrence.[23]

Governance is, in essence, the act of governing, which involves decision making, as well as management.[24] Beyond this concept, governance is also the art of assurance, 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 e-health initiatives and e-health governance, this is still described as a 'young science',[25] demanding more understanding of implementation processes, tools and models for better results.[26] 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 ISO 38500)—the first two being the most commonly adopted within the health care sector.[27]

USING FRAMEWORKS FOR E-HEALTH GOVERNANCE

The research discussed here is a continuation of a previous study conducted between 2005 and 2010, which involved:

- A comprehensive literature review[28]
- A Delphi exercise[29] proposing a causal model of determining factors involved in the adaptation of NHS to the digital society with a particular focus on Scotland

This model identified a number of factors to be understood in order to help organisations and governments make better e-health investment decisions and strategies (**figure 1**). This article and the related technical report *(www.isaca.org/monitoring-progress-on-ehealth)* focus on two of the main factors identified in the causal model: e-health governance and e-health strategic alignment.

The study started in 2008 as part of an IT governance project cosponsored by the Scottish Executive to demonstrate practical results in adopting IT governance best practices and to provide recommendations for a future adoption across the NHS in Scotland.[30] Three representative NHS boards in Scotland were selected for this trial.[31]

The technical report is based on a longitudinal study (2008-2013), involving a multicase analysis of three representative health care organisations in Scotland. A combination of empiric methods has been used: semi-structured interviews with implementers, surveys using an adaptation to health care of Luftman's instrument[32] for assessing Venkatraman's SAM[33] and cross-sectoral/national benchmarking based on a literature review.

Ninety-two participants were involved across the three HCOs under the study, with representation of the main groups of e-health, clinical and nonclinical stakeholders. The benchmarking exercise incorporated 9,226 institutions providing worldwide coverage.

RESULTS AND CONCLUSIONS

The results[34] show that e-health governance is in its infancy across sectors and countries. Eighty percent of organisations worldwide are in a transition point between a "committed" and an "established" process.

The results support the proposition that the more mature e-health governance is, the better the strategic alignment between e-health and HCOs. The strategic alignment is slowly maturing across the organisation (15 percent since 2008), progressing vaguely faster than e-health governance.

The conclusions of this study suggest there is a potentially strong statistical correlation between e-health governance and strategic alignment; however, more data are required to confirm this initial finding. It is recommended that the longitudinal analysis continues over the forthcoming years to validate 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 e-health 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 HCO research has also been provided.

Figure 1—Study Proposition

Source: Beratarbide, Kelsey and Gil. Reprinted with permission.

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8.11 Appendix 6b: ISACA Knowledge Centre: Technical report

Health Care Technical Report

Strategic Alignment and eHealth Governance

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2014

Keywords: eHealth, IT Governance, Strategic Alignment, Maturity Models, Digital Society, Value Measurement, COBIT®, ITIL.

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1 Executive summary

1.1 Background

eHealth ....

resulting innovations from the application of information and related technologies to health care.

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 eHealh 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].

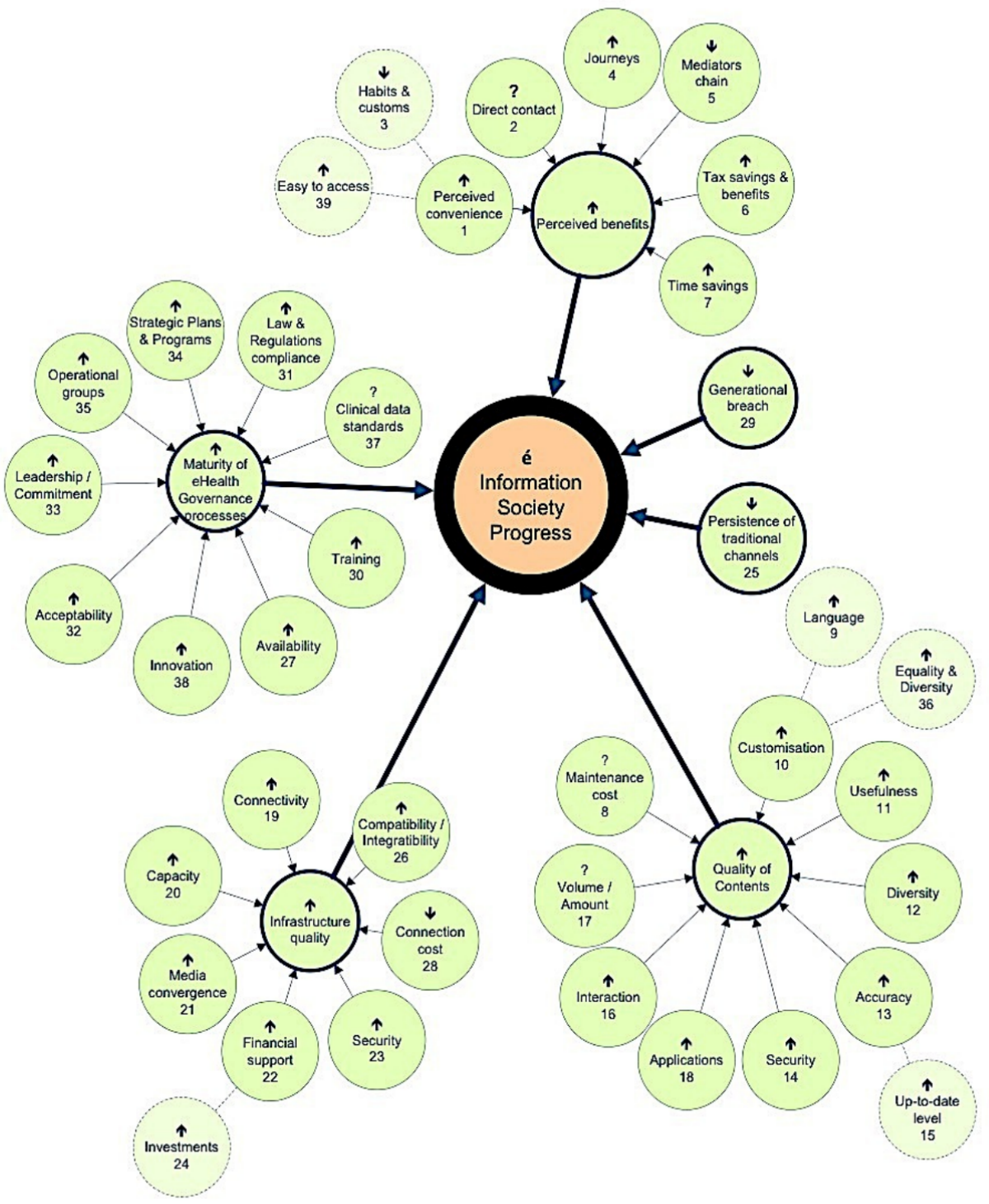


Figure 1 Causal model of determinant factors in the adaptation of the NHS to the Information Society. The arrows indicate the hypothesised relationship between the variables. Source: [3]

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 i**s 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.

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

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).

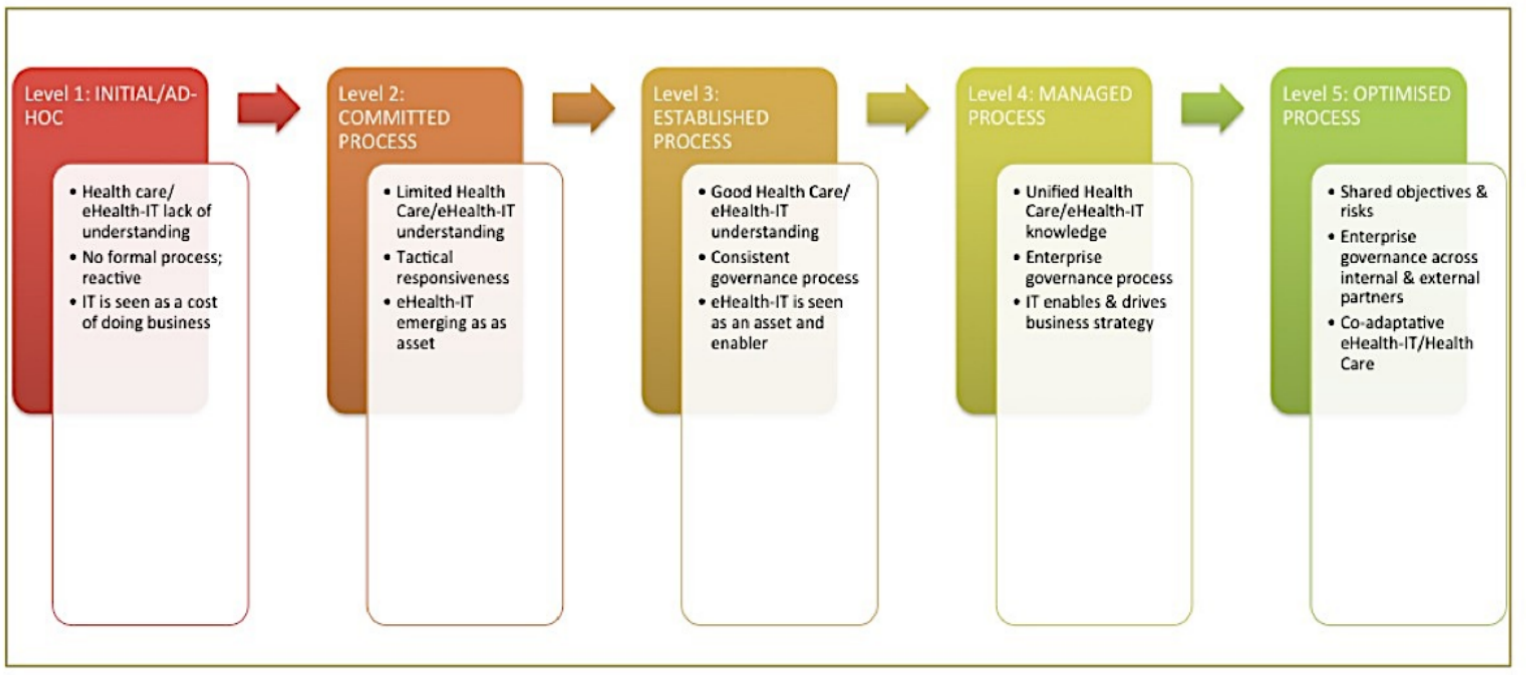


Figure 2 Strategic Alignment Maturity (SAM) Levels adapted by the authors to Health Care Organisations [1].

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

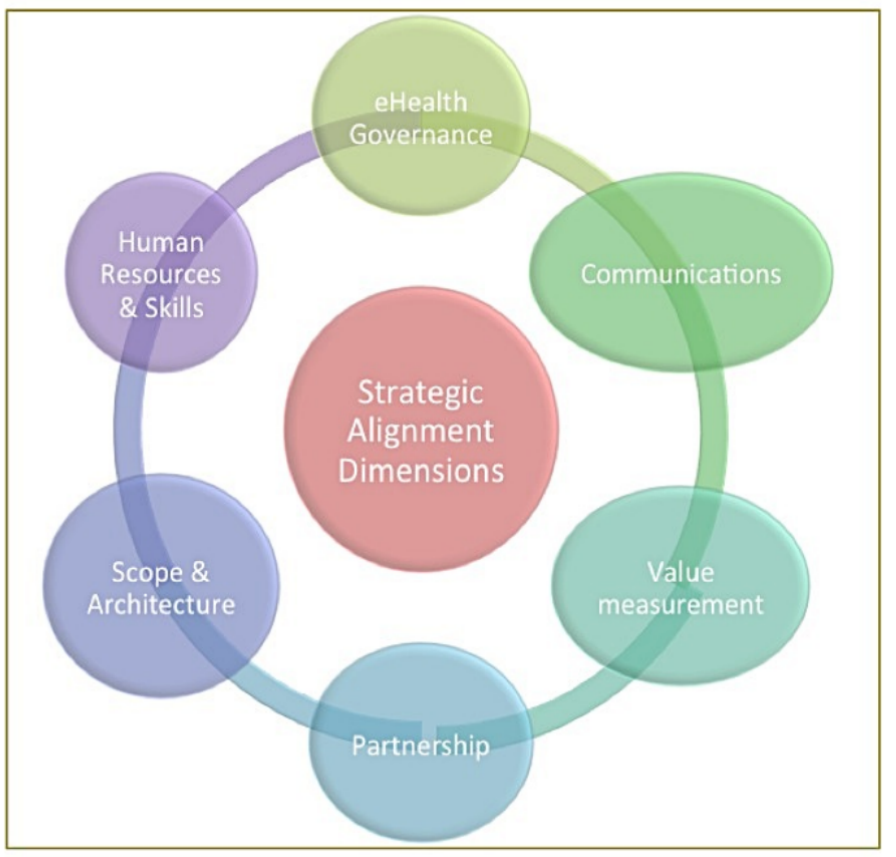


Figure 3 Strategic Alignment Dimensions adapted by the authors to Health Care [1].

gure 4 Strategic alignment perception.

The interviews where 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.

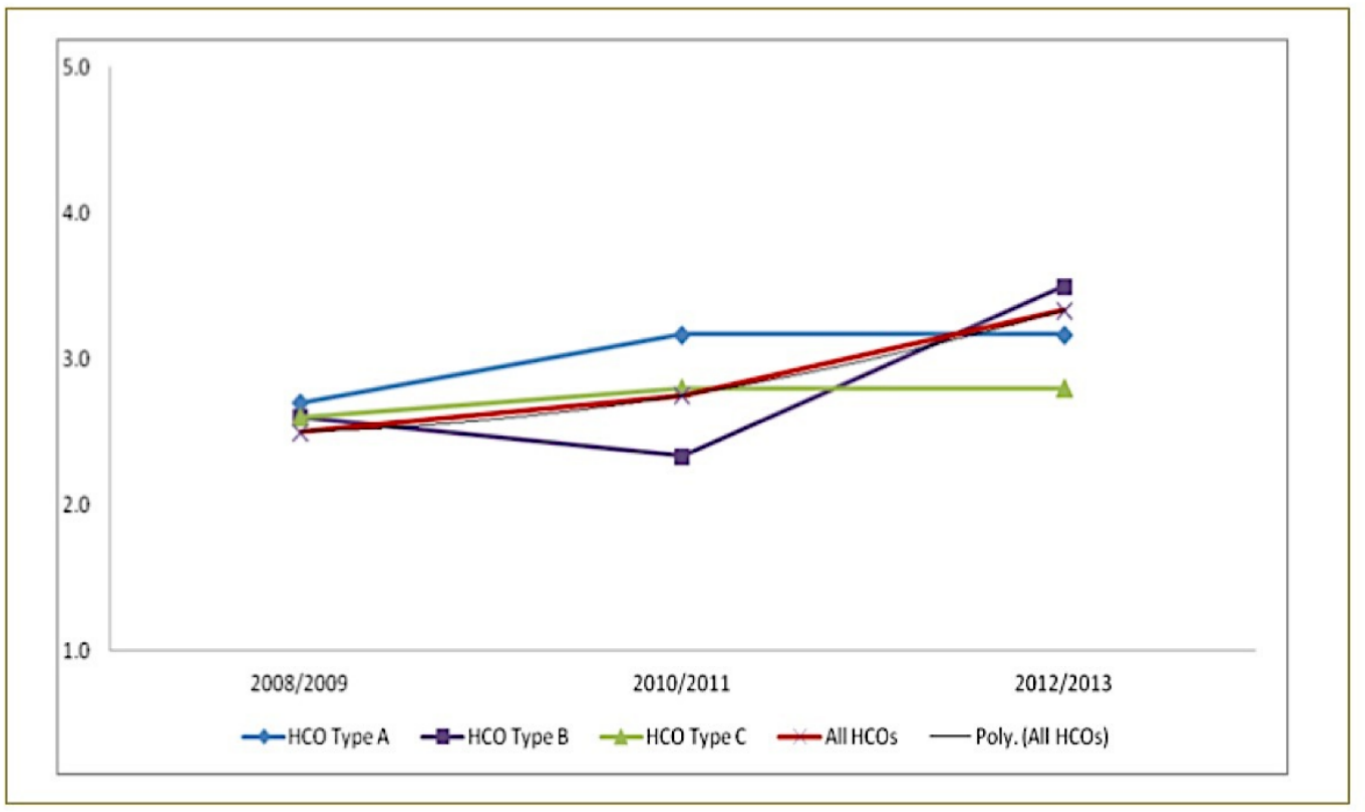
4 Results

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.



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% to36%) shown in previous years.

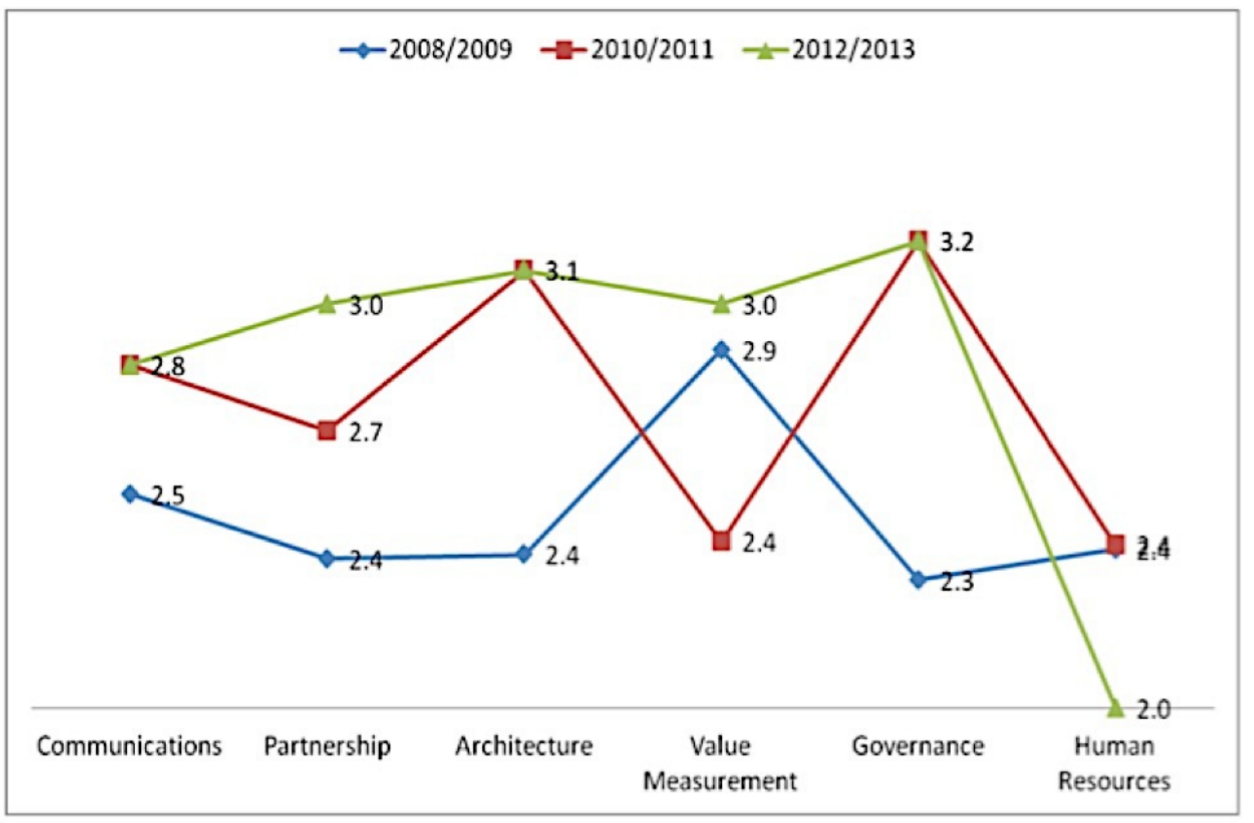


Figure 5 Progress of SAM dimensions showing maturity levels 1 (Ad Hoc) to 5 (Optimised).

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.

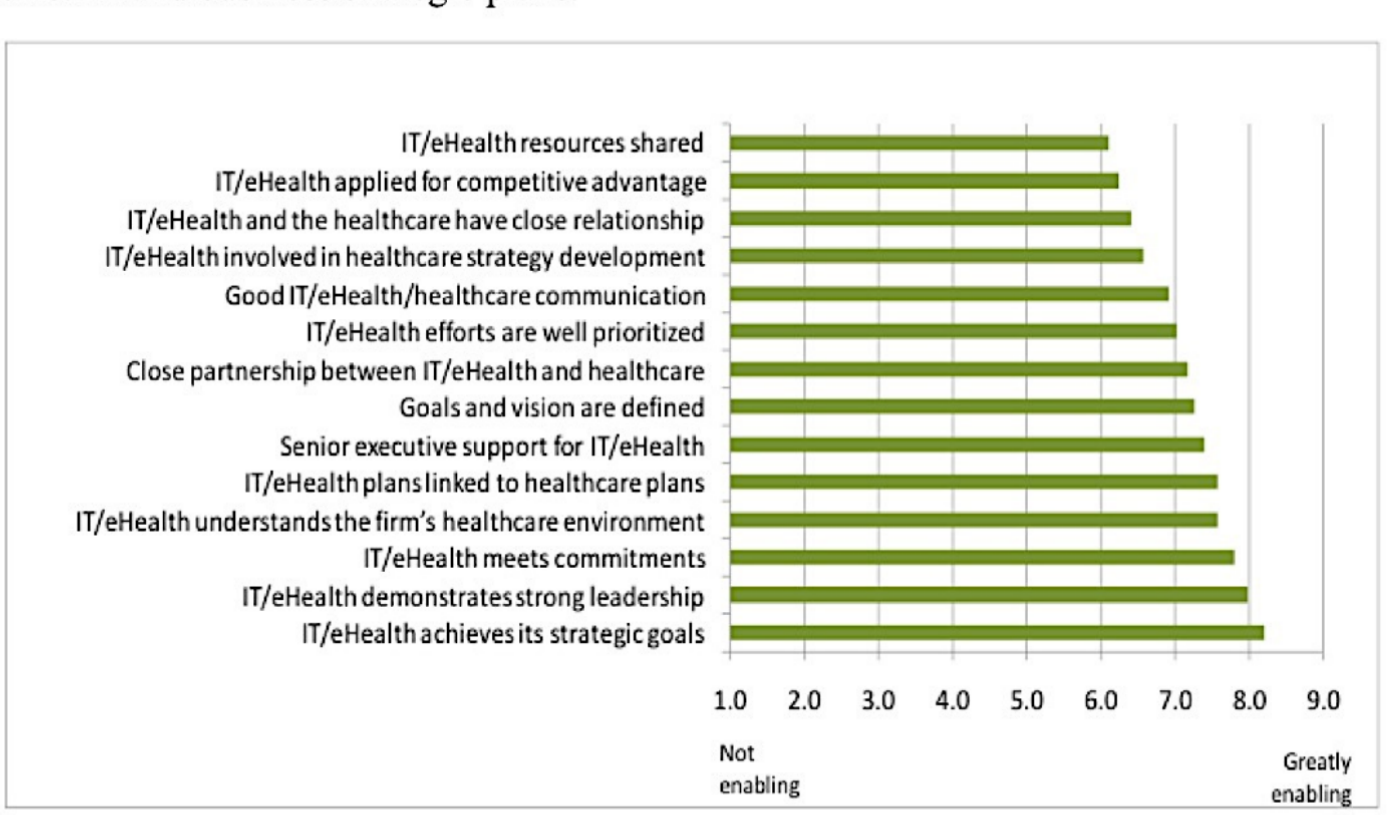


Figure 6 Alignment enablers

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.

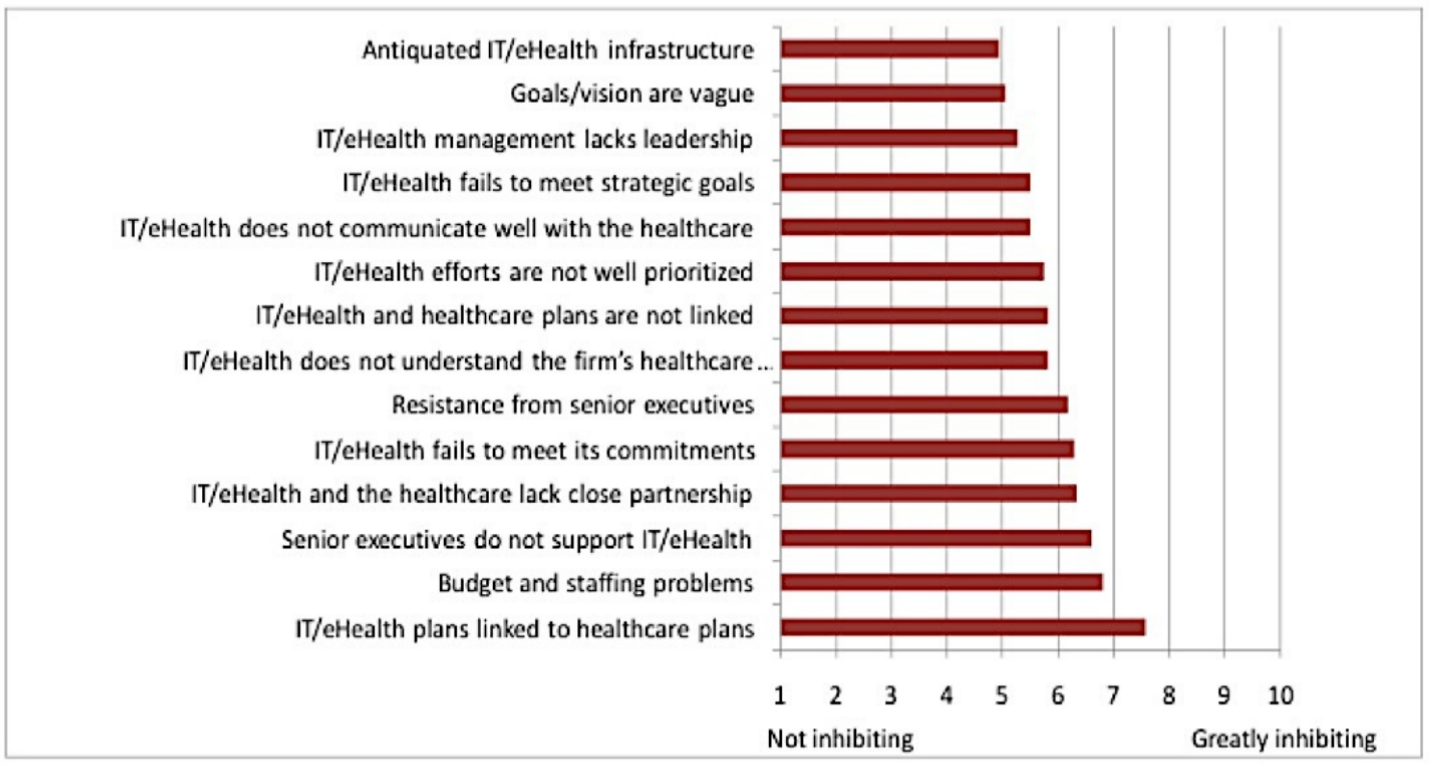


Figure 7 Alignment inhibitors.

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.

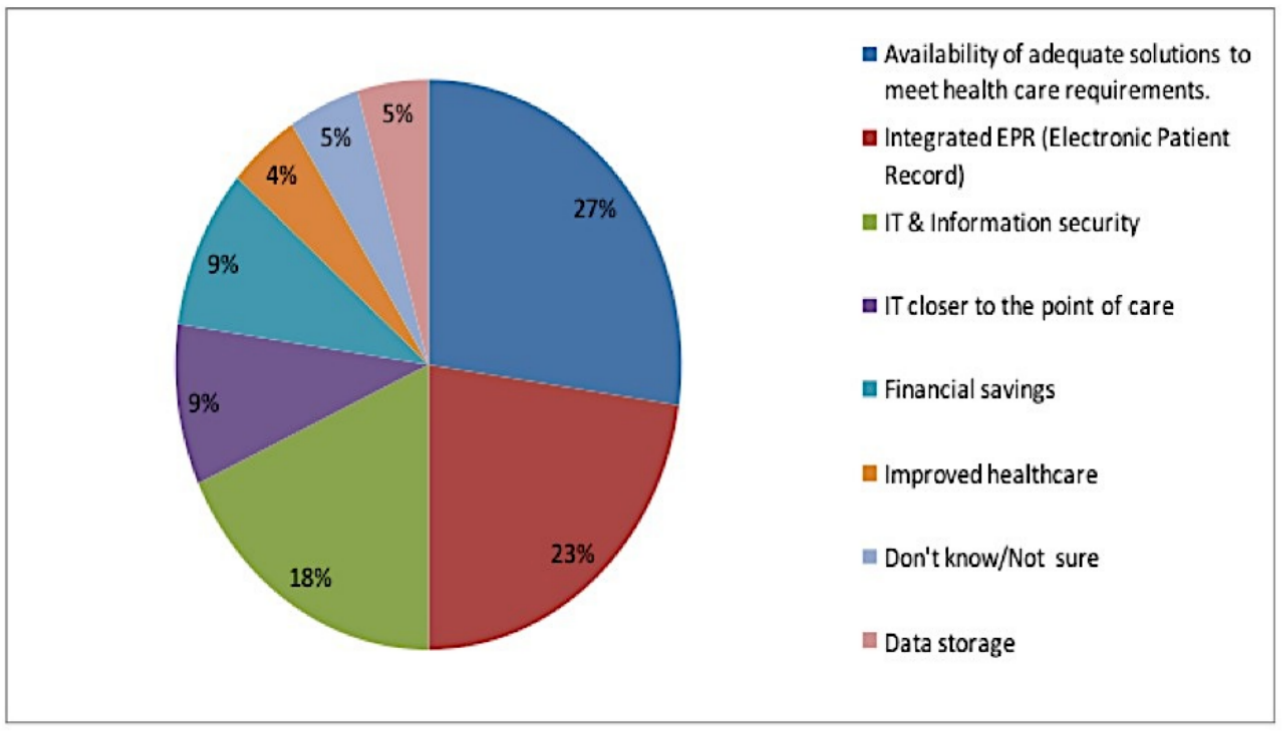


Figure 8 Most important IT/eHealth Objectives identified.

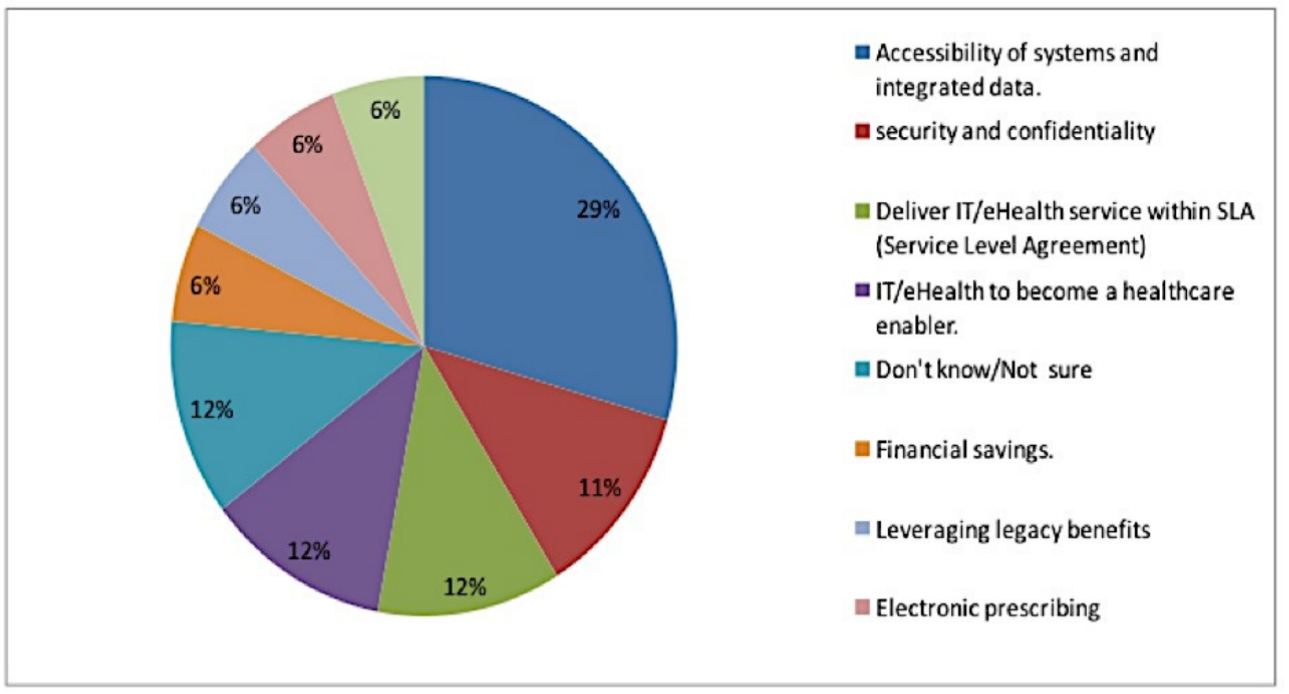


Figure 9 Second most important IT/eHealth Objectives identified.

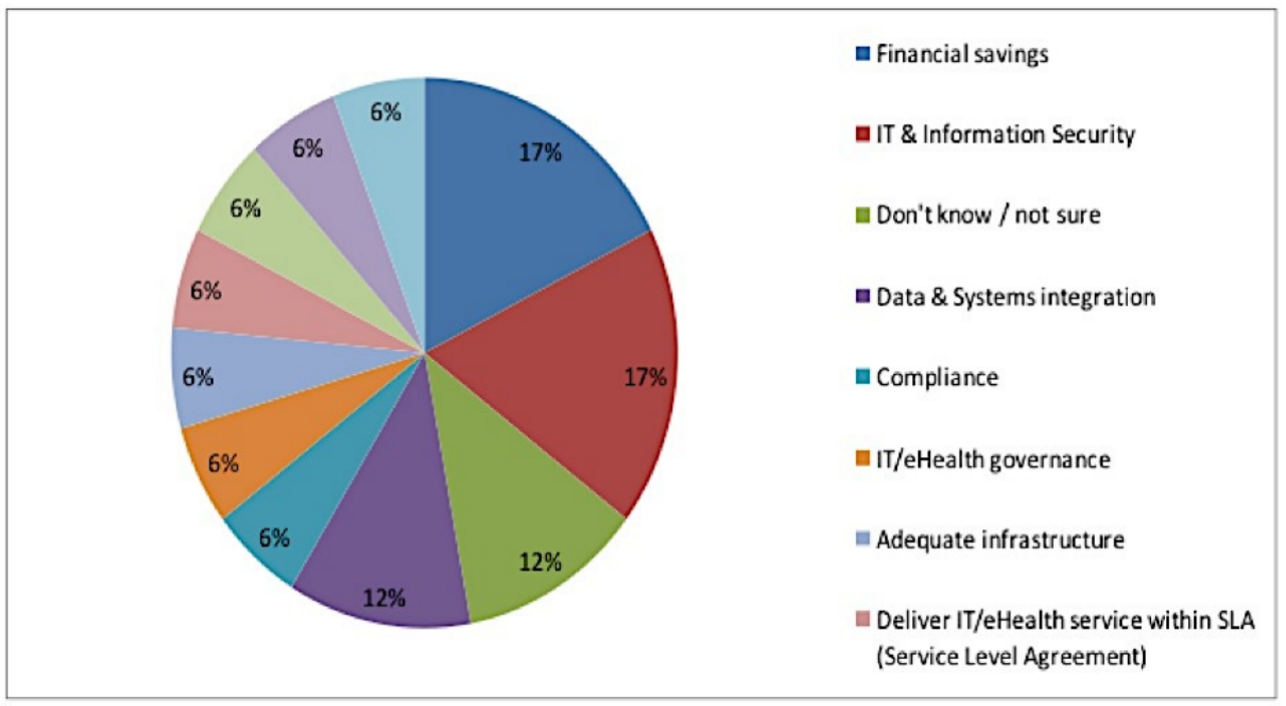


Figure 10 Third most important IT/eHealth Objectives identified.

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%).

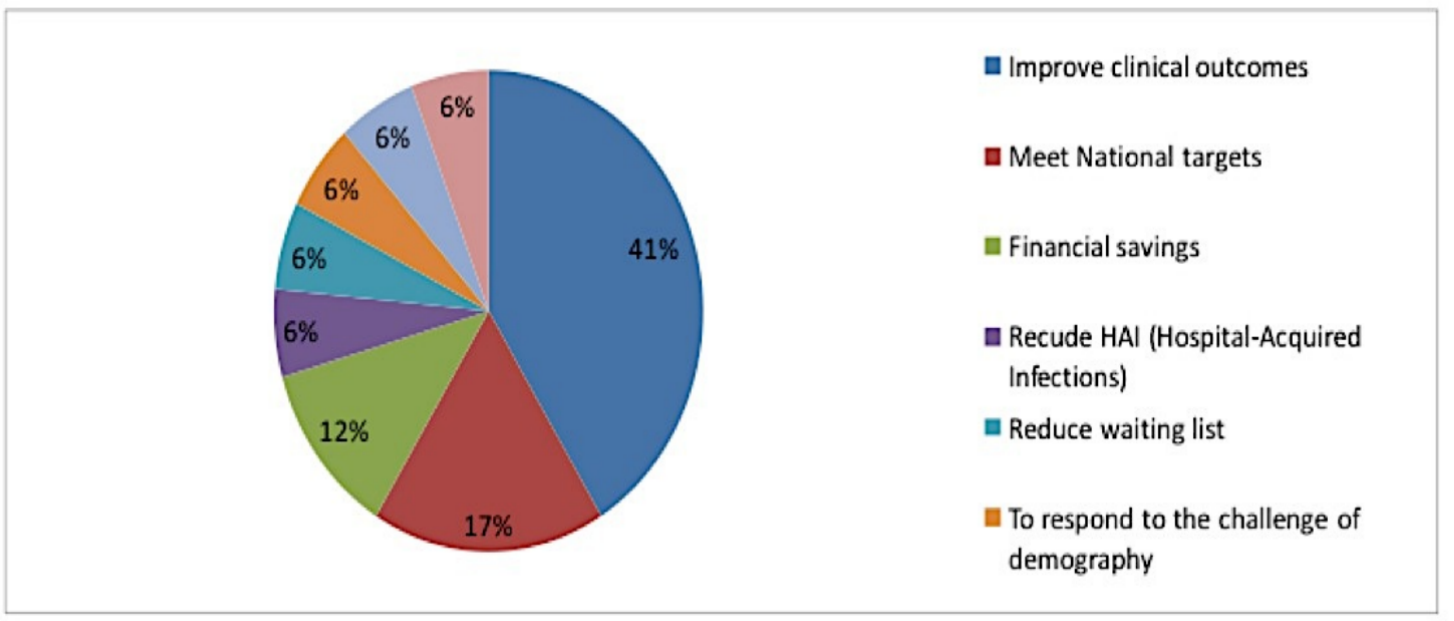


Figure 11 First most important healthcare objectives identified.

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.

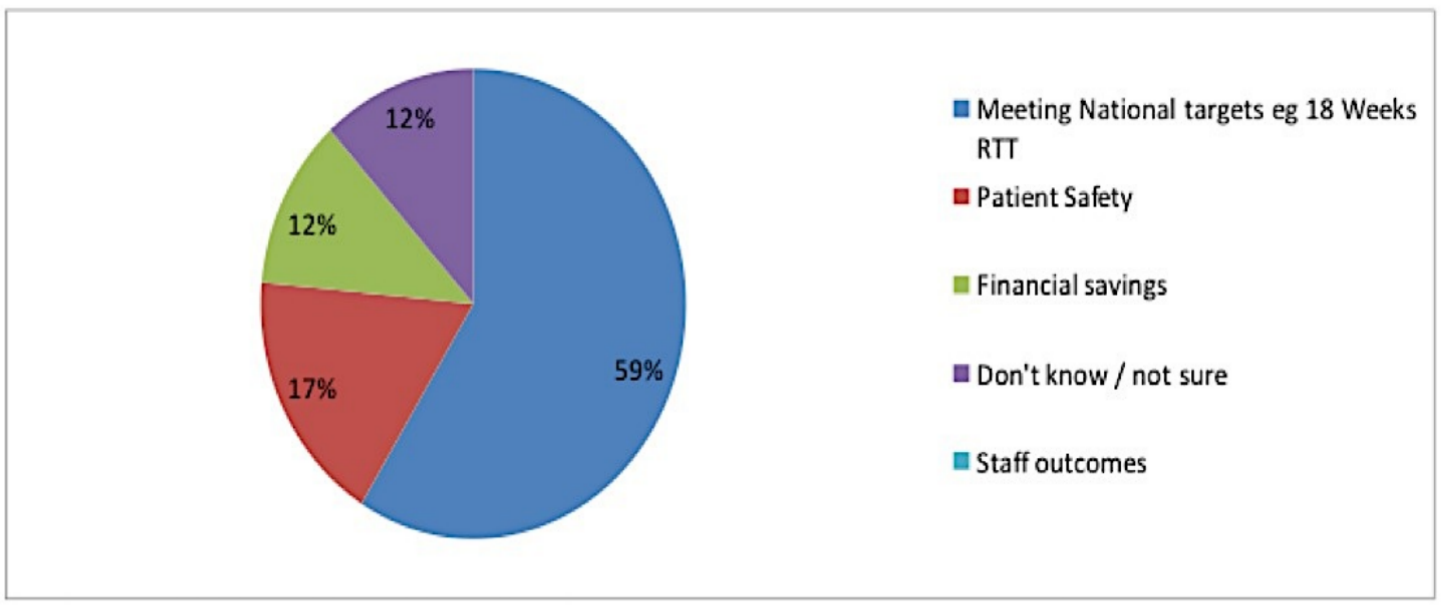


Figure 12 Second most important healthcare objectives identified.

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%).

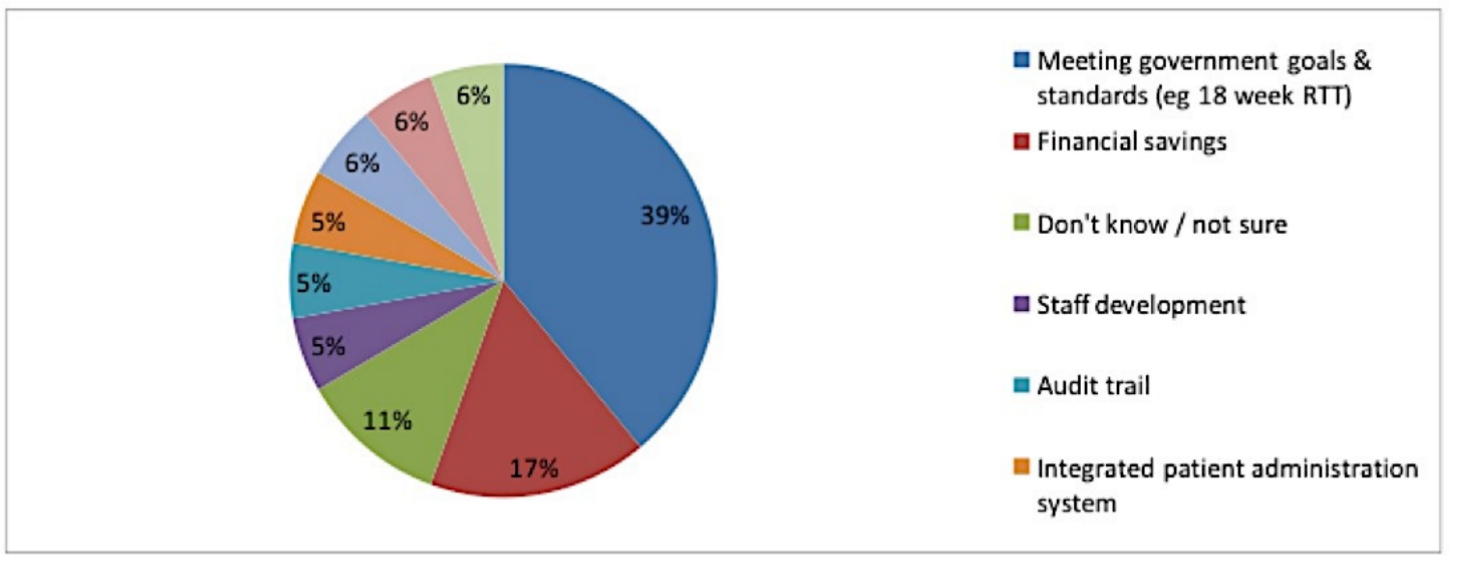


Figure 13 Third most important healthcare objectives identified.

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).

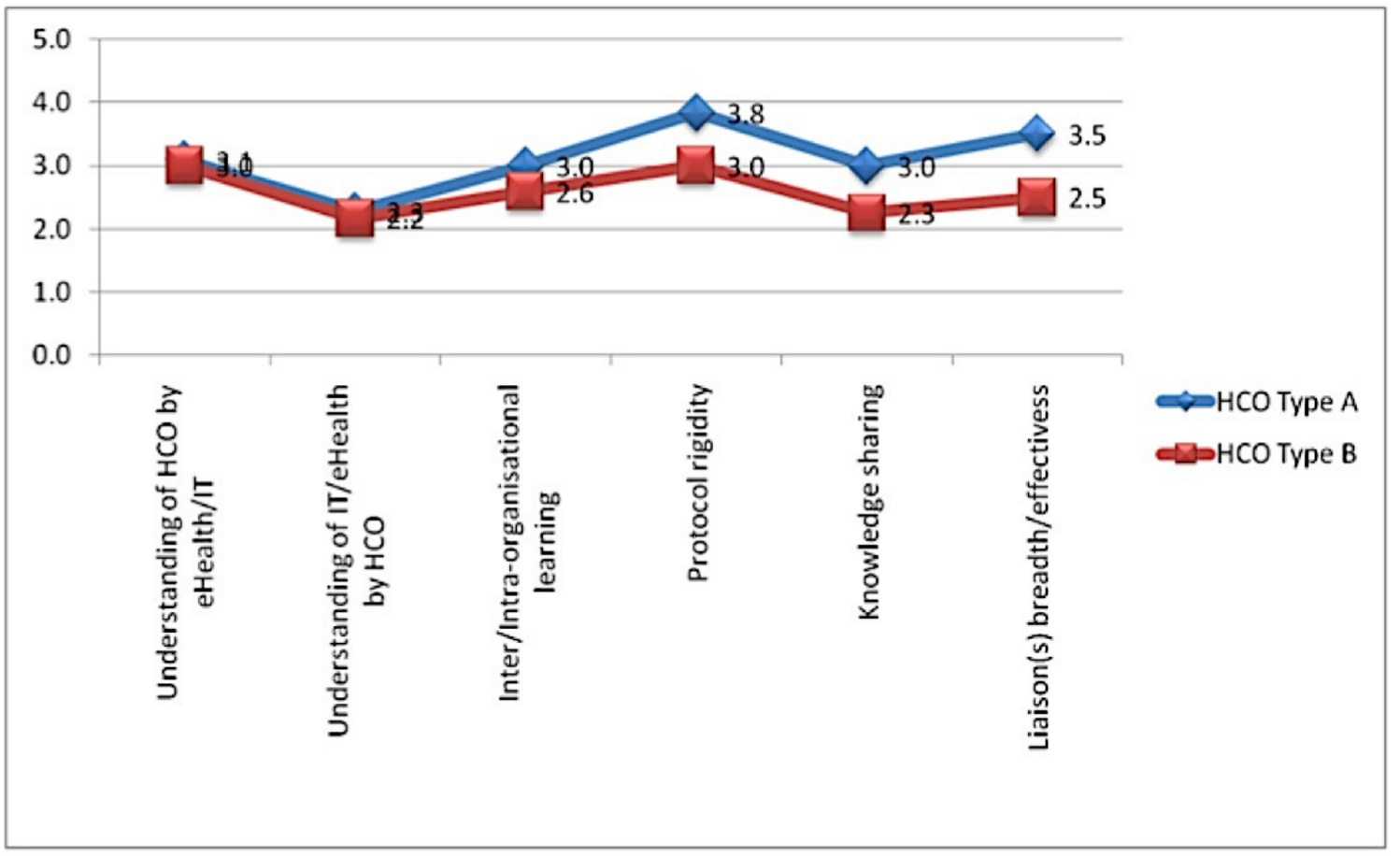


Figure 14 Communications maturity results (2012/2013)

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.

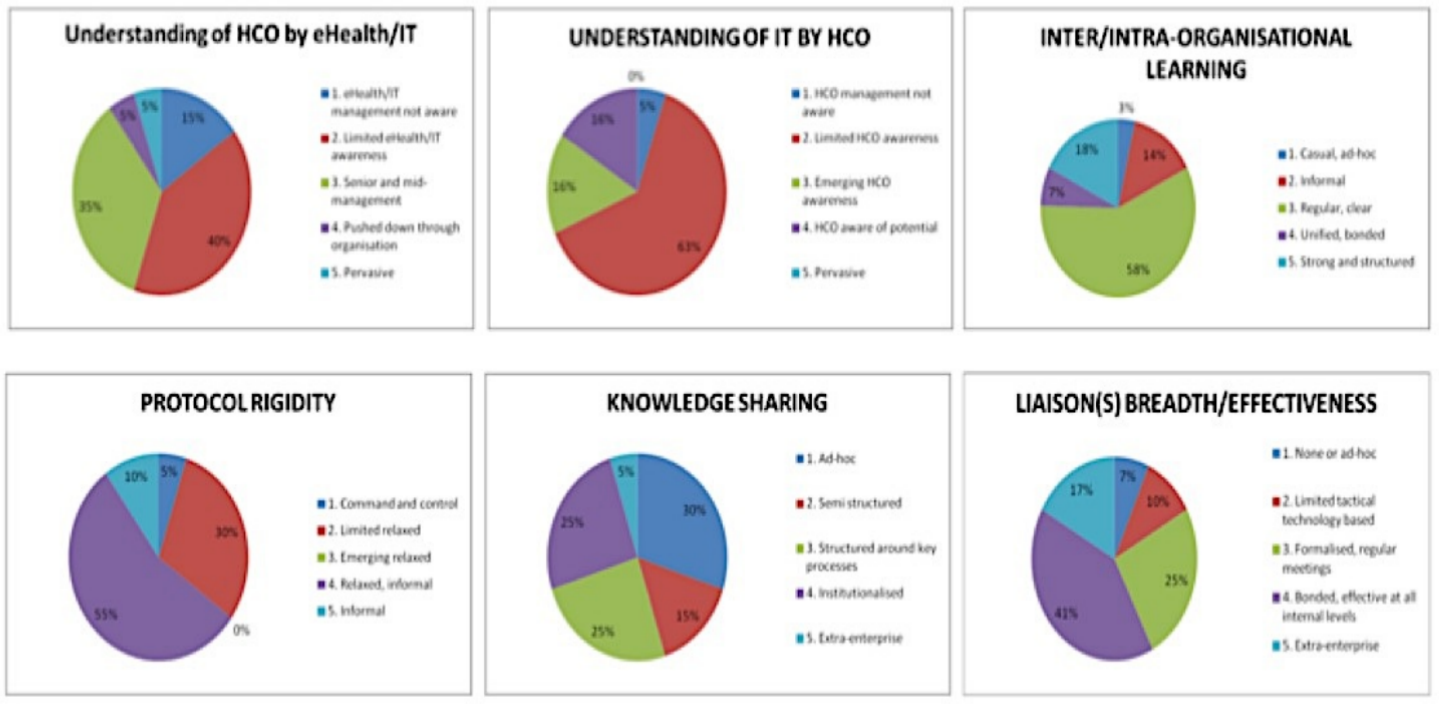


Figure 15 Additional results related to Communication Maturity dimension.

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)

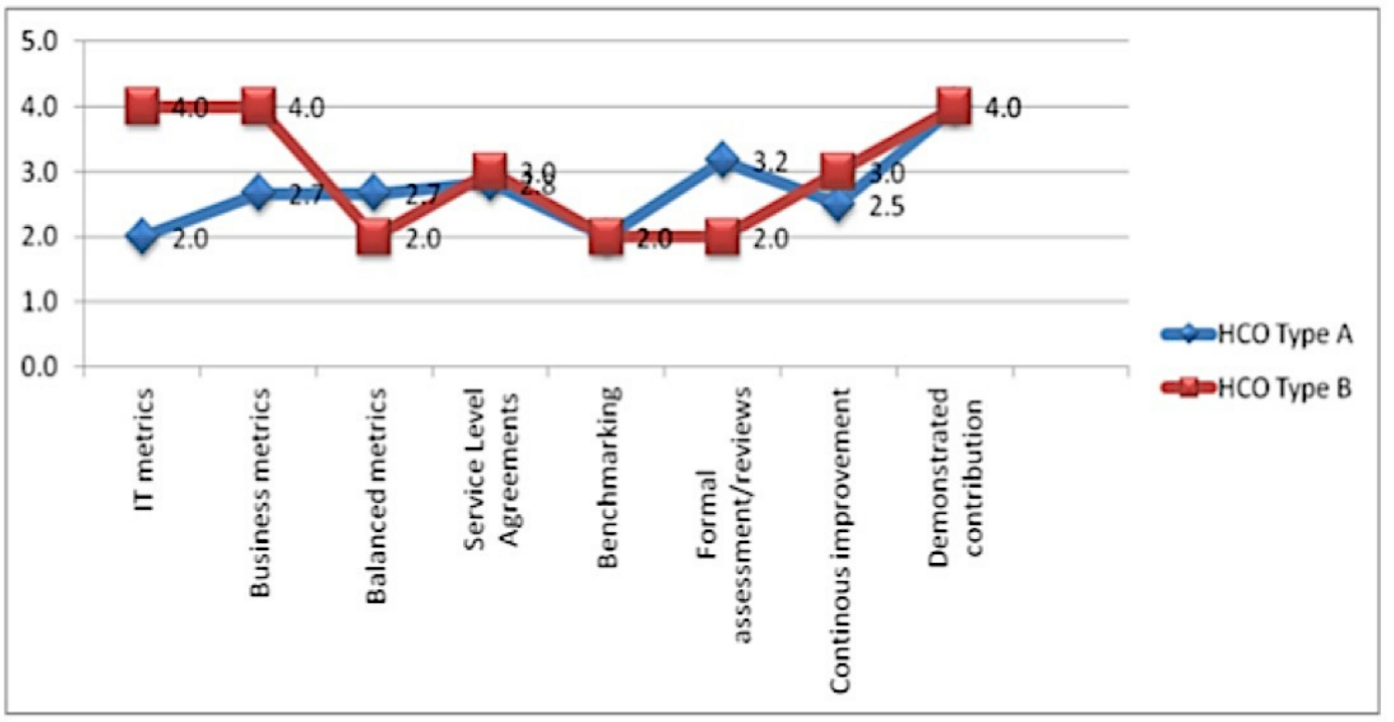


Figure 16 Competency/Value Measurement maturity results (2012/2013).

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.

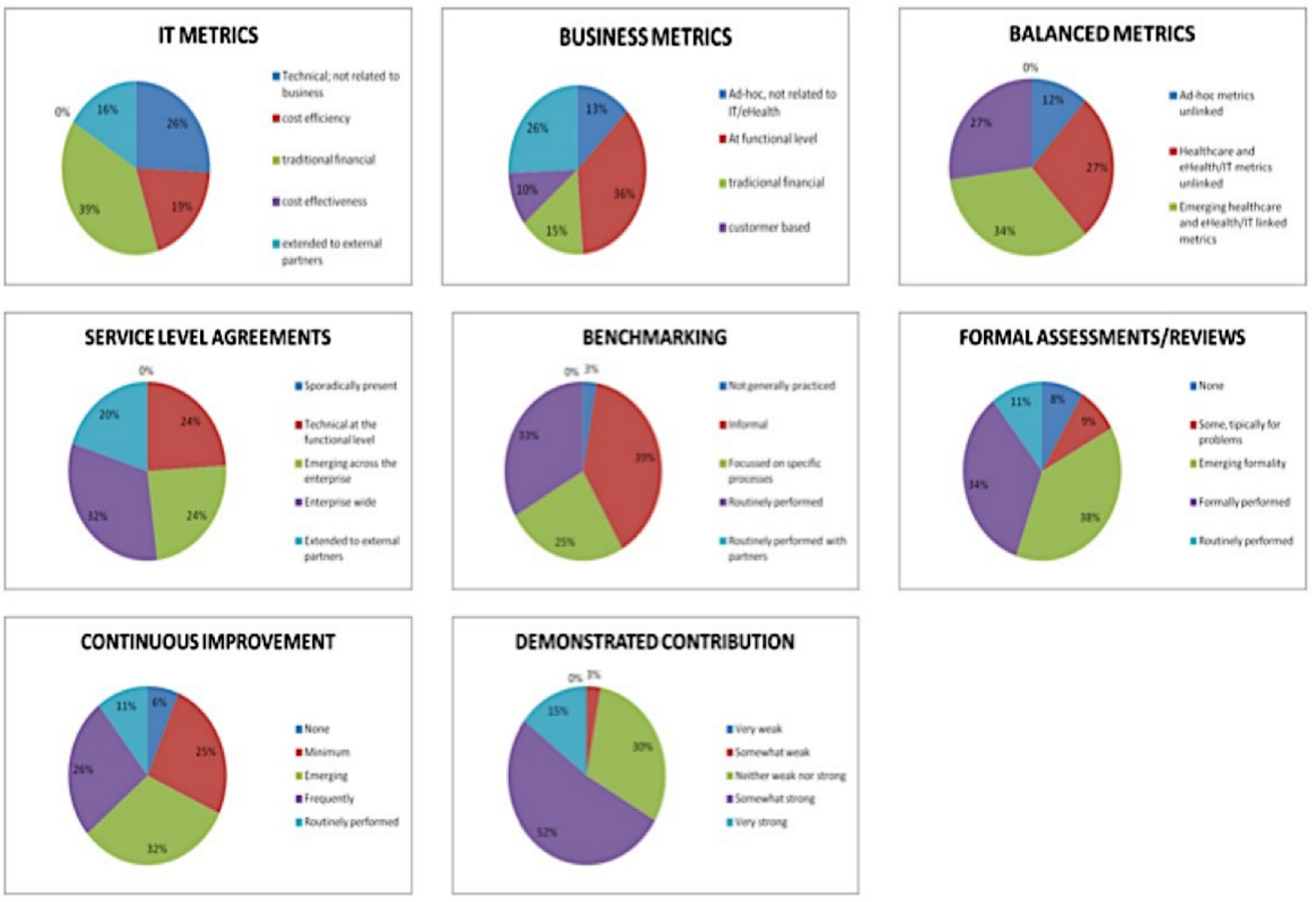


Figure 17 Additional results related to Competency/Value Measurement Maturity dimension

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).

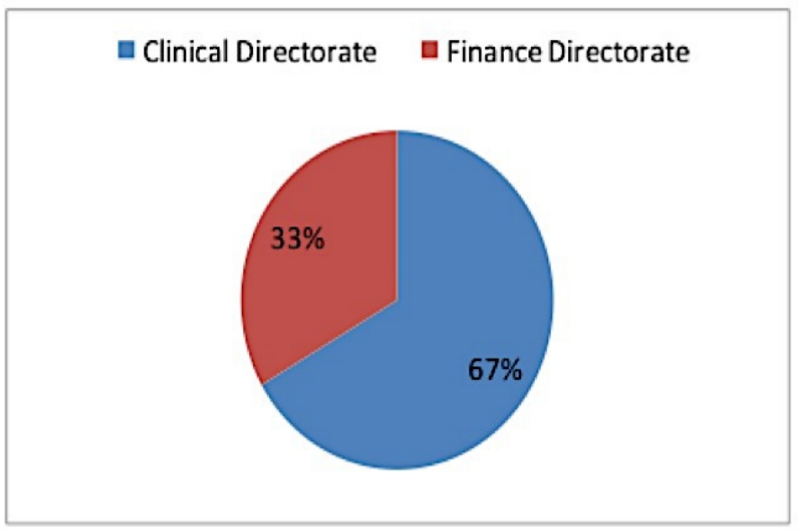


Figure 18 CIOs reporting hierarchy.

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).

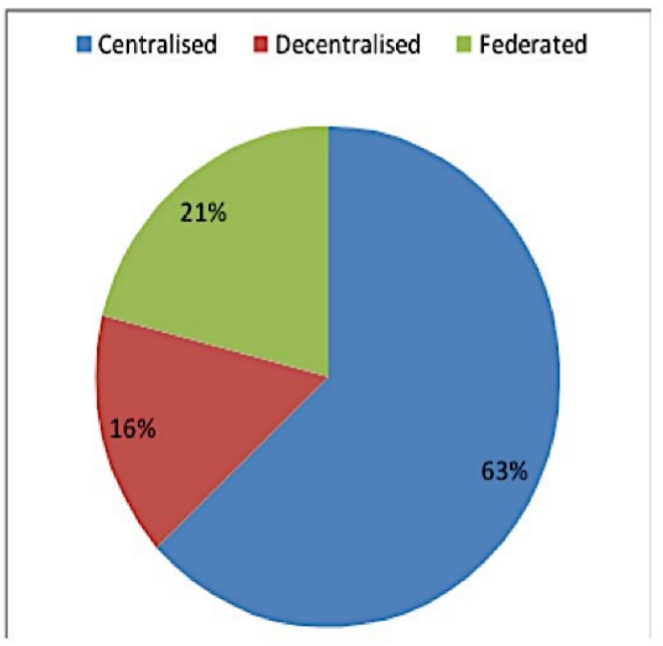


Figure 19 Organization structure of the IT/eHealth function.

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 further16% 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)

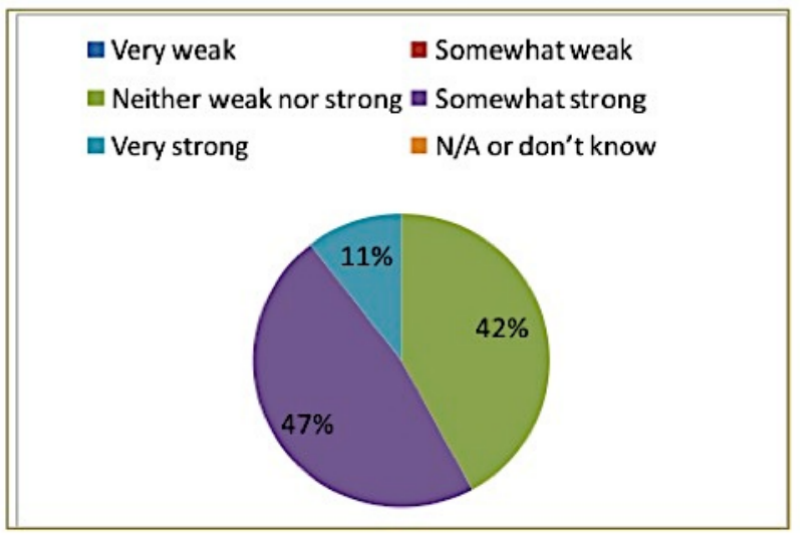


Figure 20 Ability of the IT/eHealth function to react/respond quickly to the organization's changing healthcare needs.

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.

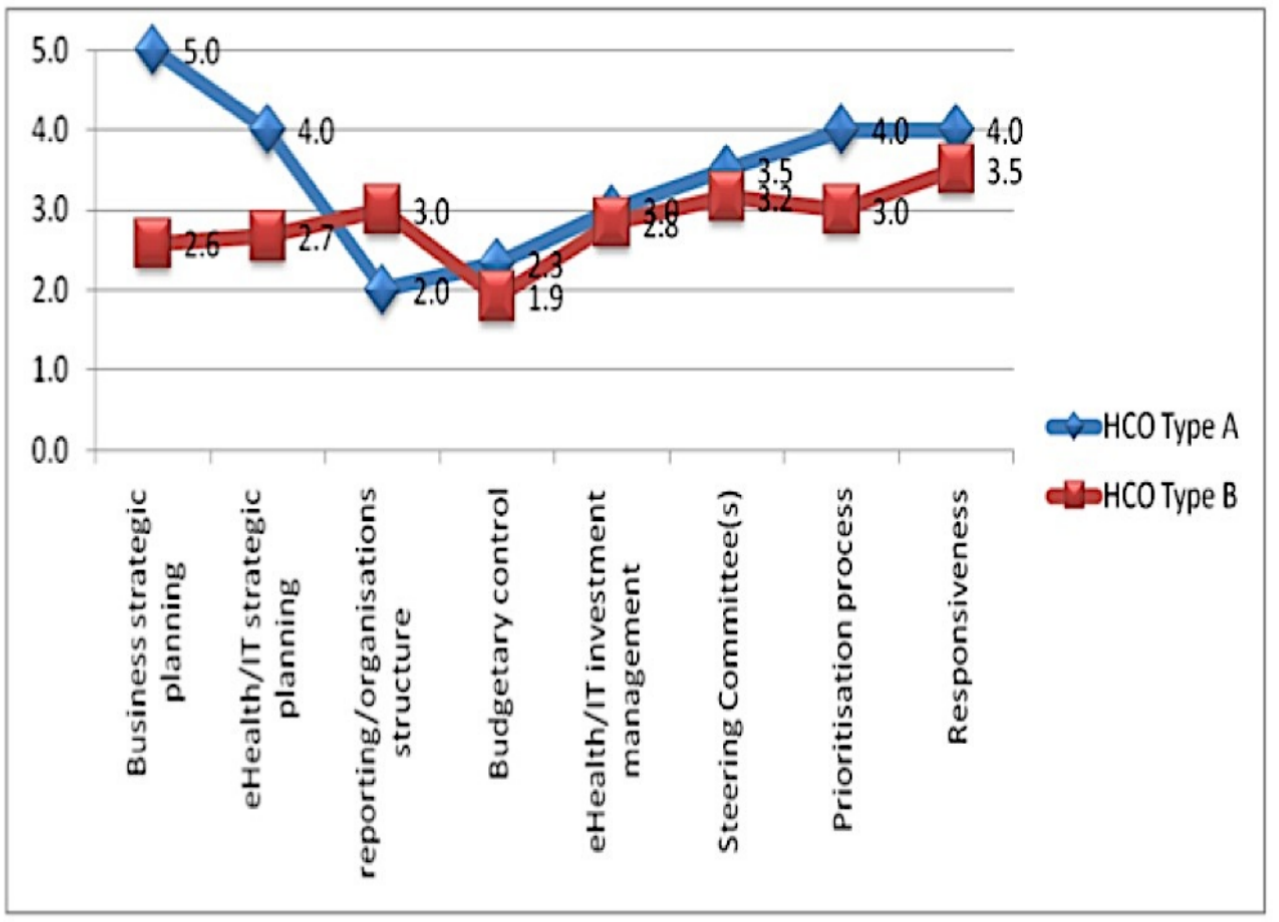


Figure 21 Governance maturity (2012/2013)

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

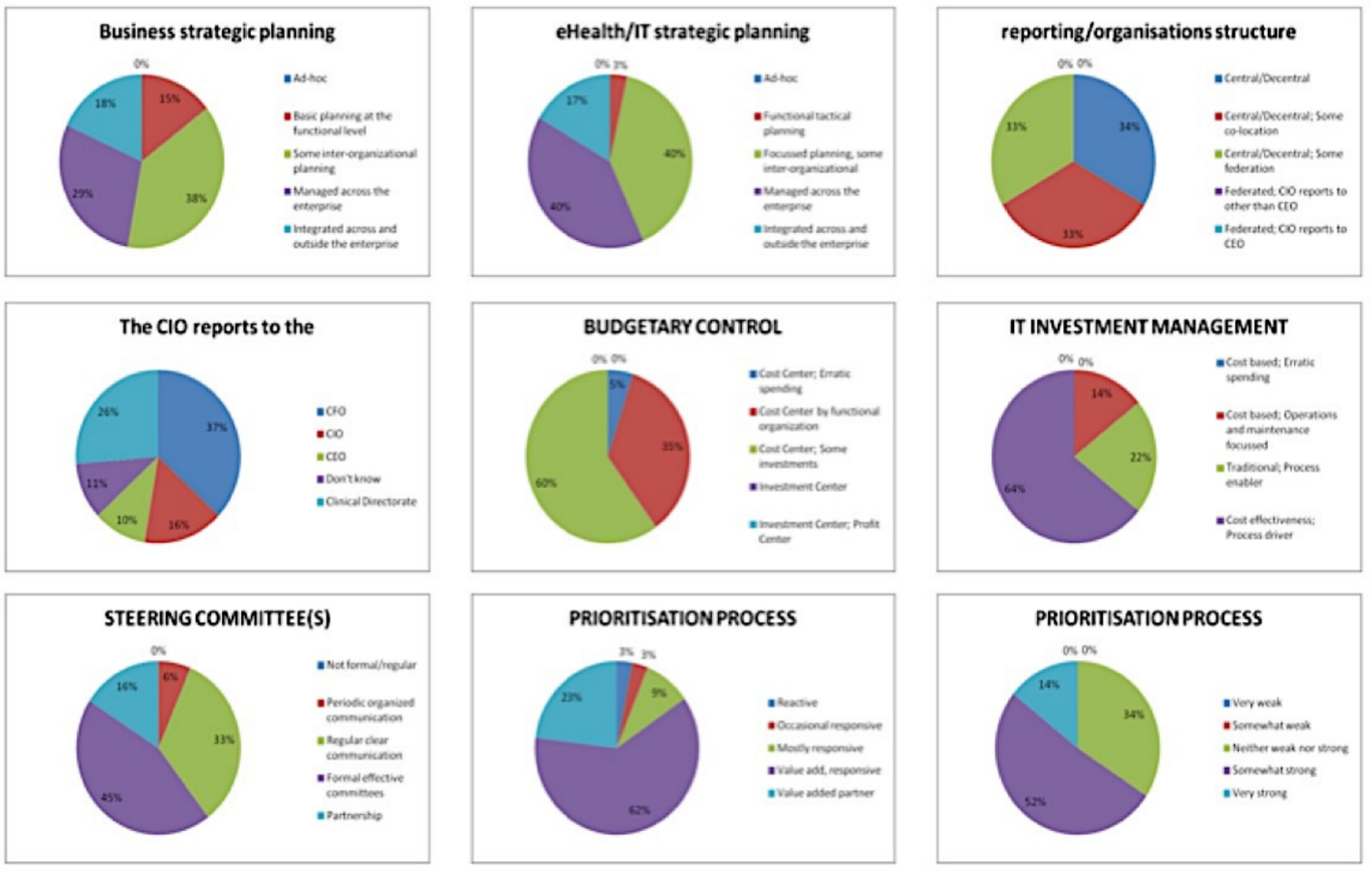


Figure 22 Additional results related to the eHealth Governance Maturity dimension.

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.

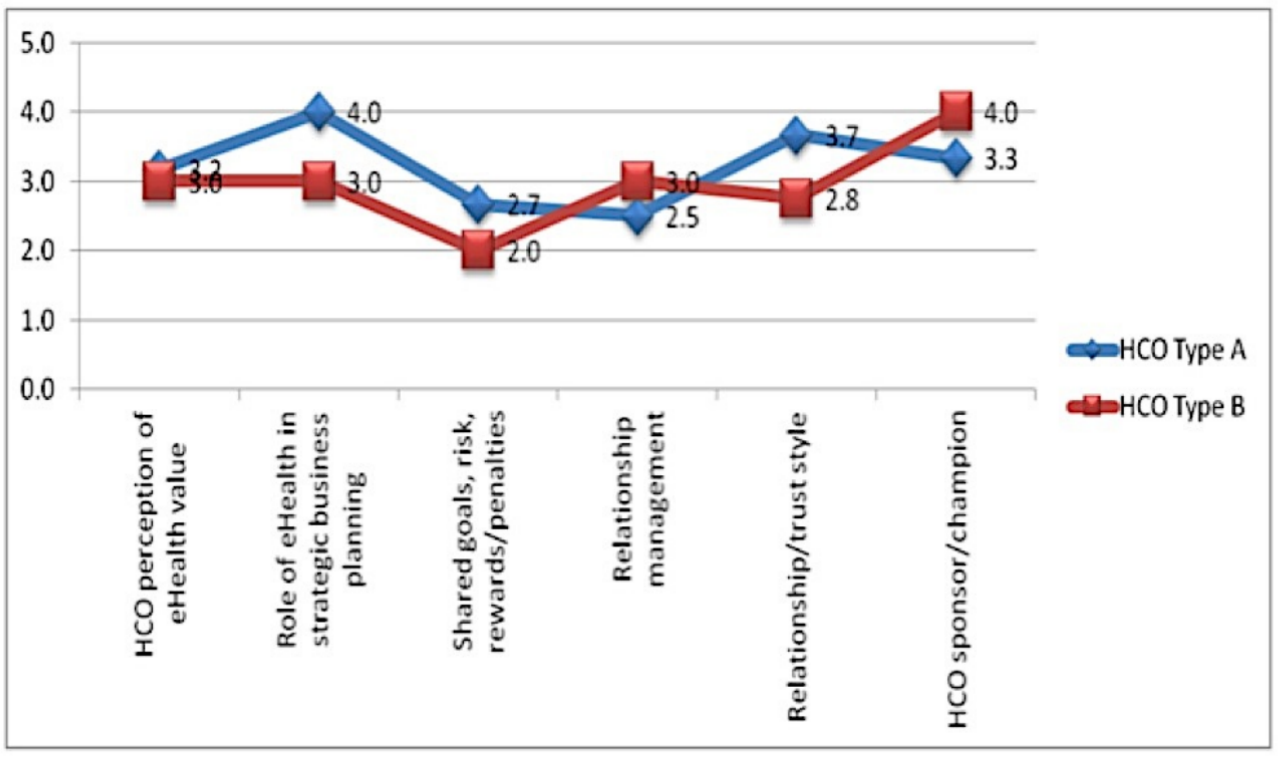


Figure 23 Partnership maturity (2012/2013)

Additional results related to Partnership Maturity dimension are shown in Figure 24.

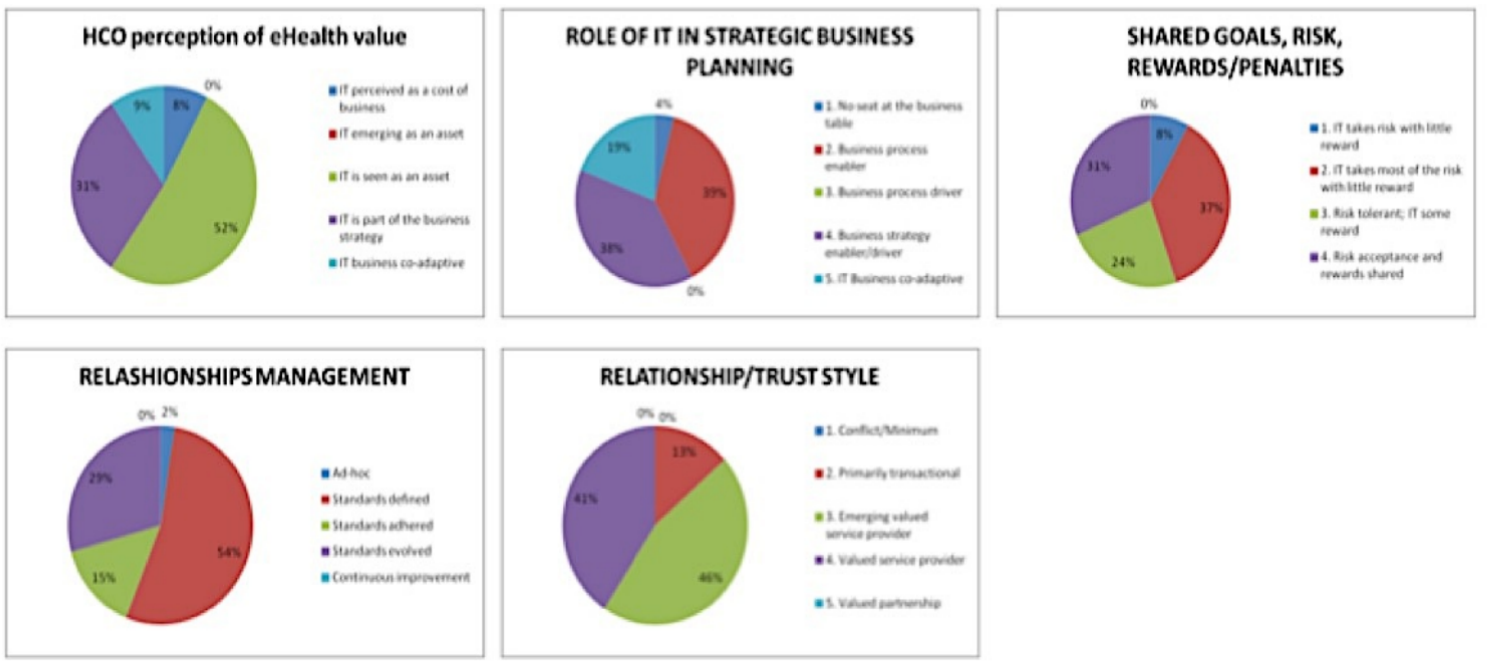


Figure 24 Additional results related to Partnership Maturity dimension

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.

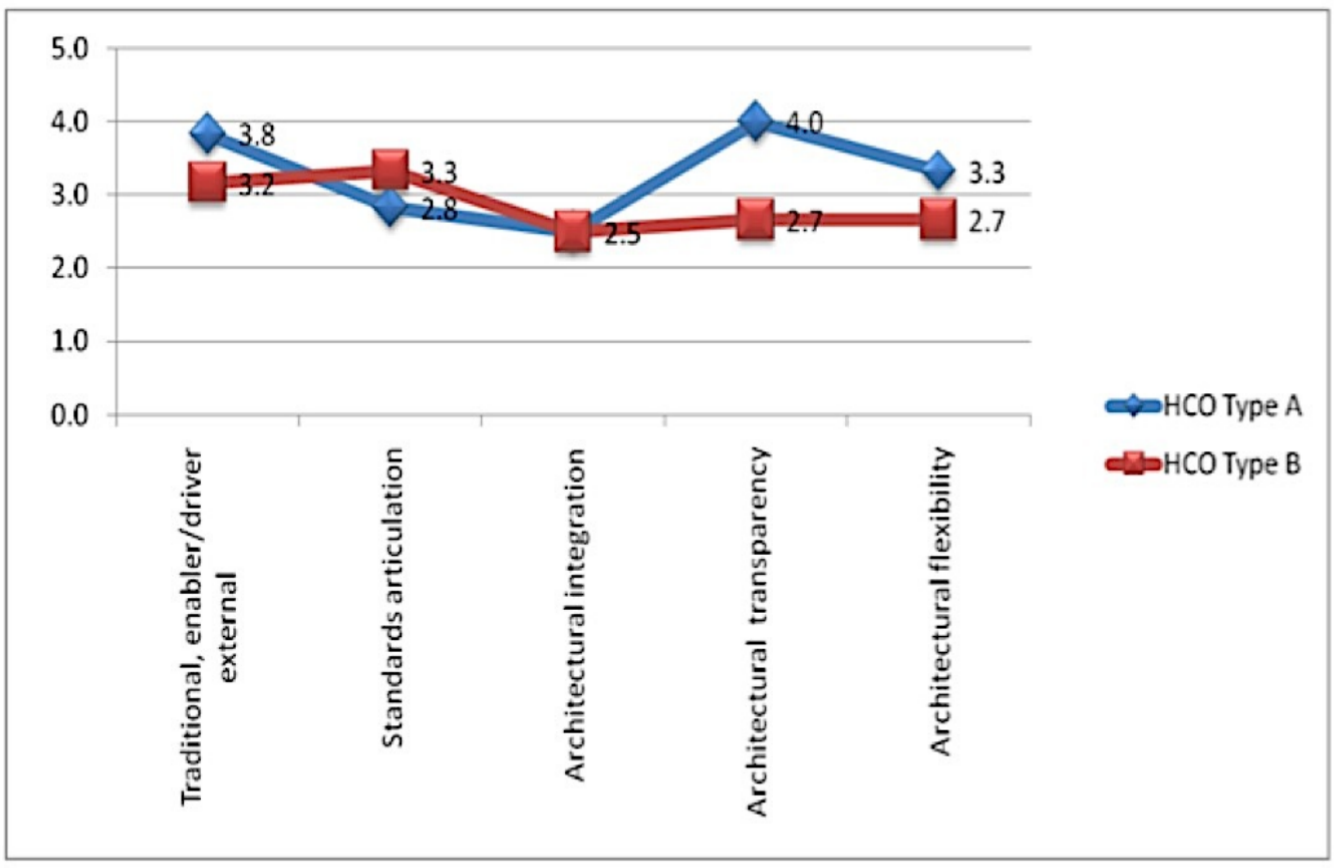


Figure 25 Scope & Architecture maturity (2012/2013)

Additional results related to Scope and Architecture Maturity dimension are shown in Figure 26.

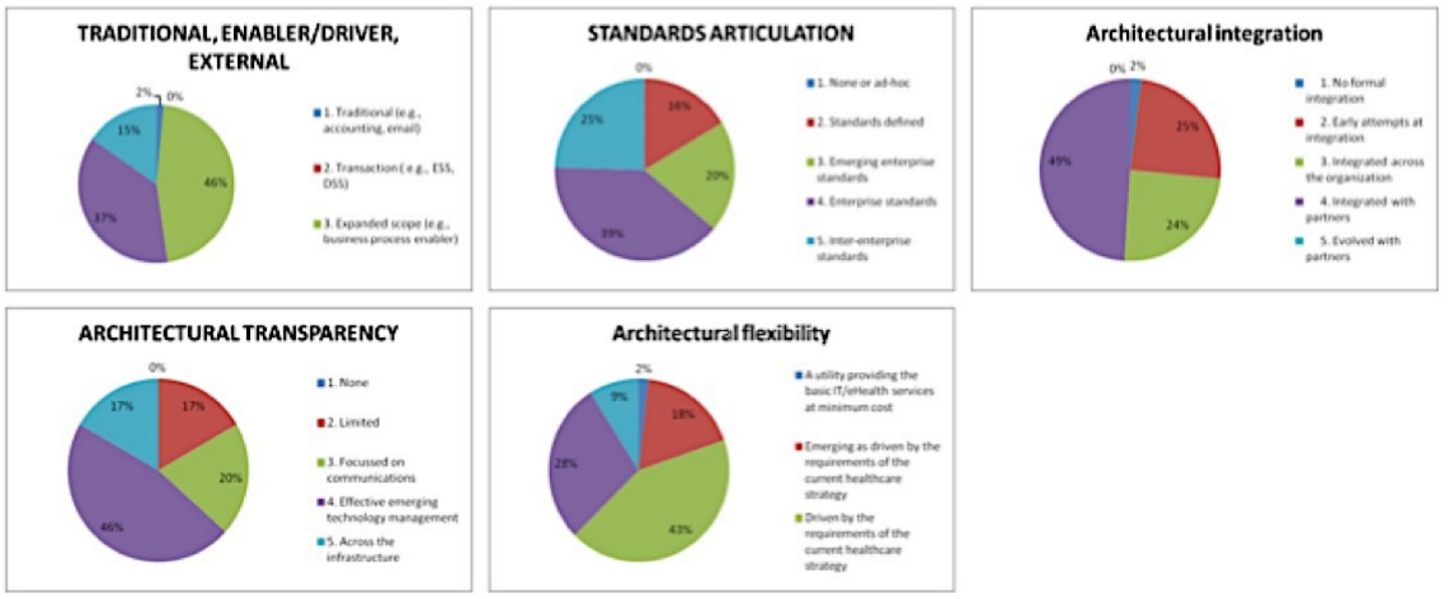


Figure 26 Additional results related to Scope and Architecture Maturity dimension.

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 the 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.

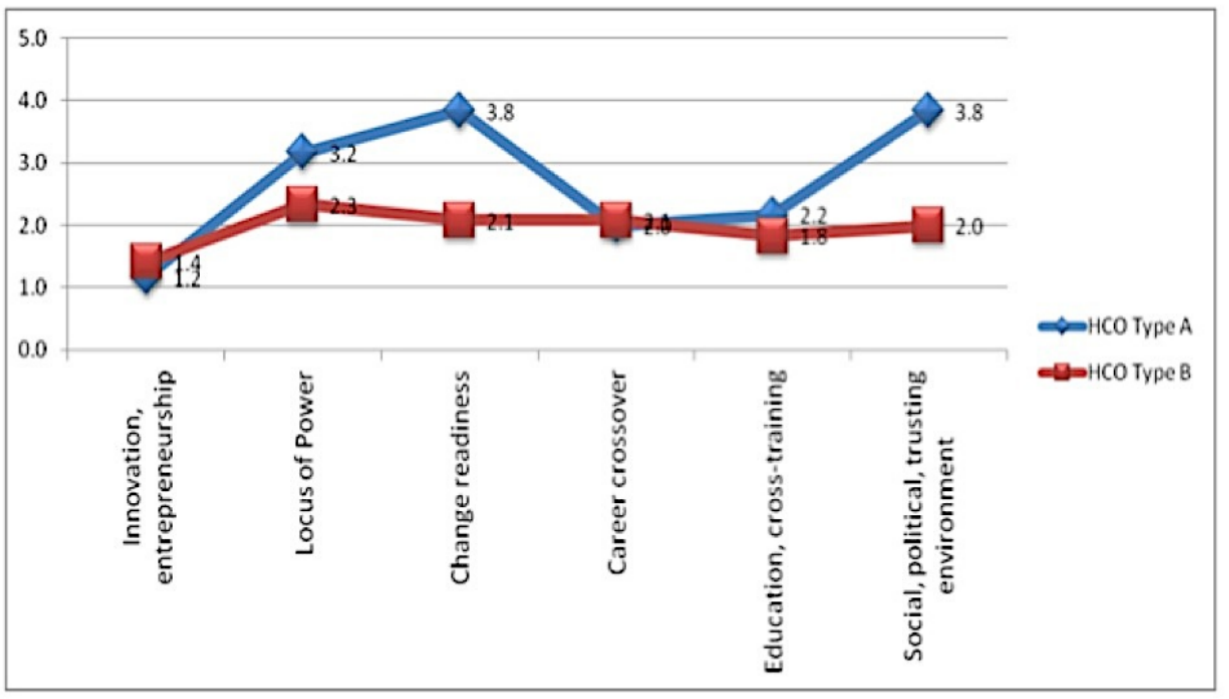


Figure 27 Skills maturity. Human resource (2012/2013)

The overall skills maturity is sitting at level 2 (

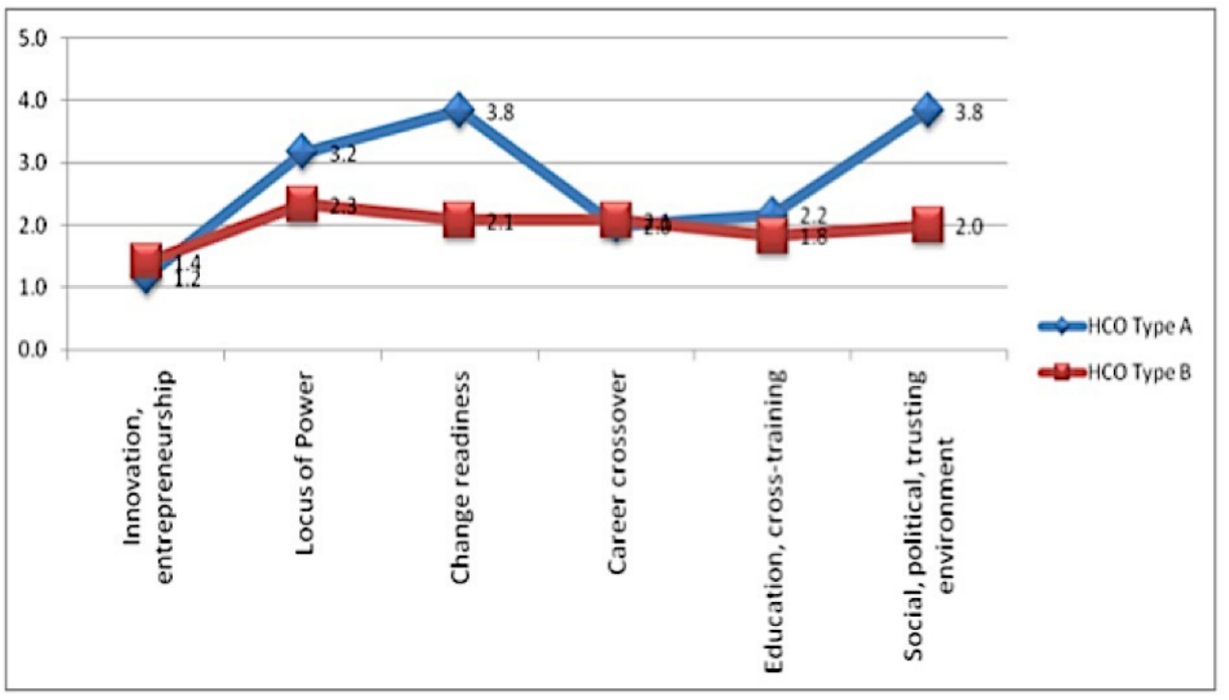


Figure 27), which means it differs across functional organisations, but it is moving towards level 3 particularly due to the evolution of change readiness and a trusting, practical, social environment. Still there is room for improvement in entrepreneurship, locus of power, carrier crossover opportunities and cross training.

Additional results related to the Skills Maturity dimension are shown in Figure 28.

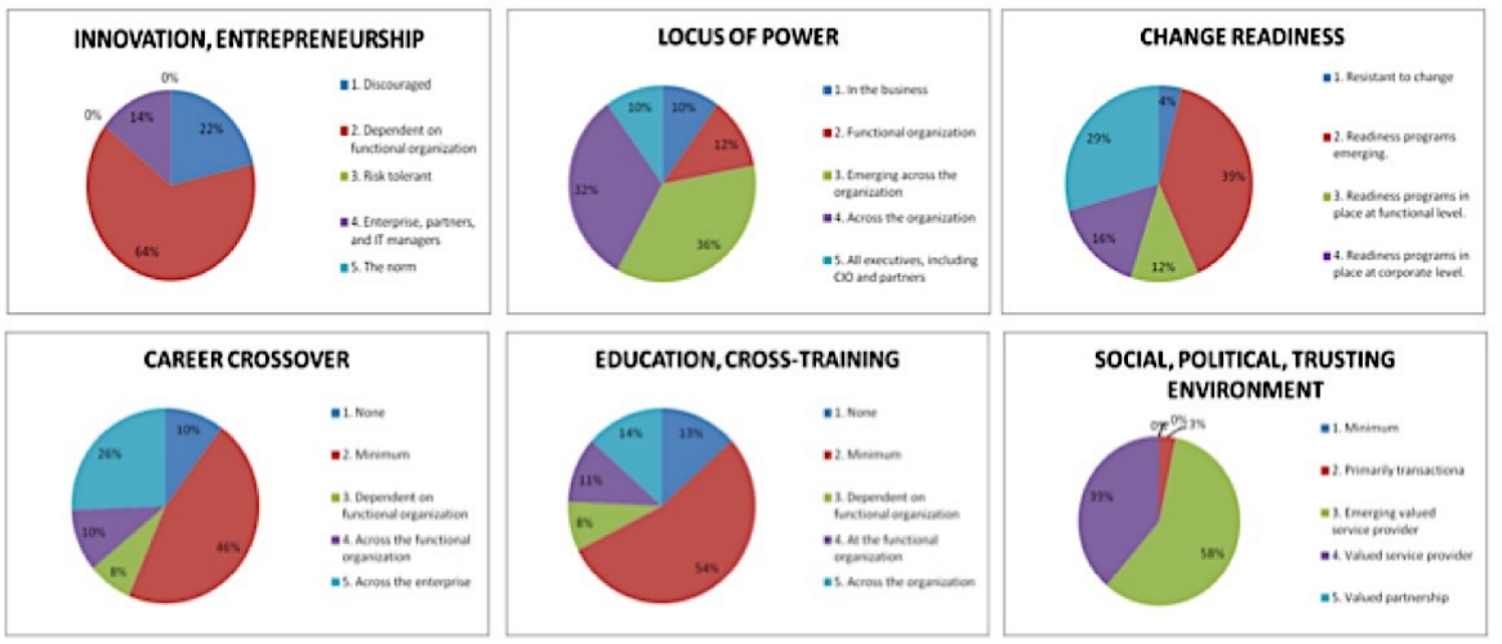


Figure 28 Additional results related to the Skills Maturity dimension.

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.

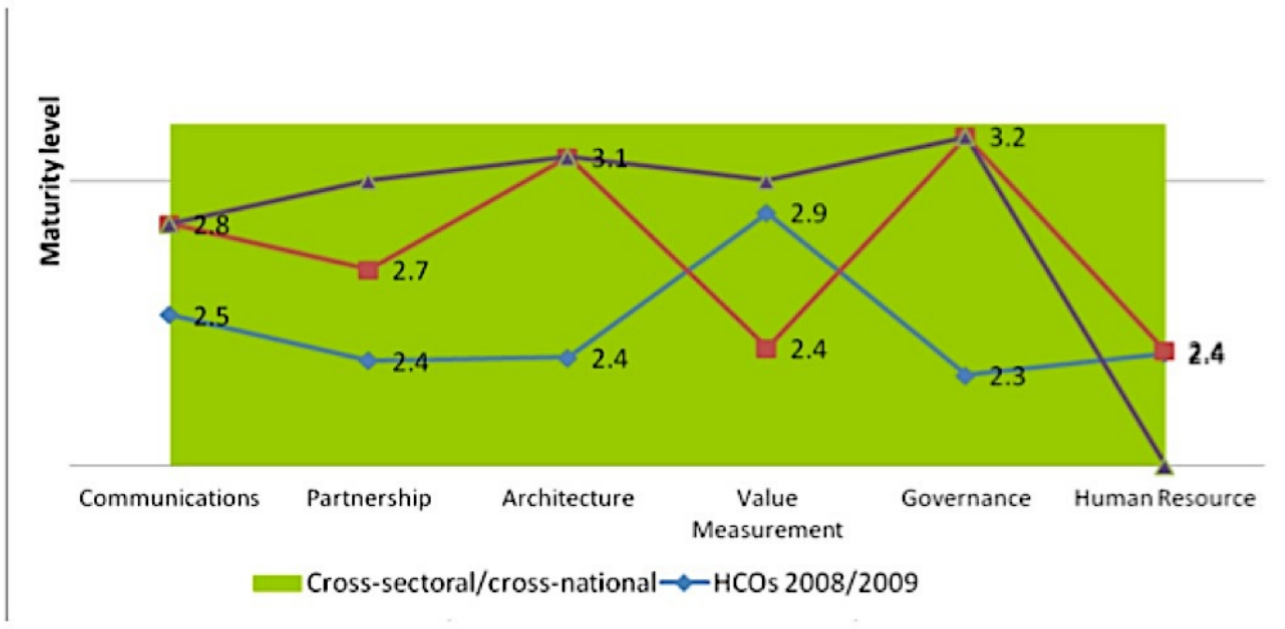


Figure 29 Longitudinal comparison of maturity against situation in other countries and sectors 2012/2013)

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.

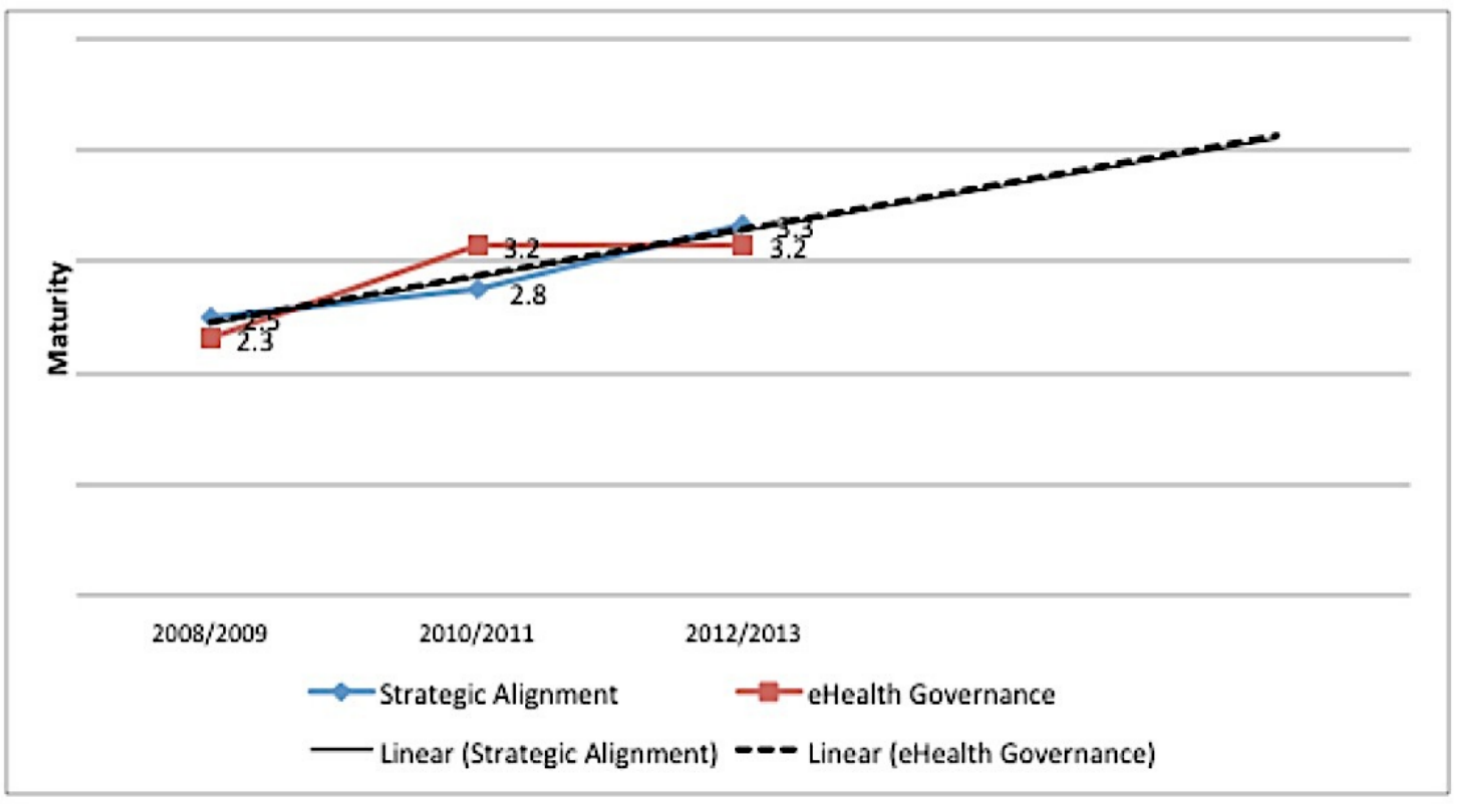


Figure 30 Strategic alignment and eHealth Governance trends.

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 it 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

CEO	Chief Executive Officer
CFO	Chief Finance Officer
CIO	Chief Information Officer
COBIT®	Control Objectives for IT
EU	European Union
GP	General Practitioner
HCO	Health Care Organisation
HEAT	NHS performance targets for H: Health Improvement E: Efficiency and Governance A: Access to Service T: Treatment Appropriate to Individuals
HEPMA	Hospital Electronic Prescribing and Medicines Administration

ICT	Information and Communication Technologies
ISO	the International Organization for Standardization
IT	Information Technologies
ITIL	IT Infrastructure Library
KIS	Key Information Summary
KPI	Key Performance Indicator
LEAN	Set of tools and techniques for organisational improvement.
LTC	Long Term Conditions
NHS	National Health Service
NVIVO	Software that supports qualitative and mixed research methods.
OLA	Operational Level Agreement
PPMS	Patient Privacy Monitoring System
RTT	Referral to Treatment (18 Weeks)
SAM	Strategic Alignment Model
SHS	Scottish Household Survey
SIBIS	Statistical Indicators Benchmarking the Information Society
SLA	Service Level Agreement

11 Annexe 1: Most relevant sources consulted to compare the situation of IT governance across industry sectors and countries.

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

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

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8.12 Appendix 7: BMC article

BMC Health Services Research Journal (Biomed Central)

Manuscript Reference: 1372800582126062.

Monitoring progress on eHealth strategic alignment and eHealth Governance in health care organisations.

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Abstract

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. How IT Governance is implemented within healthcare, the actual impact on strategic alignment and its influence to the information society progress, remains poorly understood.

Methods

This research is a longitudinal (2008-2013), involving an exploratory and explanatory multi-case analysis of three representative organisations across Scotland. A combination of empiric methods has been used: semi-structured interviews with implementers, surveys (Strategic Alignment Model), cross-sectoral/national benchmarking based on a literature review and a qualitative analysis of established eHealth progress indicators.

Results

Ninety-two participants have been involved across three case studies representing the main groups of eHealth clinical and non-clinical stakeholders. The benchmarking exercise incorporated 9226 institutions providing worldwide coverage. Data from Eurostat and The Scottish Government was available to compare progress of eHealth in the Digital society.

Conclusions

EHealth Governance is in its infancy across sectors and countries. 80% of the organisations worldwide are at in a transition point between a "committed" and an "established" process.

Our results support positively our hypothesis that the more mature eHealth Governance is, the better the strategic alignment between eHealth and health care organisations (HCOs), hence the better progress of eHealth and the Digital Society. The Strategic alignment is slowly maturing across the organisation (15% since 2008), indicating a faster development than the overall Digital Society (Scotland) progress indicators.

The National eHealth Strategy shows signs of steady progress and very positive eHealth take up in society with an overall growth of 12% since 2008, despite of the deep economical recession within the period of this research.

The conclusions of this study as a longitudinal analysis are limited and more research over the forthcoming years is required. For this purpose, a simplified and adapted method to monitor these trends in future HCOs research has been also provided.

Keywords

eHealth, IT Governance, Strategic Alignment, Maturity Models, Digital Society, Value Measurement, COBIT®, ITIL.

Background

Ethics

This research does not involve NHS patient's 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.

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 [2], 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 [3]. Furthermore, eHealth is considered key to achieve sustainable health care, especially in collaborative cross-border spaces [4].

Despite of eHealth being considered key for sustainable health care, many eHealth initiatives often have failed [2, 5] and HCOs commonly find themselves caught between the organisational pressures for delivering eHealth and organisational resistance to new ways of functioning [6].

The success implementing eHealth initiatives varies significantly according to experiences reported in the National Health Service (NHS), UK [7, 8]. Some of the downsides are related to delays, over expenditure or budget deficits, poor quality of outcomes and effectiveness on health care [9], which is consistent with the average ICT projects implementation statistics [7].

After series of disappointing eHealth implementations, there is a raising interest on eHealth/IT Governance [9] as a vehicle to provide assurance to all stakeholders that eHealth Programmes deliver the expected benefits [6]. This interest also derives from the appearance of greater pressures in HCO for compliance with best practices, standards and regulations [8].

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 [10]. Despite of 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 [9]. This is an international occurrence widely reported [11].

Governance is in essence the act of governing, which involves decision making but also management [12]. Beyond this concept, governance is also the art of assurance [13], 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, this has still been described as a “young science” [14], demanding more understanding of implementation processes, tools and models for better results [15]. There are a number of IT Governance frameworks used across sectors and industries, commonly COBIT®, ITIL and ISO (9000, 17799 and 38500), being the first two the ones most commonly adopted within the healthcare sector [11].

We were interested in exploring the application of these frameworks within the National Health Services in Scotland and their impact on the following three aspects: eHealth Governance maturity, strategic alignment with healthcare and local progress of digital societies. In other words, we expected to understand if the investments and efforts in maturing eHealth Governance practices have a perceivable impact on better healthcare from both, the strategic alignment with Health Care Services and their social impact on digital society’s progress (measured via e.g. SIBIS indicators).

Our hypothesis was that the more mature eHealth Governance is, the better alignment with the local and national healthcare strategy which ultimately will incentive digital

society progress by positively influencing local adoption of eHealth within the population.

This study has the following aims:

a. To understand how the participant HCOs are implementing eHealth Governance
b. Justify why HCOs should invest on mature eHealth Governance practices, by demonstrating the impact on better health cares through better strategic alignment and digital society progress.
c. Present a methodology for local and national monitor of eHealth Governance impact than can allow appropriate future planning and benchmarking of eHealth services and initiatives.

This research is a continuation of a previous study conducted between 2005 and 2010, which involved a comprehensive literature review[16], and a Delphi exercise [17], to propose a causal model of determining factors 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 help organisations and governments to make better eHealth investment decisions as strategies. This paper focuses on two of the main factors identified in the 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 [8]. Three representative NHS Boards in Scotland were selected for this trial [18].

In this paper we also present:

a. An adapted and simplified instrument to swiftly measure eHealth Governance and Strategic Alignment maturity levels.

b. A validated method to continue performing a longitudinal analysis and monitoring the progress and interaction between eHealth Governance, strategic alignment and eHealth as a component of the digital society.

c. Results of the longitudinal analysis within the three cases under study.

d. Insights on the situation in other countries and sectors.

e. A suite of recommendations for HCOs wishing to enhance their levels of eHealth Governance maturity and strategic alignment.

Methods

Design

A combination of methods has been required in order to capture observations and data of different nature and sources, and to correlate the relevant variables under study.

We report mainly on case studies of three different NHS regional Boards (Scotland) undertaking the adoption of eHealth Governance frameworks. Data was collected using surveys and semi-structured interviews. This method has been previously used on similar studies around governance and alignment achieving adequate results [1].

Benchmarking is a method focused on evaluations by comparison. It has been applied based on a comparison of studies related to eHealth Governance and strategic alignment different sectors and countries. Data was collected through a thorough literature review of governance and alignment studies (Table 2).

Progress on eHealth and Information Society was analysed using a selection of recommended indicators elaborated by SIBIS (Statistical Indicators Benchmarking the Information Society) [25]. SIBIS developed and tested across all state members of the

EU a set of information society indicators to monitor the rapidly changing nature of modern societies and to enable the benchmarking of progress in EU Member States. Local data was captured from official statistics from Eurostat and The Scottish Government public databases.

This is a qualitative longitudinal study presenting observations since 2008. It is also an exploratory and explanatory piece of research based on the experience of three Scottish case studies, along with an evaluation by comparison with documented studies in other countries and sectors. A correlation analysis is presented between the main variables of the main hypothesis, namely Strategic Alignment, eHealth/IT Governance, eHealth and Digital Society.

Setting.

In order to ensure appropriate representation of the variety of HCOs within the National Healthcare Services in Scotland, the following criterion was applied when selecting the study cases:

- Clinical context: end-to-end health care service provider, including primary, secondary and community care.
- Must include representative regions of Scotland with a variety of rural/urban areas and different deprivation index.
- Diversity of organisation sizes

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

The National Health Service in Scotland (NHS Scotland) is responsible for the provision of public healthcare to the 5.2 million residents of Scotland[19]. NHS Scotland comprises 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.

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 sound representation.

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 participants consent.

Data collection

Three different sets of data were collected:

a. Strategic alignment and eHealth Governance maturity

b. Benchmarking

c. Digital society progress

Strategic Alignment and eHealth Governance Maturity

During the first year of the study a full COBIT assessment was conducted along with an anonimised SAM survey. 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 [20] 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 [21, 22] and greatly applied in different industries and countries [20]. The instrument, adapted to HCOs, is available through St. Andrew's University website [23]. Repeated observations were then taken on a yearly basis across the selected NHS Boards. All main stakeholders involved in eHealth Governance within each organisation where invited to participate in the survey. Interviews where 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 anonimised and coded using NVIVO. The electronic surveys were anonymous since didn't collect the identity of the respondent but his/her role. Participation was only possible by invitation and access to the survey site was password protected in order to avoid data contamination.

Benchmarking

Data for benchmarking was obtained from a bank of SAM outcomes from 25 Fortune 500 companies [24] and a comprehensive literature review [11].

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

The literature reviewed provided worldwide data across a rich representation of industry sectors [11]. 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.

Digital Society Progress

Data from Eurostat and The Scottish Government was available to compare progress of Digital society based on a combination of eHealth progress indicators (SIBIS) [25] recommended by the European Commission (EUROSTAT Digital society database) [26], HEAT targets [27] and Scotland Performance reports [28].

Data analysis

Data were analysed using the framework method proposed by Luftman [20]. This method allows the analysis of IT/IS practices within 5 levels of maturity, 5 being the highest (Figure 1). Data was coded and normalised to six constructs available at each maturity level, namely: communication, competency/value measurement, governance, partnership, scope and architecture and skills.

The interviewer and chief investigator coded the interviews developing a coding framework supported by NVIVO [29]. This framework was reviewed in a multidisciplinary research workshop involving all authors.

The revised 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.

Finally, a subset of the SIBIS indicators framework has been used in order to analyse, compare and contrast progress of Digital Societies in Scotland since 2008 and progress of eHealth. The data was obtained from Eurostat and the Scottish Government databases.

Progress of the main variables of our driving hypothesis was calculated and a correlation analysis of these variables (Strategic Alignment, eHealth/IT Governance, eHealth and Digital Society) over the 2008 -2013 period was conducted.

The NHS Research and Development department supervised the design of the study, the ethics approval and the overall progress of the study and data captured, specially with a designated R&D advisor. A formal report with participant volumes and progress was presented on yearly basis along the whole period of study.

Results and discussion

Ninety-two participants have been involved across three NHS Boards representing the main groups of eHealth stakeholders, including clinical and non-clinical seniority, eHealth providers and health care executives. The benchmarking exercise covered twenty-six selected worldwide studies and 9226 institutions.

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. We had limitations with the representativeness of one of the three cases under study, the smallest Board, due to slight participation on the survey during the last year of this study; however, previous years all Boards had sound representation.

The responses were provided mainly by eHealth teams (35%) and senior managers (30%) but also included decision makers (20%) and other clinical stakeholders (15%). Data saturation was achieved but took longer than expected because of the delays obtaining the desired volume of responses to the survey and different perspectives on maturity levels emerging from the three groups of stakeholders. We didn't want to close the data collection too early until a minimum of representativeness was achieved. However, data saturation can be considered achieved, as the information collected started to become repetitive and contained no new ideas, reason why we are reasonably confident that the inclusion of additional participants was unlikely to generate new knowledge.

Strategic Alignment maturity

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

Most of the alignment dimensions show a modest growth (Figure 3), representing a 15% overall improvement. The areas organisations seem to focus their efforts in recent years are 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 of the steady progress (13% to36%) shown since 2008.

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.

Alignment enablers and inhibitors.

The organisations under study coincide on the importance of IT/eHealth achievement power, its demonstration of strong leadership, its capacity for meeting commitments and its 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 rely on IT/eHealth to drive the shift towards alignment. The main enablers are perceived to be in the IT/eHealth arena (Figure 4) 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 5), 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.

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 6).

- 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. Council) (Figure 7).
- Third target: Financial savings and cost management (e.g. reducing costs through convergence and standardisation) (Figure 8).

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 6), second (Figure 7) or third (Figure 8) 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.

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 9) (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 target is a wider objective. The organisations under study are driven by a National strategy:

"Better health, better care strategy" [5], 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 principal 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-centered, safe and effective service with quality infrastructure.

The three most important second (Figure 10) and third (Figure 11) 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%).

eHealth/HCO alignment dimensions

Effectiveness of IT and Business communications (Communications Maturity)

This SAM dimension is about mutual understanding [24] between IT/eHealth and the organisation, from both clinical and non-clinical perspectives, and the methods to promote better communication.

As shown in Figure 12, 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 improvements, not only internally but extra-enterprise.

Additional results related to Communication Maturity dimension are shown in Figure 13.

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" [24].

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 of 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.

Service Level Agreements (SLAs) are extensively used and measured and regularly monitored. There is still 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 lost 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 15

eHealth Governance Maturity

In 1996, Hendenson and Venkatraman defined governance in terms of choices and decisions the organisation makes when prioritises investments, takes ownership of projects, budgets and technology[1]. This is the same approach adopted in SAM [24] and hence in this study.

In order to understand how mature is governance within the organisations under study, we considered who 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 16). 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 4 and Figure 5).

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 17). 21% of the participants think the 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 further16% 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%).

In overall terms, Governance is sitting between a high level 2 (2.8) and mid level 3 (3.5) (Figure 19), 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.

Additional results related to Competency/Value Measurement Maturity dimension are shown in Figure 15

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 delivery 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 4) but lack of close partnership or the presence of conflict between eHealth/IT and healthcare units is an inhibitor for achieving (Figure 5). 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 21), 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.

Additional results related to Partnership Maturity dimension are shown in Figure 22.

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 [24] to be considered when analysing the maturity or the architecture. A broader analysis is available in Beratarbide and Kelsey work on healthcare organisations [11]:

- 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

611 go above the processes becoming business strategy enablers/drivers (IT/eHealth is a
612 catalyst for changes in the healthcare strategy), but still 5.3% consider that their
613 systems are limited to traditional office support (e.g., e-mail, accounting, word
614 processing, legacy systems).
615 In terms of the articulation of and compliance with IT/eHealth standards, the existent
616 standards are mainly considered as defined and enforced (94.8%), in some cases only
617 at the functional unit level but not across different functional units (26.3%), but 21.1%
618 believe that it transcends with emerging coordination across functional units, or is
619 fully embedded across functional units (31.6%). Only 15.8% feel that it happens with
620 joint coordination among their strategic healthcare partners/alliances.
621 In terms of the scope of architectural integration, the components of the IT/eHealth
622 infrastructure are mainly considered to be integrated (84.3%), in some cases only at
623 the functional unit with emerging integration across functional units (31.6%) , across
624 functional units (52.7%). None of the organisations consulted indicated traces of
625 evolving with healthcare partners but instead integrated with them (31.6%). 10.5%
626 were not sure about the scope of architecture integration in their organisations.
627 With regards to the level of disruption caused by healthcare and IT/eHealth changes
628 (e.g., implementation of a new technology, healthcare process, merger/acquisition),
629 most of the time, a change in the organisation under study is considered to be
630 transparent (94.7%) at functional level only (26.3%), with emerging transparency
631 across all remote, branch, and mobile locations (21.1%), transparent across the entire
632 organization (36.8%) and to their healthcare partners/alliances (10.5%). 5.3% are not
633 sure about how transparent the process is.
634 The IT/eHealth infrastructure is viewed as an utility providing the basic IT/eHealth
635 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 this 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 1), which means 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.

Additional results related to Scope and Architecture Maturity dimension are shown in Figure 24

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 the 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 regularly 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.

The overall skills maturity is sitting at level 2 (Figure 25), which means it differs across functional organisations, but it is moving towards level 3 particularly due to the evolution of change readiness and a trusting, practical, social environment. Still there is room for improvement in entrepreneurship, locus of power, carrier crossover opportunities and cross-training.

Additional results related to the Skills Maturity dimension are shown in Figure 26.

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 27. 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.

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%) [31].

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[5] We speculate that this is in response to multiple studies which suggest that a federal styles best supports organisation-wide IT architectures and processes [5, 32].

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.

Digital society Development

Progress of the National eHealth Strategy

The Scottish Government's eHealth programme is ambitious in terms of using ICT to improve patient care. The eHealth Programme is fundamental for shifting "reactive, crisis management, acute-orientated care towards anticipatory, preventative and continuous care" [33].

The National vision of eHealth [34] is still not implanted within the NHS Boards and society. Our study shows there is a difference between the National concept and the vision of eHealth within the NHS Boards. Whilst the National vision presents eHealth as

a new way of thinking, working, receiving and providing healthcare from acute to community care services, HCOs are still circumscribing eHealth around ICT and information as supporting services rather than part of the healthcare value chain.

The type of eHealth changes that all NHS Boards are facing involve transformations further than just technology, information or joining up GPs with hospital services. There is a recognition that healthcare has modernising processes and encourage new ways of working where eHealth can "support" better acute and community care services. The vision of eHealth as provider of better care services not just supporting services is still to materialise across the NHS Boards and society.

Table 3 shows examples of National eHealth initiatives with expected high Digital Society impact.

In order to measure progress delivering the National Strategy, Boards are required to provide quarterly common progress measures [35], which show a slow but steady progress at least in the following areas:

Paper-lite hospitals (Efficiency).

This is measured by the number of requests to hospital Health Records services to retrieve the full patient record, as a ration or clinics booked, A&E attendances and inpatient admissions. Measures show variances across NHS Boards, from 23% to 100% of contacts required paper records to be pulled. Paper records remain always-pulled in 43% of the NHS Boards. The main issue identified to progress to electronic records is the lack of current agreement to stop pulling casenotes. A&E services are identified as the more likely to be electronic in the short term. Over time it is expected to see less "default" use of the paper casenote.

Remote working (Efficiency): Video-conferencing and remote clinics.

This is measured by the level of activity (calls and duration) through registered national video conferencing devices and, separately, by the number of clinical services offering remote electronic consultations. It shows a steady progress 6% across Scotland every quarter. There is also recognition that this indicator is underestimating the actual level of activity because of the extensive un-measured use of office communication systems across the Boards.

In terms of remote clinics, Board measures ranged from none to up to 11 different services per individual Board, including Stroke, Breast cancer, Orthopaedic, A&E and Hospital at Home, Medical Education and Telepresence. Boards are slowly reporting the incorporation on new remote services every other quarter.

A limitation for this indicator is the current inconsistency capturing the measure across different organisations; hence this should be cautiously interpreted.

Person centred: patient portals.

Progress is measured in terms of percentage of GP practices within a Board offering on-line services to their patients. 40% of the NHS Boards have reported between 2% and 73% of GP practices offering on-line services, with an average of 22% incrementing approximately 5% every quarter. It is expected a sharp increase by the end of 2014 once the new National GP Patient Administration System delivered in 2013 is established.

By the end of 2013 only 0.002% of the population in Scotland had registered with patient portals and 85% of those are active users. The main patient portals in place are "My Diabetes My Way" and "Renal Patient View".

It is expected that in the near future, NHS Boards will also report on the number of patients registered to use patient portals and the number of patients that have made use of online services such as appointment booking or repeat prescriptions.

Integration and LTCs (Long Term Conditions)

This is measures by the percentage of all patients on GP practices whom a KIS (Key Information Summaries) has been created. By the end of 2013 almost 60% of all practices in Scotland use KIS capabilities. The number of summaries available is increasing at rate of +1500 new KIS every quarter per average Board. The current amount of KIS represents approximately 0.0038% of the total population by the end of 2013 (0.0021% in Q1 2013).

Availability (Clinical Portal)

This is measured by the number of clinical users accessing clinical portal, the number of accesses and the % of the key clinical priority information items accessible through the portal.

86% of the NHS Boards reported having active Clinical Portals in place with a total of nearly 47,000 users accessing clinical portals, with 670,000 accesses in Q1 2013. 71% of the Boards with active portals have at least 64% of the key information items available, and 2% of the Boards have all 14 key information items available.

The progress ratio is 20% every other quarter (users) and almost 500% in number of accesses, which reflects a rapid take up amongst clinicians.

The 14 key information items are as follow:

- Patient health summary: past medical history, current problem list and medications, allergies and alerts, treatment plan, events and procedures and social history.

- Clinical letters: referrals, discharge and clinic letters.
- Diagnostic test results
- Clinical observations
- Knowledge support (e.g. local and national clinical guidelines)
- Clinical notes, including clinic, admissions and pre-assessment notes.

This indicator has to be harmonised once the measurement criteria is standardise (portlets vs. page accesses).

Information Assurance (secure access to information).

At the present time IA is only monitored in terms of the number of clinical systems subscribed to Patient Privacy Monitoring systems (PPMS).

Within Scotland there is a tendency to start implementing this type of systems across the Boards. In Q1 2013 30% of the NHS Boards had PPMS implemented covering 4 to 6 key clinical systems. By end of 2013 85% has at least planned implementations of PPMS covering approximately 2% of the systems in use across an average Board.

eReferrals

This is measured by the percentage of referral made electronically from optometrists to hospital eye services. This indicator has to be interpreted cautiously because the measures provided are not consistent. Some include email referrals others only considered referral through the National system. 71% of the Boards provided a measure, and 50% of them reported no electronic referrals though plans were in place. Of the 50% referring Boards, measures ranged from 8 % to 100% including email. In an average Board a 5% growth has bee reported every quarter since Q1 2013.

Electronic Medical Record (Safe medicine)

This is a composed indicator showing:

a. Percentage of inpatients with fully electronic medicines record and processes (HEPMA).

Nearly 20% of hospital staff with medical records role has access to GP prescription data in scheduled care. This indicator is pending on harmonisations as the criteria of "qualifying" staff was not consistent across the Boards.

Almost 40% of the Boards achieved over 70% electronic interim discharge letters (IDLs) within 24 hours of discharge, whilst 21% of the Boards have great variations between 3% and 68%. Some Boards (33%) reported 0%. The rest of the Boards don't produce IDLs (special Boards).

HEPMA is currently very low in progress across Scotland as it is only at planning stage, in consultation between the Scottish Government Health Department and lessons learnt sessions with eHealth Leads across Scotland to compare and contrast two different options. Since this initiative is not live yet, there are no measures to present, in other words, the percentage of hospital in-patients with fully electronic medicines record and processes (hospital ePrescribing and medicines administration) is still 0% at the end of 2013.

Management information (Intelligence)

This indicator shows the progress of clinical and management staff accessing relevant management information (MI) systems and the consequent number of accesses. This measure shows a very rapid take up amongst clinical and management staff, with a number of registered users growing around 300%-350% every quarter. In Q1 2013

there were over 240,000 accesses across all NHS Board to management information systems.

In summary, the National eHealth strategy in Scotland is moving forwards with demonstrated signs of continual take up in all areas of healthcare (acute, community, GP) and also in society; the citizens take up is still emergent but increasing.

Digital Society and eHealth Progress.

The UK in general has been regarded as one of the European frontrunners in eHealth [36]and Scotland is not an exception, showing a slow but steady progress since 2008 (3% to 5%), which is consistent with the progress of the Scottish Digital Society (Figure 28) [37-41]. The sets of indicators chosen reflect an overall progress of the Digital Society since 2008 until 2012 of 9%, whilts the eHealth indicator show a slightly higher progress ratio of 12%.

This result suggest that potentially eHealth is progressing quicker than other factors influencing the Digital Society, however this study analysed only a key subset of the entire SIBIS indicator system (Figure 29) limited to the purpose of our analysis. These indicators are defined within the SIBIS framework as suitable for monitoring the most important and far-reaching aspects of the Information Society developments within the EU [25]but further comparisons need to be done in order to provide a complete picture of how other factors are influencing a wider view of the Digital Society progress.

The specific eHealth progress measures as suggested within the SIBIS framework are shown in Figure 30.

The main results identified in the SHS survey are as follow [37]:

- Over three-quarters of Scottish households report having home Internet access in 2012 (76%), which continues a long established year-on-year increase (3% from 2011).
- Home Internet access increases with net annual household income, from around half of households for those with income less than £15,000 up to 98% of those with an income greater than £40,000.
- Nearly all of the households in Scotland who access the Internet at home have a broadband connection (96%). Broadband uptake rates, where households have an internet connection, show very little difference by deprivation and by rurality.
- Just over one-fifth of adults (22%) do not use the Internet at all, an improvement on the 24% reported in 2011. There is a clear relationship between age and use of the Internet, with use declining as respondents get older - though the proportion of old people using the internet continues to increase year on year (21% of those aged 75 and over in 2012 use the internet).
- The ways in which people access the internet are becoming increasingly diverse and complex, in particular the proportion of those accessing the internet on the move, for example on a mobile phone, increasing from 14% in 2011 to 25% in 2012.
- The SHS asked adults who make no personal use of the Internet the reasons why they did not. Among the most common responses related to people's preferences or requirements were, 32% saying they did not like using the Internet/computers, 27% saying they did not need to use the Internet/computers and perhaps more importantly 25% saying they did not how to use a computer.

Correlation analysis

In order to provide better understanding of the strength of the relationship between the variables identified in our hypothesis, a correlation analysis was conducted. The

variables are identified as: Strategic Alignment [SA], Digital Society [DS], eHealth [eH] and IT/eHealth Governance [eG].

A correlation coefficient of +1 indicates a perfect positive correlation. As variable [SA] increases, variable [DS] increases and vice versa.

Coefficients above 0.7 indicate the presence of a strong relationship between variables but not a perfect positive correlation. This is the case of rest of the variables as shown in the graph.

Our result, although limited, suggest a perfect positive correlation between variable [SA] variables [DS] suggesting that maturity in Strategic Alignment has positive impact in the progress of Digital Society. The rest of the variables also show a strong relationship although it is not perfect positive correlation. This result suggest than any effort in improving eHealth Governance quite likely will have a positive impact on Strategic Alignment (r=0.73) which has also a very strong effect on the eHealth progress (r=0.97) and a perfect positive correlation with the progress of Digital Society (r=1).

Conclusions

This study aimed to provide a better understanding on how IT Governance is implemented within HCOs, the actual impact on strategic alignment and its influence to the information society progress.

Our results are summarised in Figure 32, showing the progress of the main variables under observation: Strategic Alignment, eHealth Governance, Digital society and eHealh take up.

Main conclusion

Our results support positively our hypothesis that the more mature eHealth Governance is, the better the strategic alignment between eHealth and HCOs, hence the better progress of eHealth and the Digital Society.

Our results show very strong positive correlation between all these variables, which means that any effort in improving eHealth Governance quite likely will have a positive impact on Strategic Alignment, which in return will have a positive effect on the eHealth progress and the progress of Digital Society (r=1).

Increments in eHealth Governance maturity are correlated to increments in the Strategic Alignment (HCO-eHealth) maturity. More data is required in order to establish the proportionality of the increment, but the correlations seems to be strong (r=0.73). It is also required further investigations in order to isolate the effect other SAM dimensions in to the final Strategic Alignment achieved.

Increments in the Strategic Alignment maturity are correlated to increments in eHealth (r=0.88) take up indicators and Digital Society progress (r=1, perfect positive correlation).

We propose a minimum of eHealth Governance maturity is required in order to sustain eHealth societal take up. Those organisations with eHealth Governance maturity under Level 2 may not respond to our correlation analysis as suggested in this study. This is mainly due to the fundamental limitations in the decision-making process associated with Ad-Hoc IT governance. In order to achieve progress on any other variables of our model, 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.

Strategic Alignment is progressing faster.

Strategic alignment between eHealth and HCOs is progressing faster than the overall performance of the Digital Society, eHealth take up or even eHealth Governance (Figure 32). 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.

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 it 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.

Strategic alignment will promote eHealth progress and will only influence the Digital Society evolution in specific circumstances

Our study demonstrates that eHealth, as a component of the Digital Society [25] is progressing, what is more, is doing it at a quicker pace than the overall Information Society indicators in Scotland. This is positive news for the Scottish population as eHealth has too many benefits to offer to citizens in the Digital Society, especially for those with long term conditions and living in rural areas. A steady progress since 2008 is a promising result.

The Digital Society is also showing signs of steady progress since 2008, despite of the fear that the economical recession could have slow down the required investments.

Our results support the hypothesis that the more mature eHealth Governance, the better strategic alignment in HCOs, therefore the better progress of eHealth which, in return will impact positively the overall progress of the Digital Society.

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 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).

eHealth Progress

eHealth is showing signs of steady take up in Scotland (3% growth per year). The delivery of the National eHealth Strategy is monitored centrally and shows also stable progress on the key areas: paper lite hospital (43%), videoconfering (24% growth per year), patient portals (20% increase per year), Key Information Summaries (0.0017% population in 2013), Clinical Portals (20% more users and 500% more accesses every quarter), Information Assurance (Patient Privacy monitoring systems in 85% Boards), eReferrals (5% increment every quarter).

eHealth has the potential to allow unprecedented transformations of healthcare processes, not just technologies, but minimising clinical risk, materialising better and wider multidisciplinary care teams and shifting the self-management of citizen's own health. Any effort improving the outcomes of eHealth should be nurtured within HCOs in order to be able to face the challenges of the future healthcare system. eHealth Governance has the potential to provide the assurance required by HCOs that efforts and investments are aligned with the healthcare strategy. This study provides pieces of knowledge on this regard, but further research is required. For this purpose, this study also presents a methodology to continue monitoring the correlation between eHealth Governance, strategic alignment, eHealth and Digital Society progress.

Competing interests

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

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.

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1164 **List of abbreviations**

CEO	Chief Executive Officer
CFO	Chief Finance Officer
CIO	Chief Information Officer
COBIT®	Control Objectives for IT
EU	European Union
GP	General Practitioner
HCO	Health Care Organisation
HEAT	NHS performance targets for
	H: Health Improvement
	E: Efficiency and Governance
	A: Access to Service
	T: Treatment Appropriate to Individuals
HEPMA	Hospital Electronic Prescribing and Medicines Administration
ICT	Information and Communication Technologies
ISO	the International Organization for Standardization
IT	Information Technologies
ITIL	IT Infrastructure Library
KIS	Key Information Summary
KPI	Key Performance Indicator
LEAN	Set of tools and techniques for organisational improvement.
LTC	Long Term Conditions
NHS	National Health Service
NVIVO	Software that supports qualitative and mixed research methods.
OLA	Operational Level Agreement

PPMS	Patient Privacy Monitoring System
RTT	Referral to Treatment (18 Weeks)
SAM	Strategic Alignment Model
SHS	Scottish Household Survey
SIBIS	Statistical Indicators Benchmarking the Information Society
SLA	Service Level Agreement

Illustrations and figures

Figure 1 Strategic Alignment Maturity (SAM) Levels [20].

Figure 2 Strategic Alignment perception

Figure 3 Progress of SAM dimensions showing maturity levels 1 (Ad Hoc) to 5 (Optimised).

Figure 4 Alignment enablers

Figure 5 Alignment inhibitors.

Figure 6 Most important IT/eHealth Objectives identified.

Figure 7 Second most important IT/eHealth Objectives identified.

Figure 8 Third most important IT/eHealth Objectives identified.

Figure 9 First most important healthcare objectives identified.

Figure 10 Second most important healthcare objectives identified.

Figure 11 Third most important healthcare objectives identified.

Figure 12 Communications maturity results (2012/2013)

Figure 13 Additional results related to Communication Maturity dimension.

Figure 14 Competency/Value Measurement maturity results (2012/2013).

Figure 15 Additional results related to Competency/Value Measurement Maturity dimension

Figure 16 CIOs reporting hierarchy.

Figure 17 Organization structure of the IT/eHealth function.

Figure 18 Ability of the IT/eHealth function to react/respond quickly to the organization's changing healthcare needs.

Figure 19 Governance maturity (2012/2013)

Figure 20 Additional results related to Competency/Value Measurement Maturity dimension.

Figure 21 Partnership maturity (2012/2013)

Figure 22 Additional results related to Partnership Maturity dimension

Figure 23 Scope & Architecture maturity (2012/2013)

Figure 24 Additional results related to Scope and Architecture Maturity dimension.

Figure 25 Skills maturity. Human resource (2012/2013)

Figure 26 Additional results related to the Skills Maturity dimension.

Figure 27 Longitudinal comparison of maturity against situation in other countries and sectors 2012/2013)

Figure 28 Overall eHealth Progress in Scotland Digital Society (2008-2012). Source: [37-41]

Figure 29 Subset of selected Digital Society progress indicators (Scotland). Source: [37-41]

Figure 30 Subset of selected eHealth progress indicators (Scotland). Source: [19, 37-41]

Figure 31 Correlation analysis between the main variables of the hypothesis.

Figure 32 Percentage of Progress of the variables under observations.

Tables

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

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

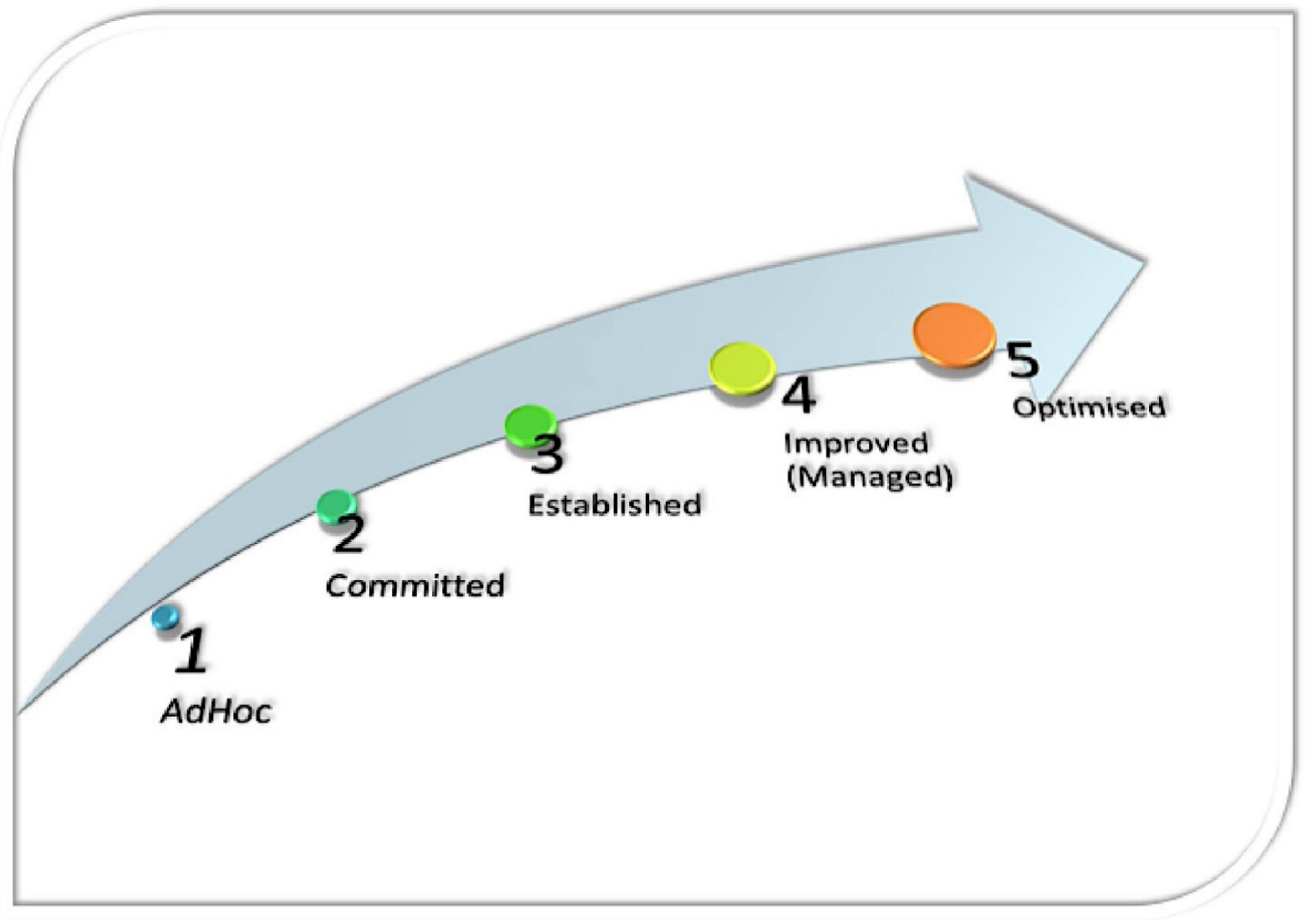
Table 2 Most relevant sources consulted to compare the situation of IT governance across industry sectors and countries.

INDUSTRY SECTOR	COUNTRY	SOURCE
Financial Services	Belgium	[42]
Multi-sectoral (Retail, Pharmaceutical, Manufacturing, Financial Services, Leisure/Entertainment, Food and Beverages)	Australia	[43]

INDUSTRY SECTOR	COUNTRY	SOURCE
Credit Cooperative	Germany	[44]
Industry sector not disclosed. Large organization. Multi-divisional.	Australia and New Zealand	[45]
Multi-sectoral (Consumer and Industrial Products and Services, Financial Services, Technology, Information, Communication and Entertainment , Public Sector, Healthcare and Pharma)	Belgium, France, UK, Germany, The Netherlands, Italy and Spain.	[46]
Healthcare (British National Health Service-NHS)	UK	[47]
Multi-sectoral (Trace 23%, Manufacture 21%, Construction 21%, Logistics 8%, Information 5%)	Austria	[48]
Multi-sectoral	Global	[9]
Healthcare	USA (Boston)	[31]
Healthcare	UK (Scotland)	[8]

Table 3 Examples of key National eHealth initiatives to be delivered by 2015.

National Targets	Theme
Digital Dictation	Efficiency
Voice Recognition	Efficiency
VideoConferencing	Efficiency
Scanning	Efficiency
Optometrists Referrals	Efficiency
Optometrists ePayments	Efficiency
ePalliative Care Summary	Integrated
eKey Information Summary (KIS)	Integrated
Clinical Portal	Access
Clinical Document Editor (CP)	Integrated
Single Sign On	Access
Privacy Breech Systems	Access
Infection Control Assurance	Access
Electronic Results Reconciliation	Patient Safety
Electronic Discharge Letter (EDL)	Patient Safety
Hospital ePrecsribing	Patient Safety
Electronic Medicine Reconciliation	Patient Safety
Electronic Document Transfer	Efficiency
MiDIS (electronic Access to letters)	Efficiency
WardView (Electronic Whiteboard)	Safety/Efficiency
eFEWS	Patient Safety
Patient Portal (Appts/Repeat Pres)	Efficiency
REMIND (DNA Reduction)	Efficiency
TIARA9 (Scheduling)	Efficiency
Neo-Natal Support	Integrated
Maternity	Integrated



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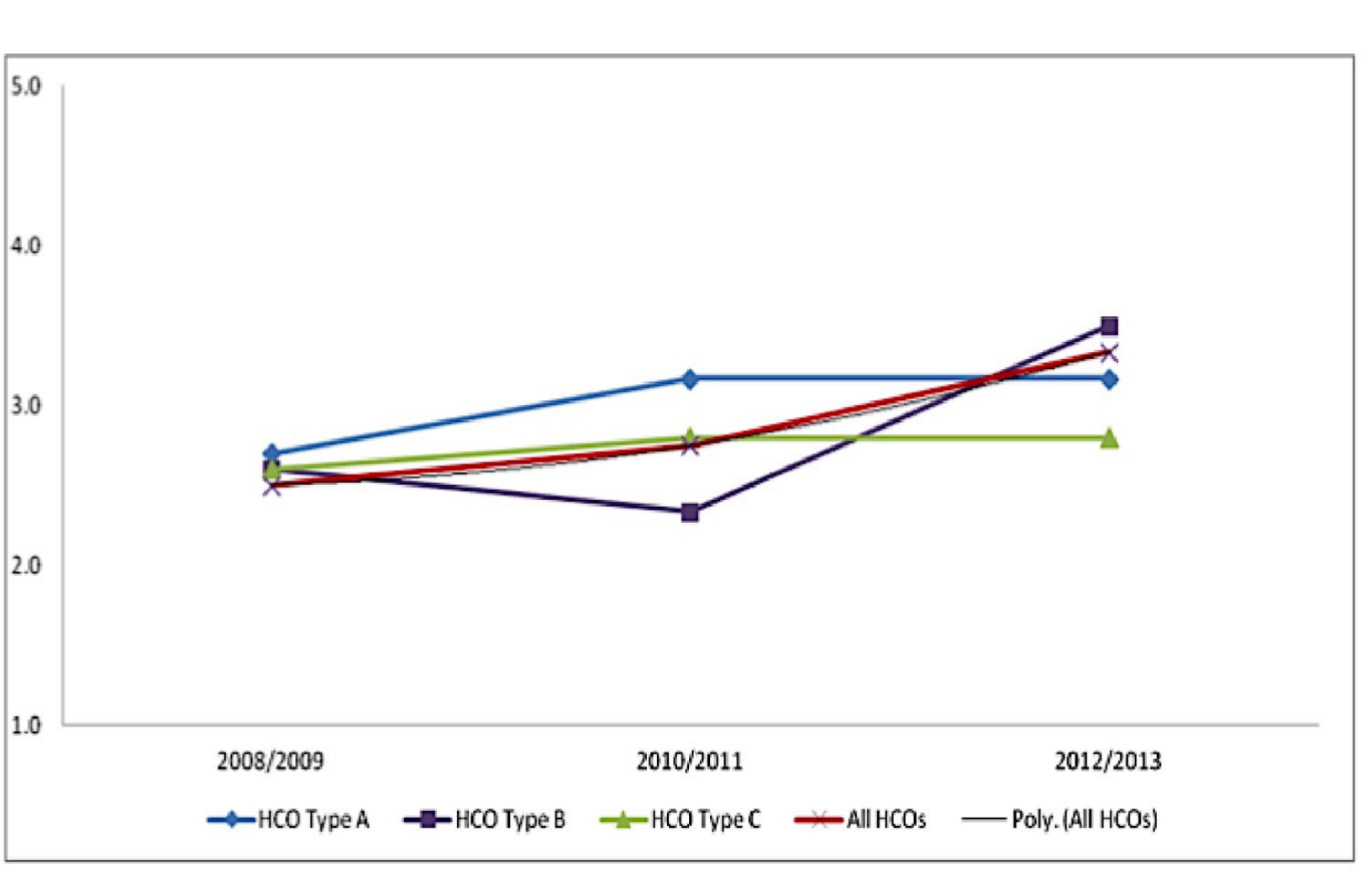

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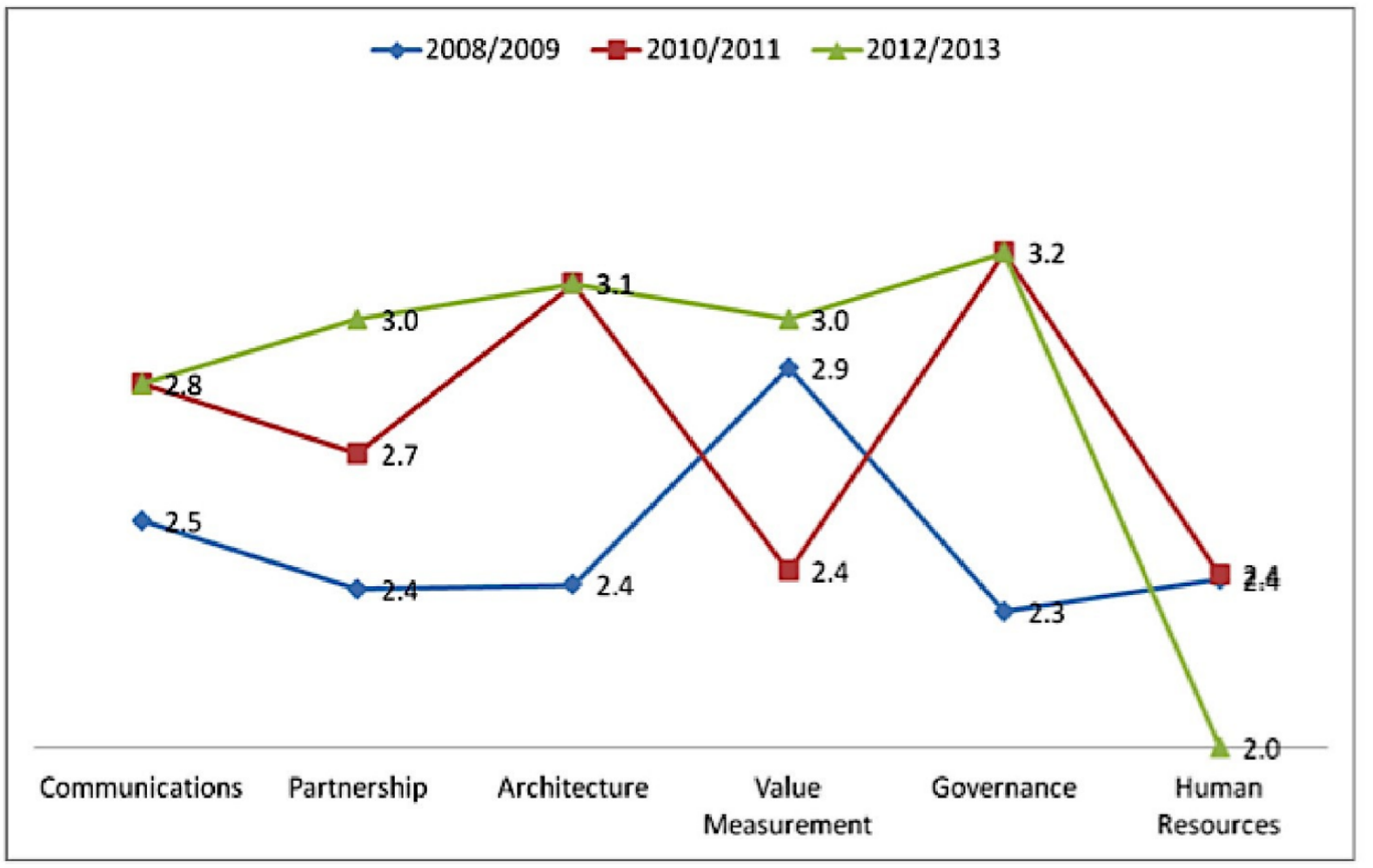

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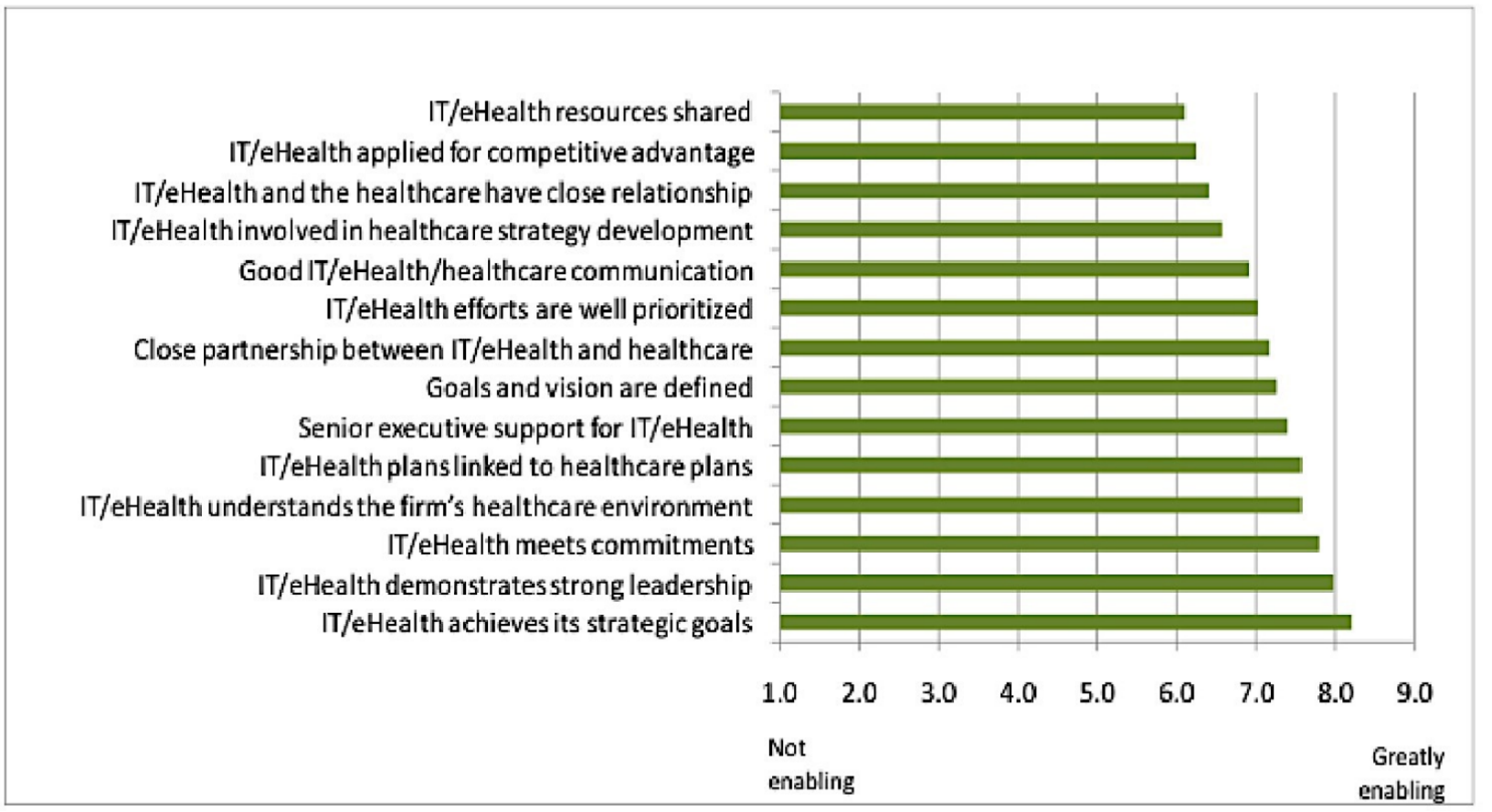

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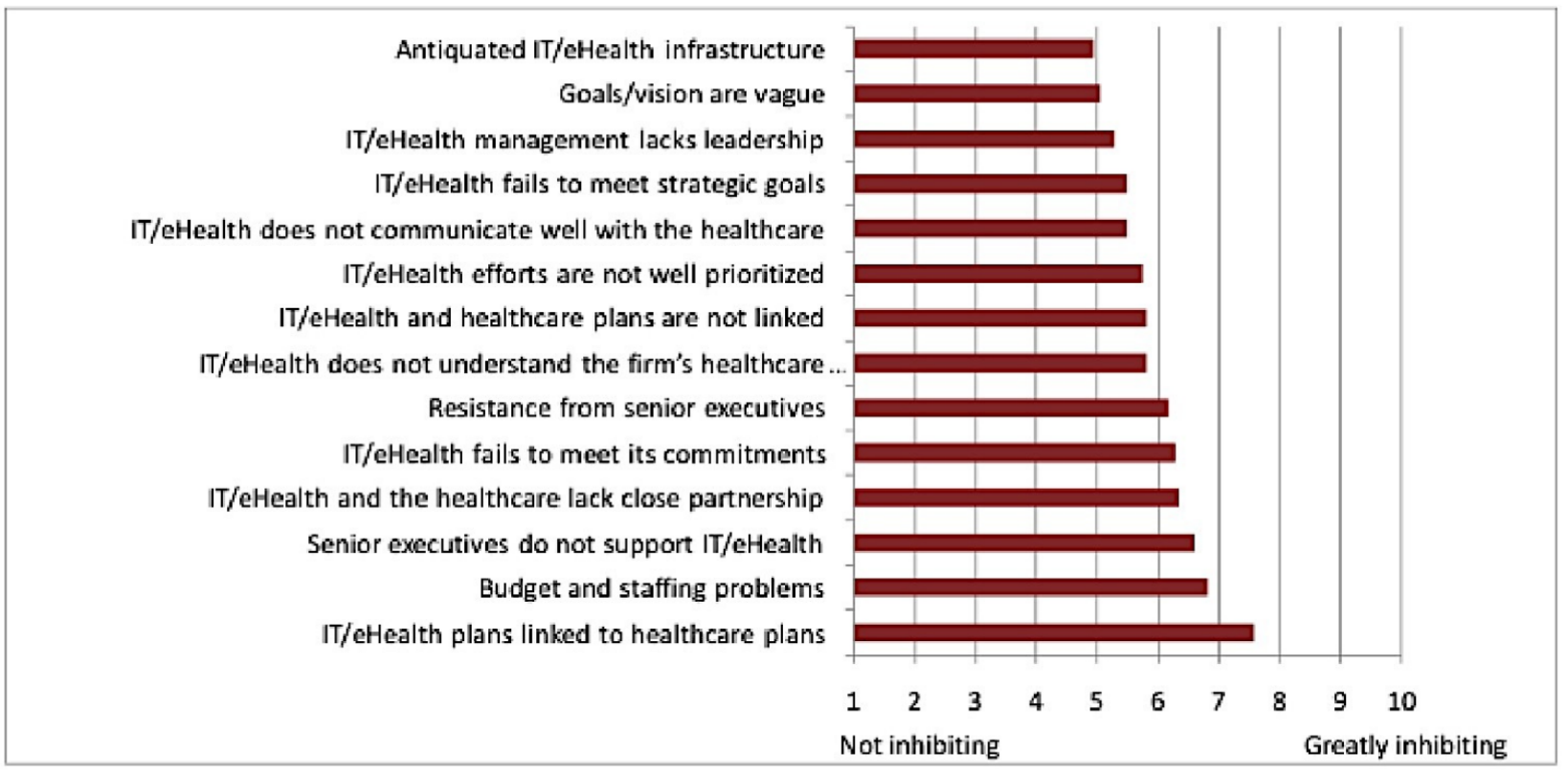

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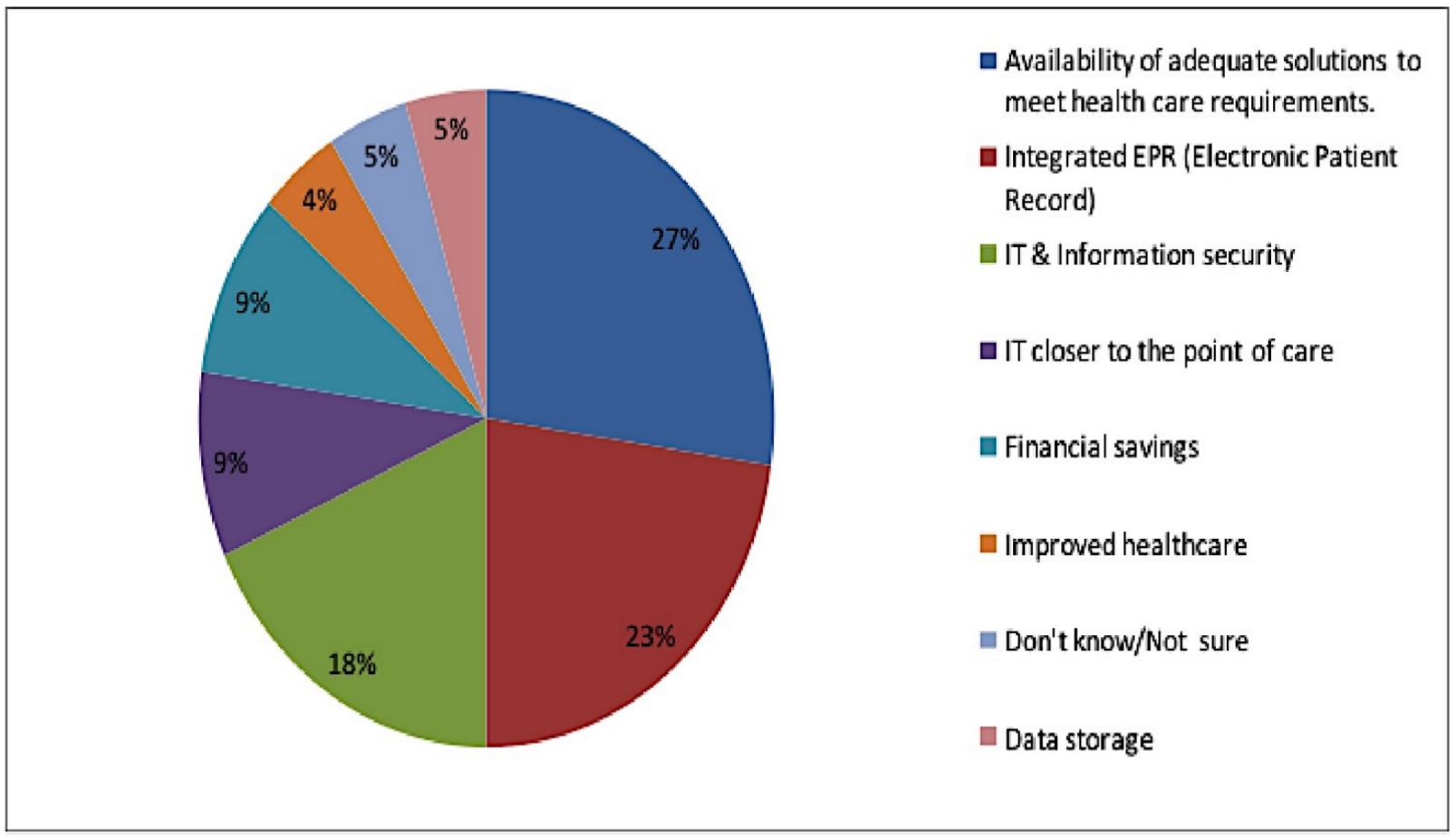

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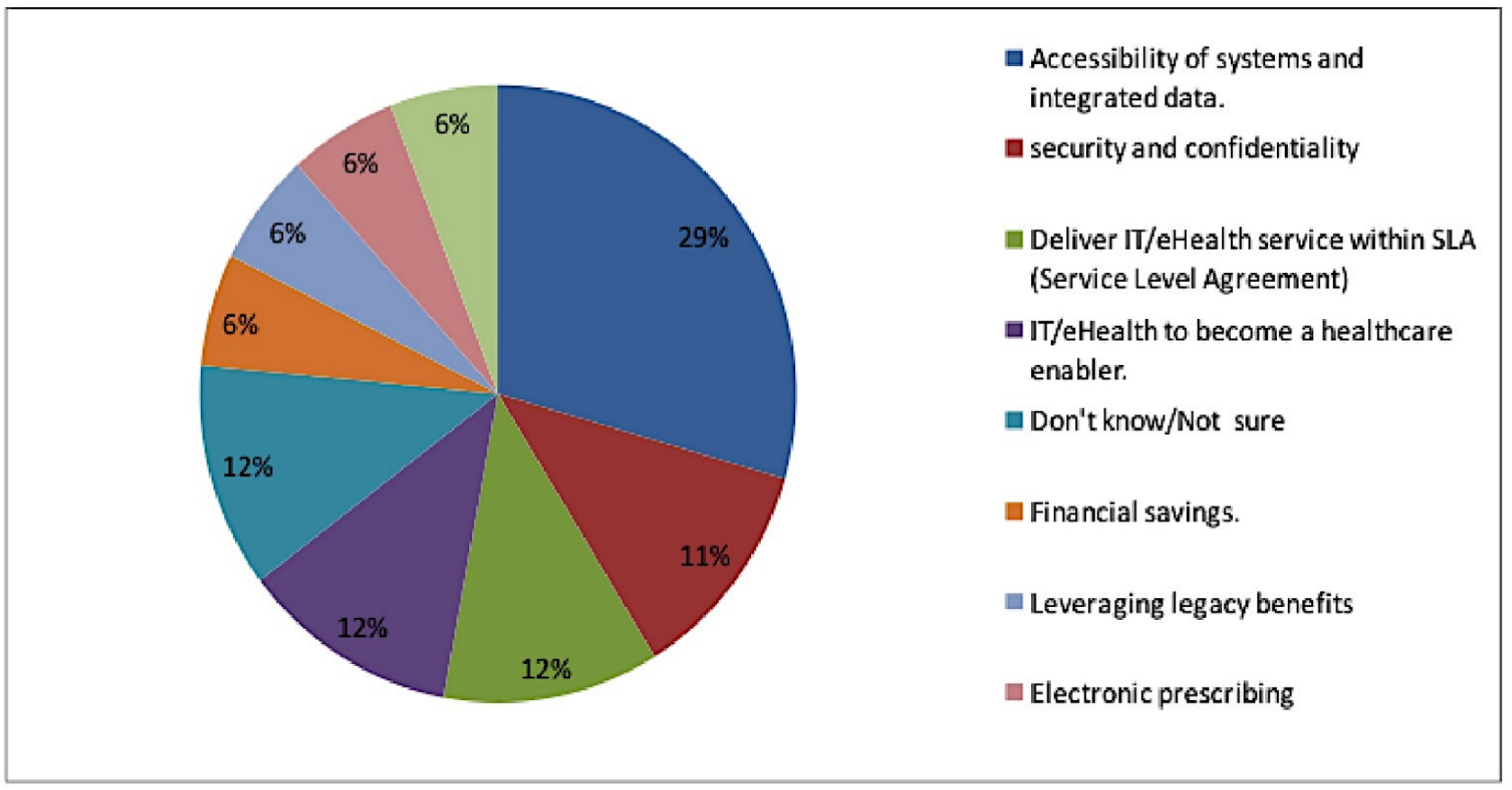

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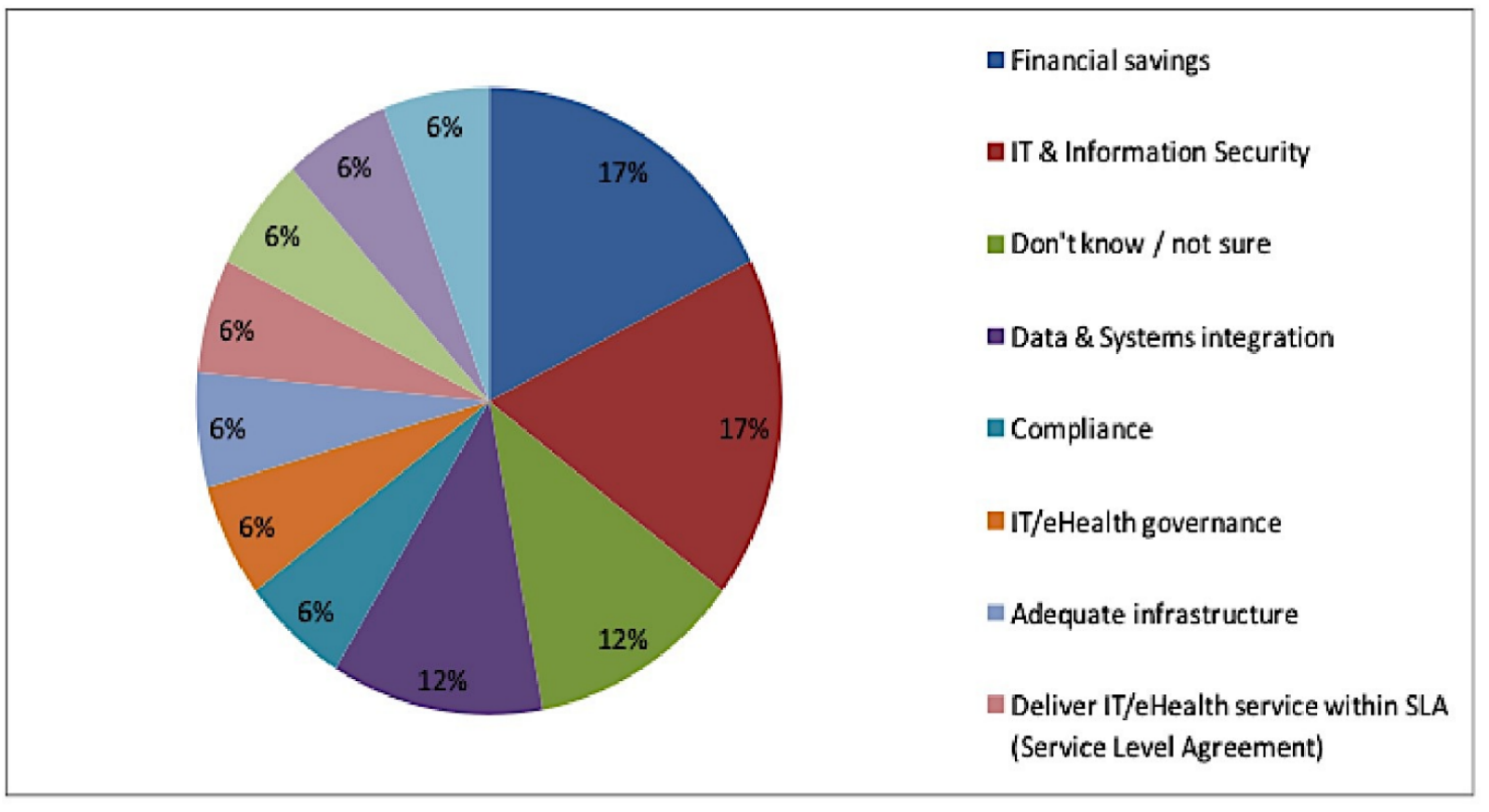

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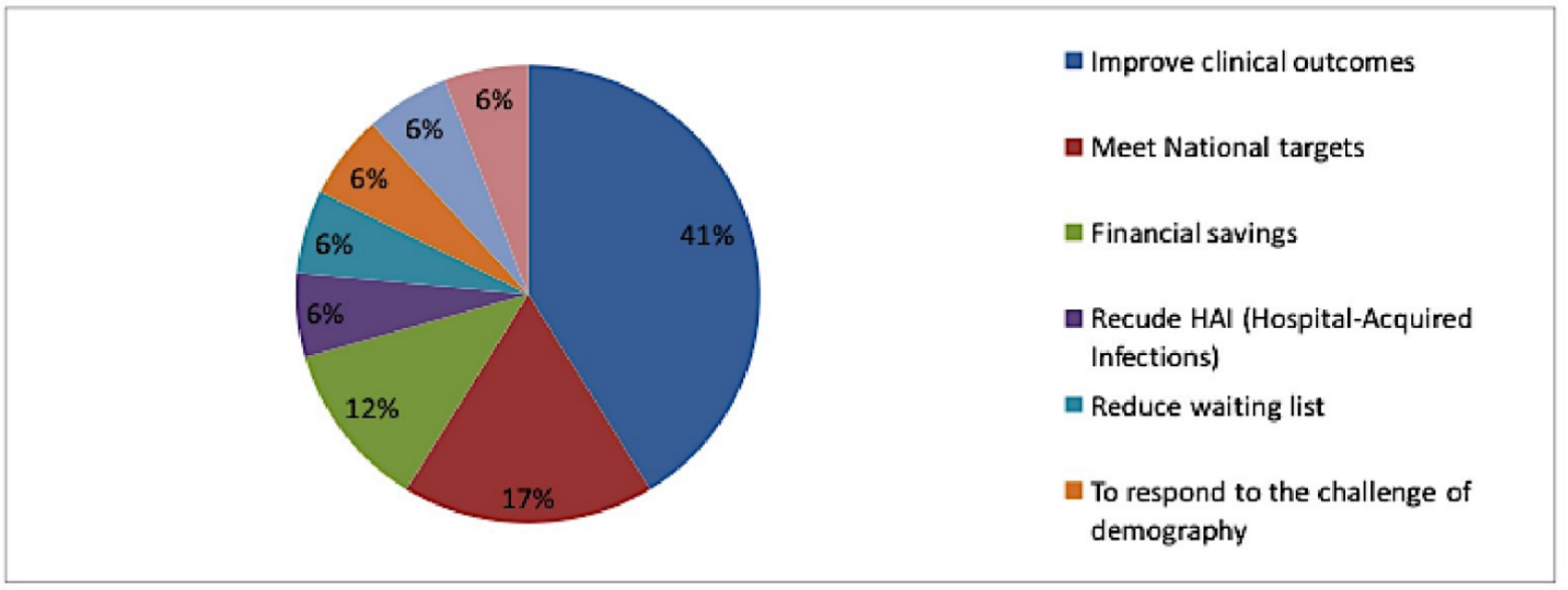

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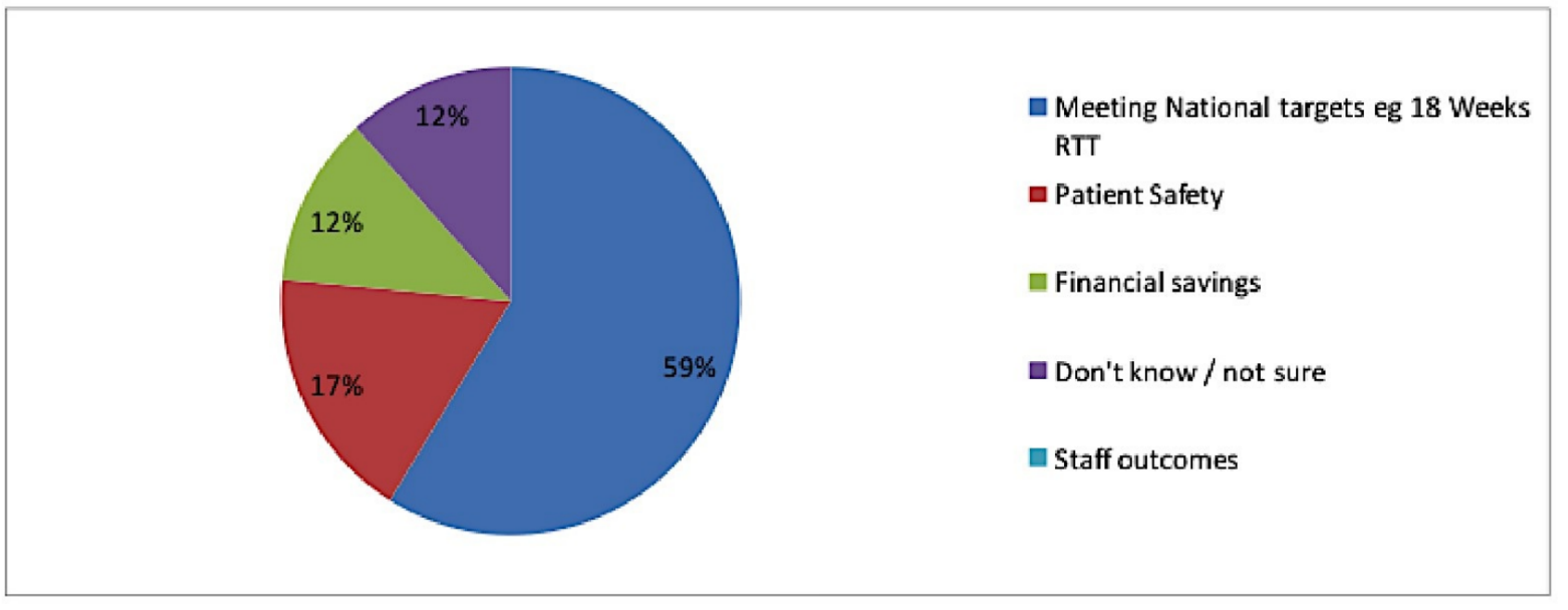

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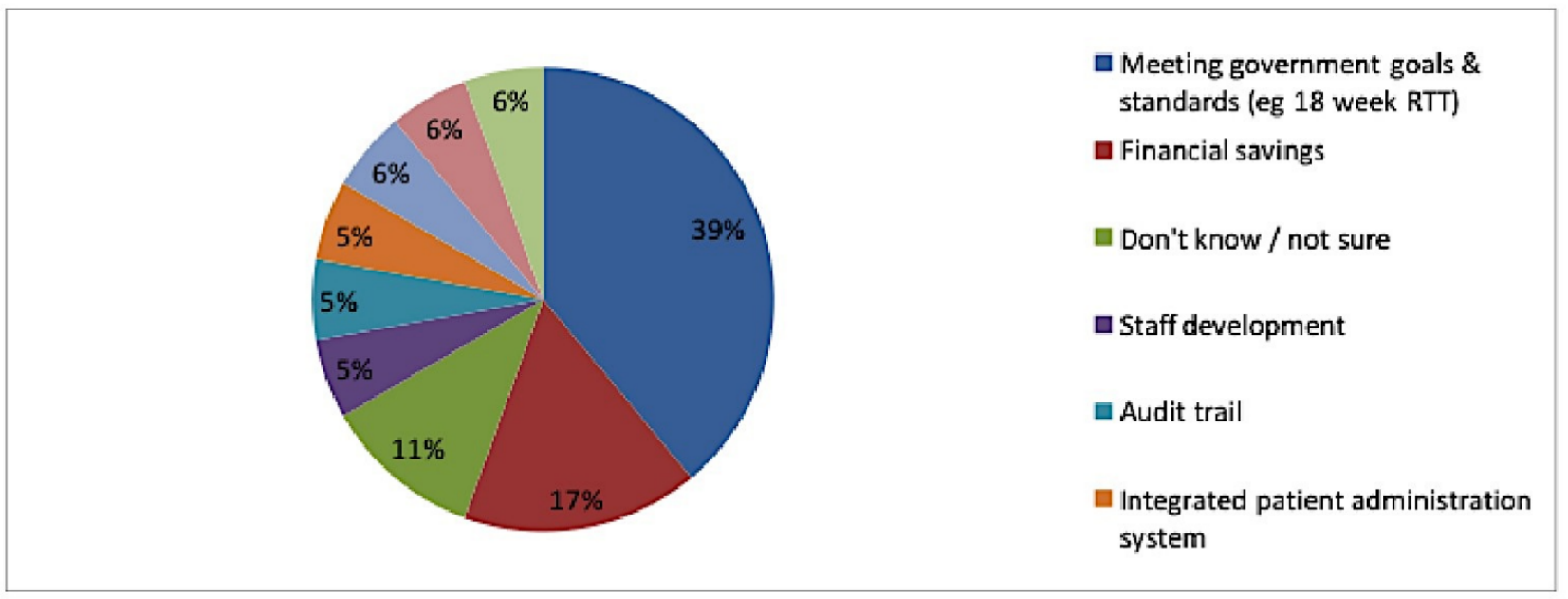

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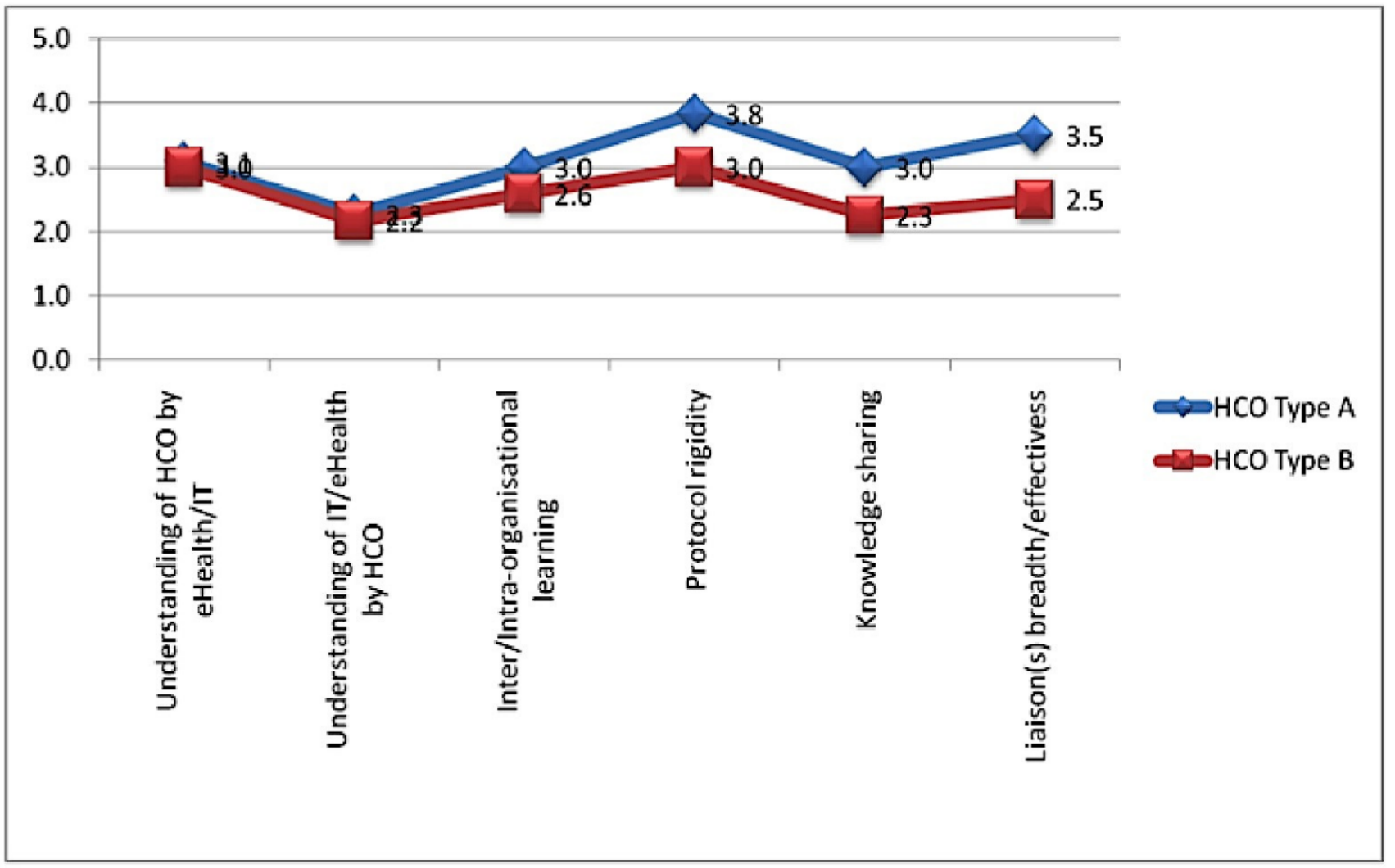

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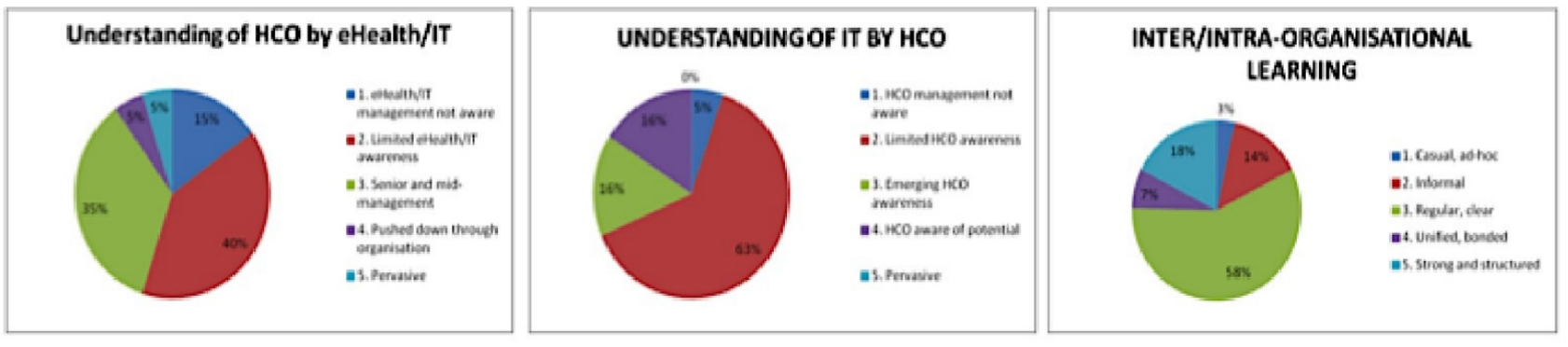

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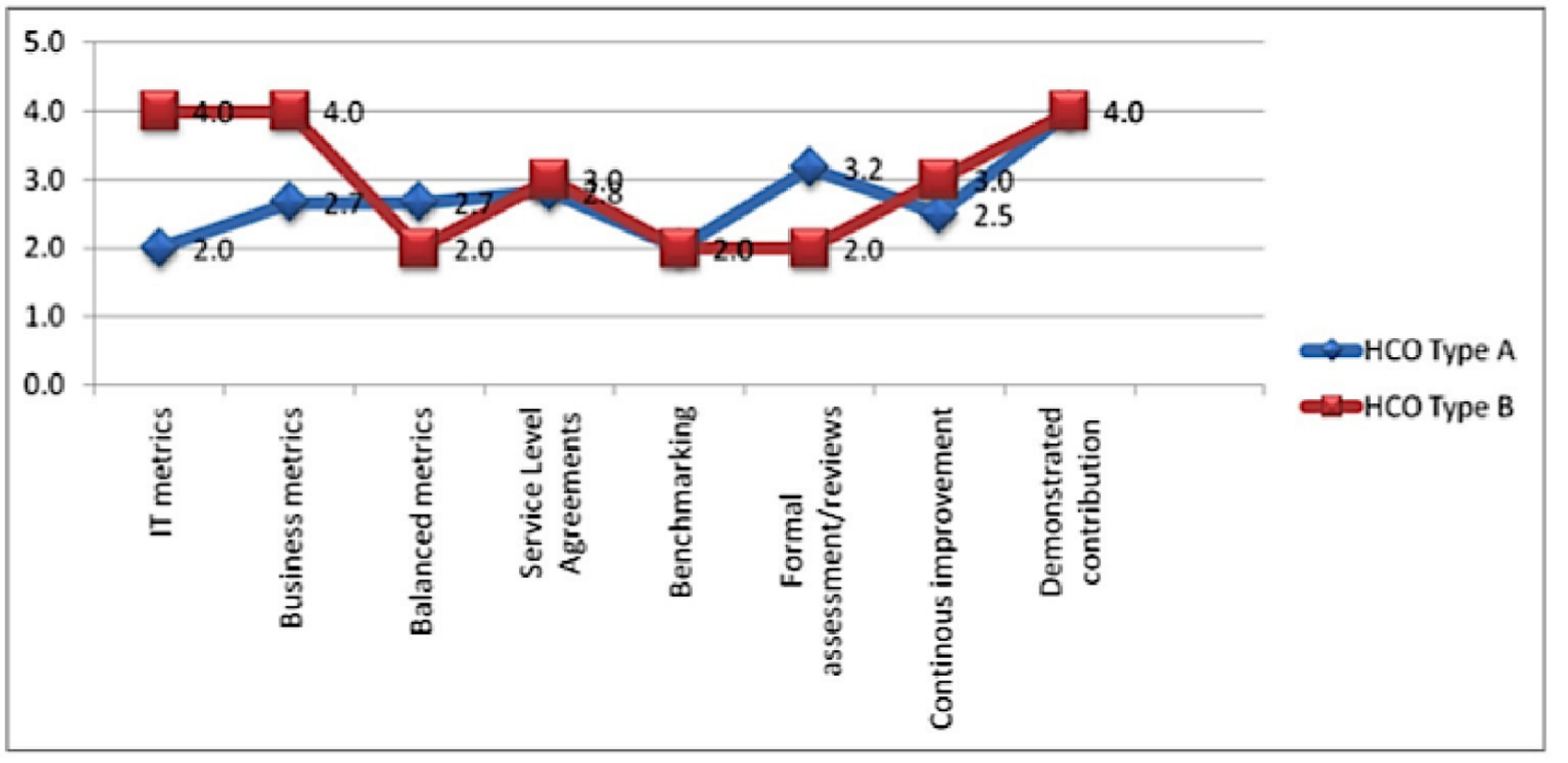

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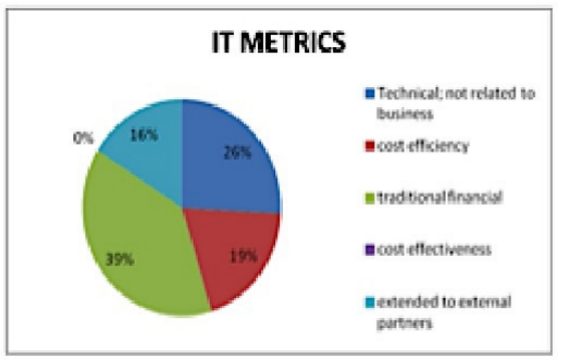

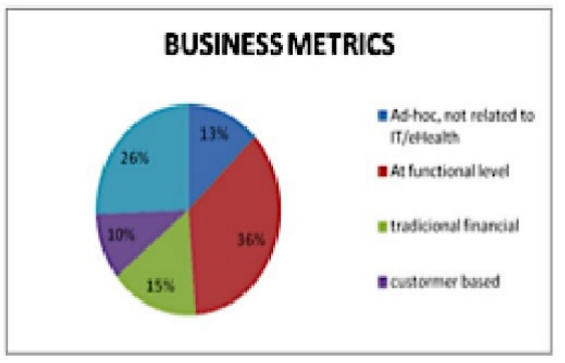

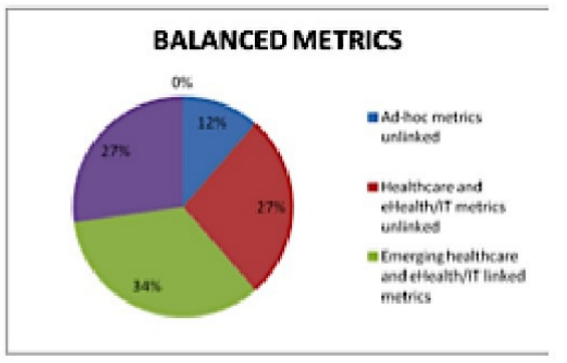

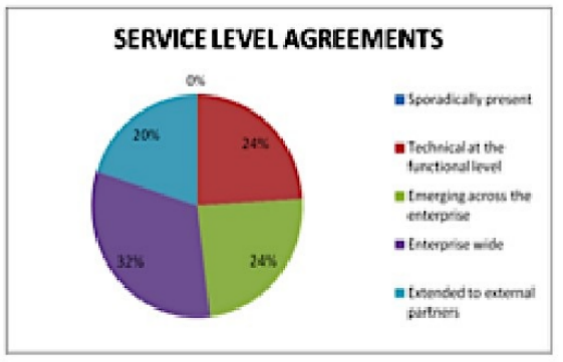

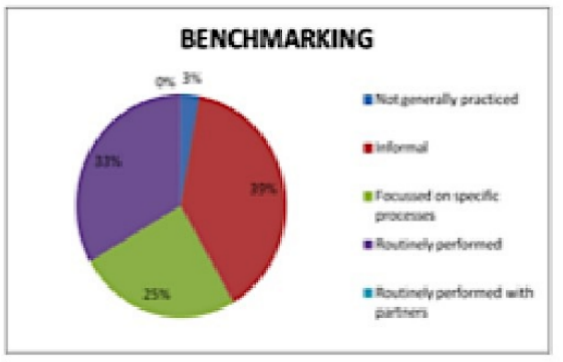

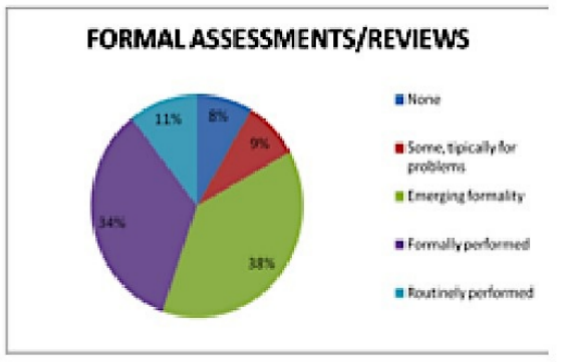

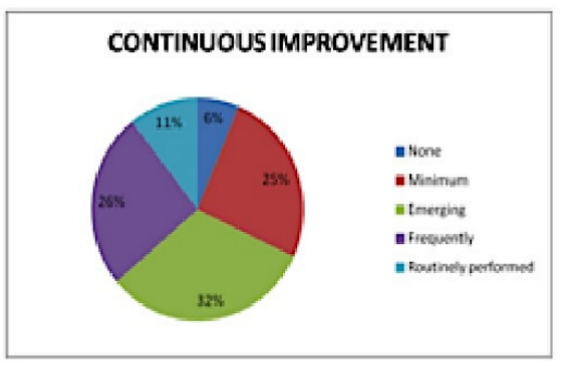

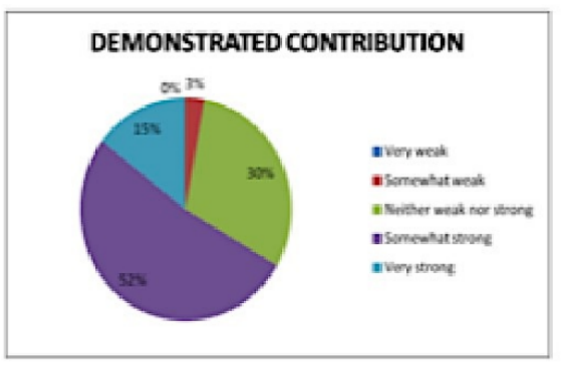

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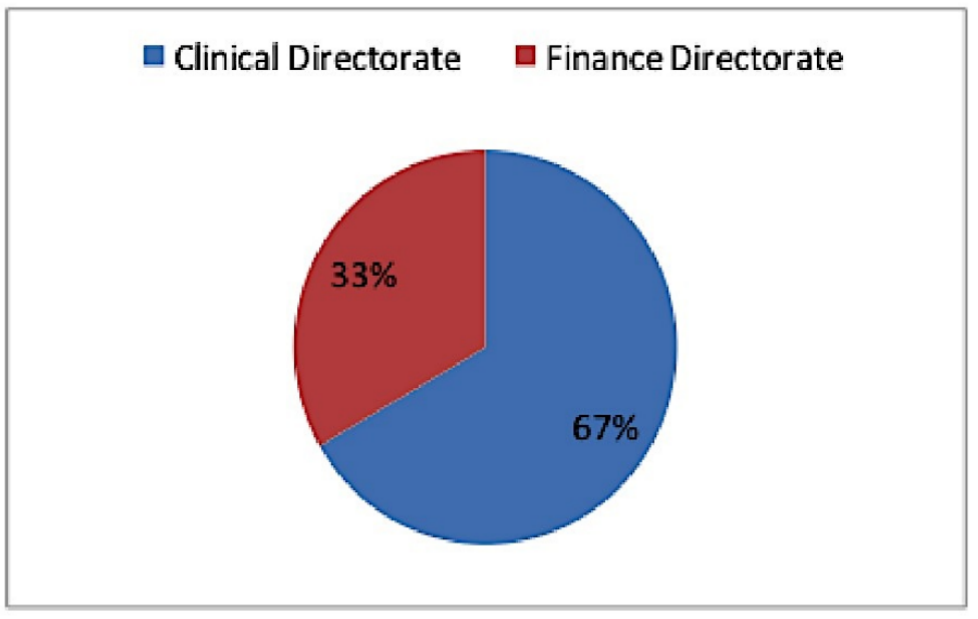

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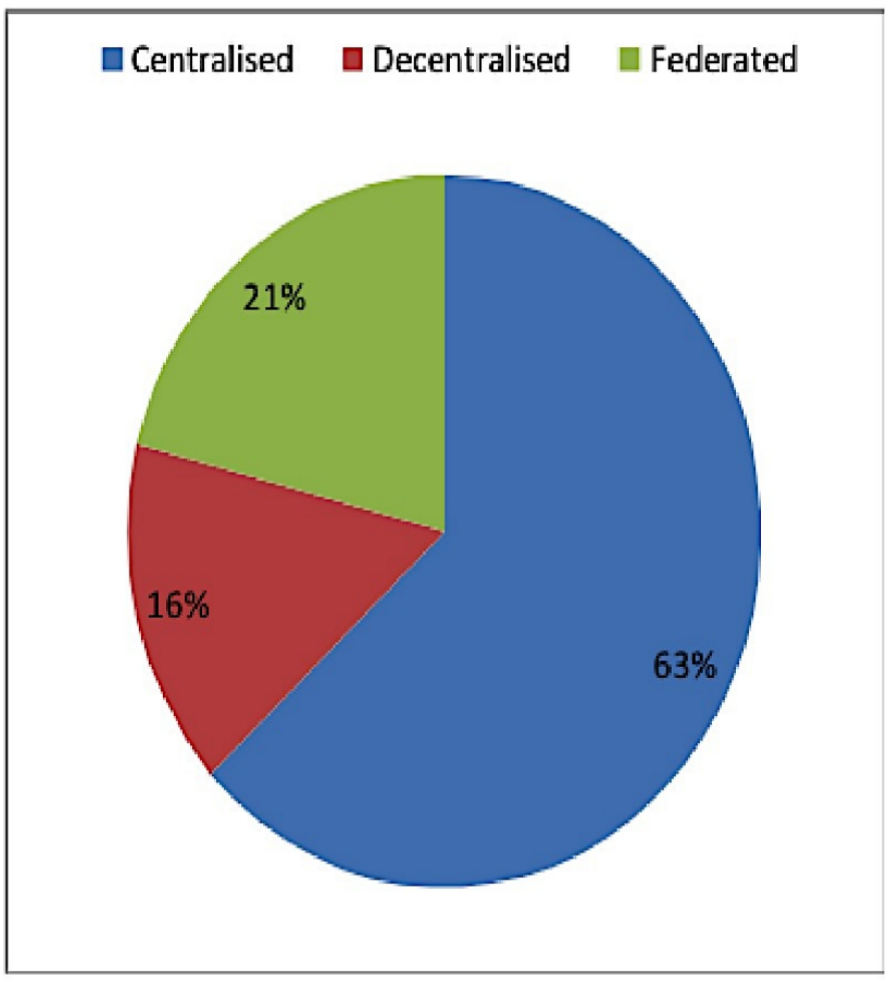

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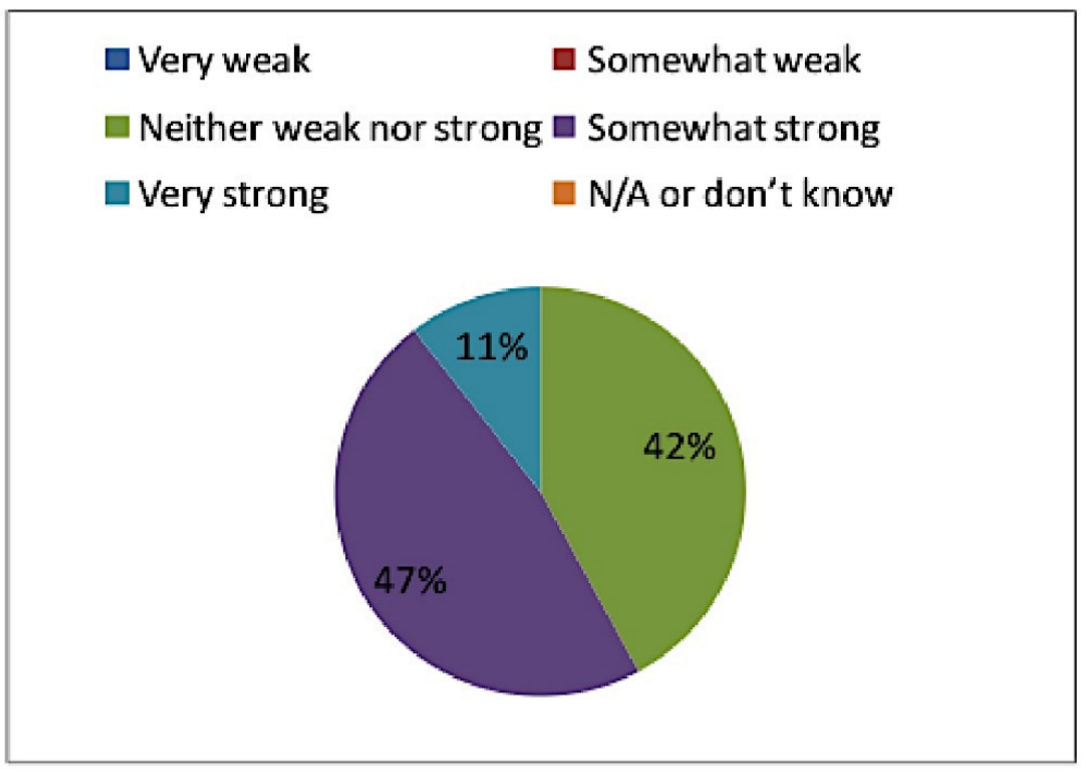

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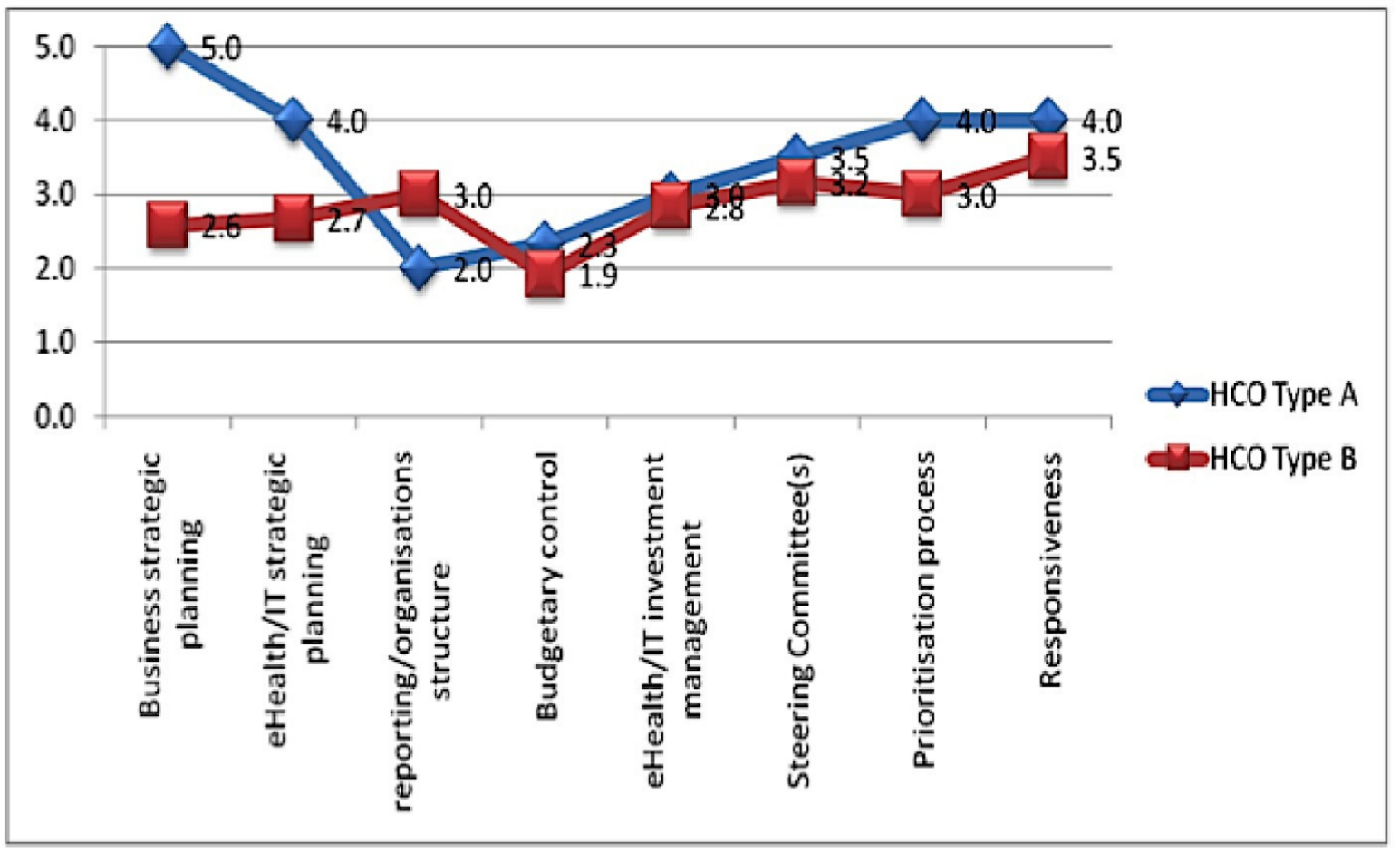

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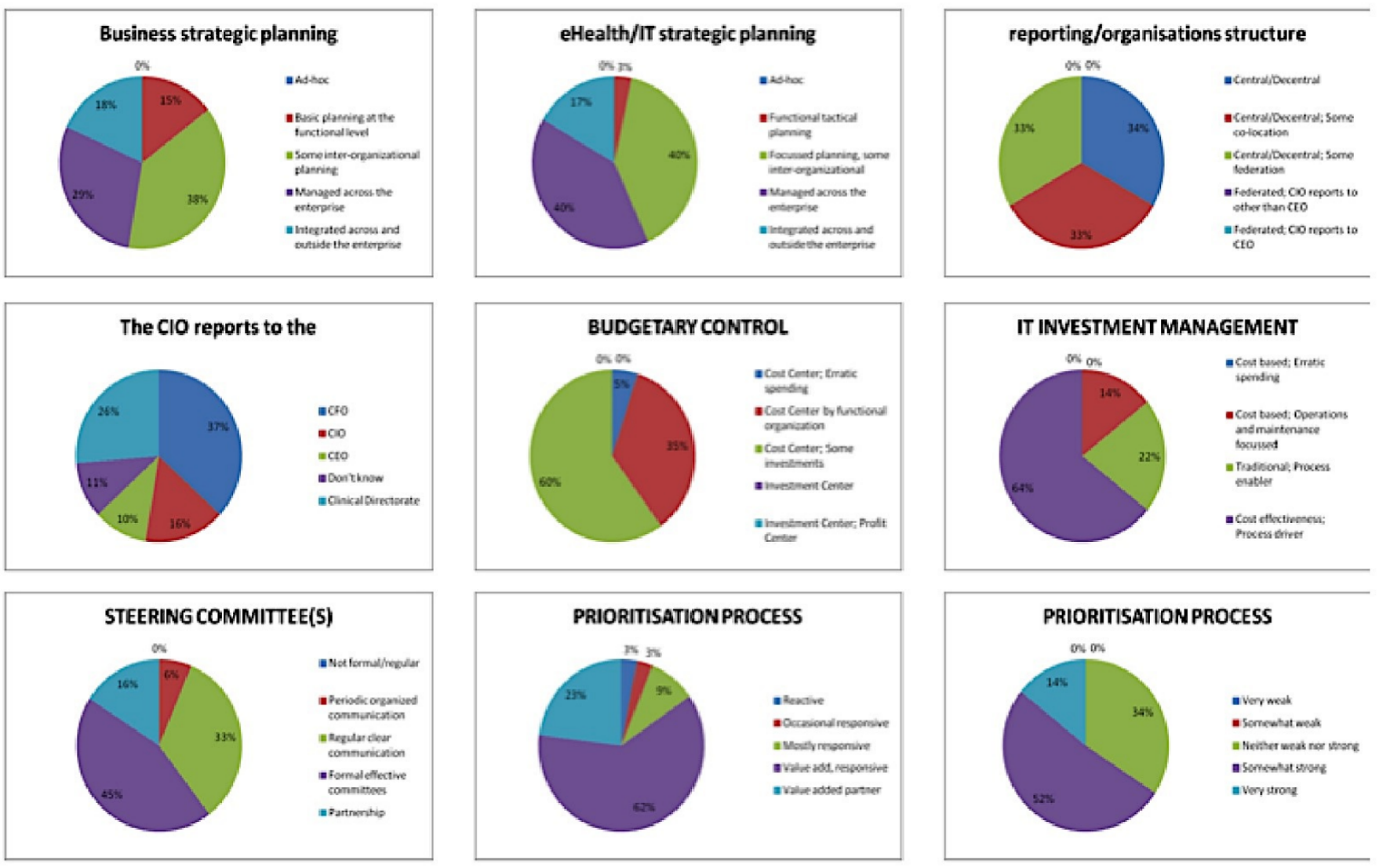

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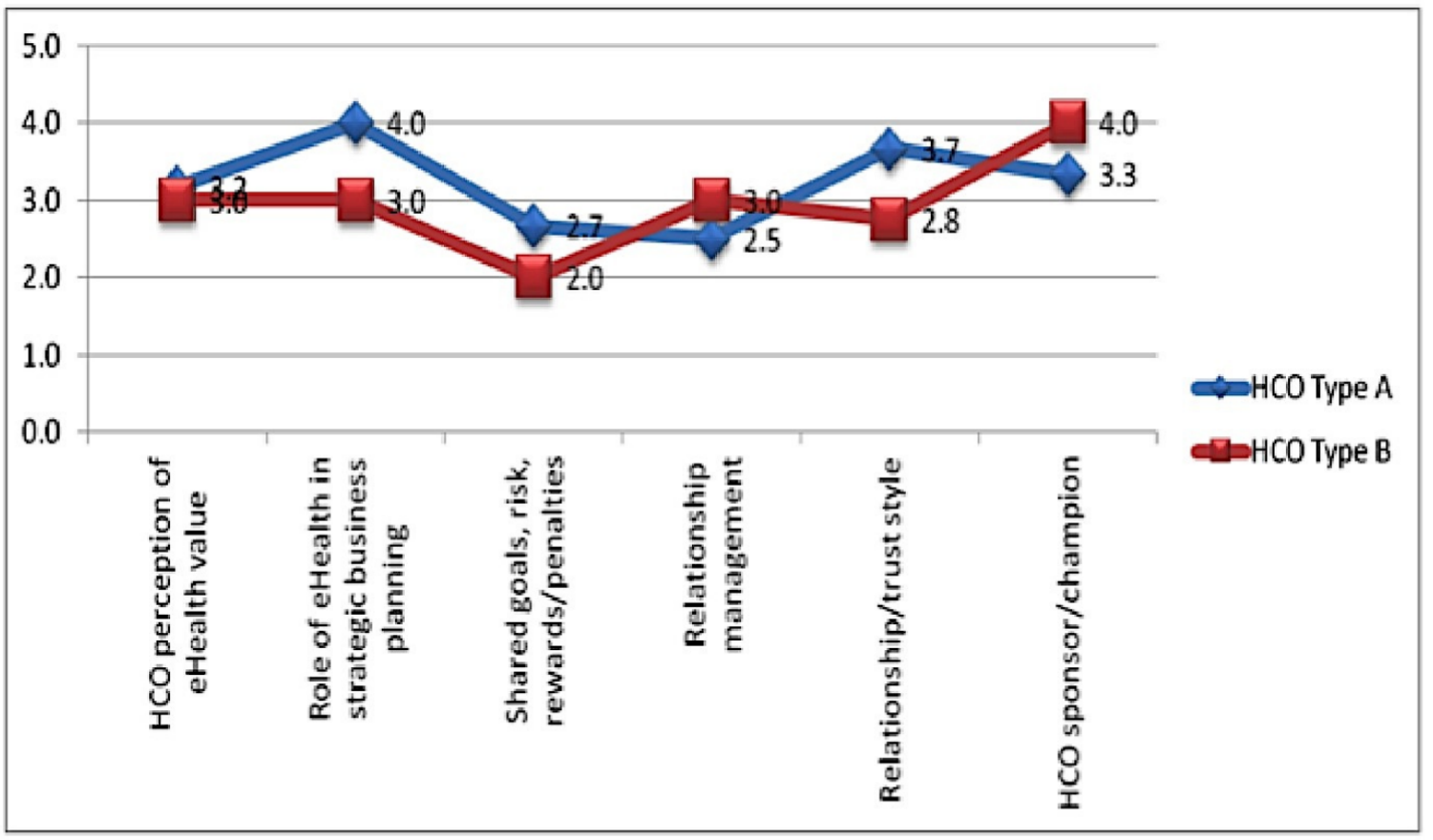

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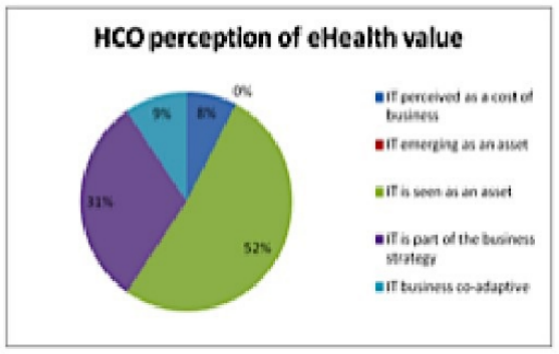

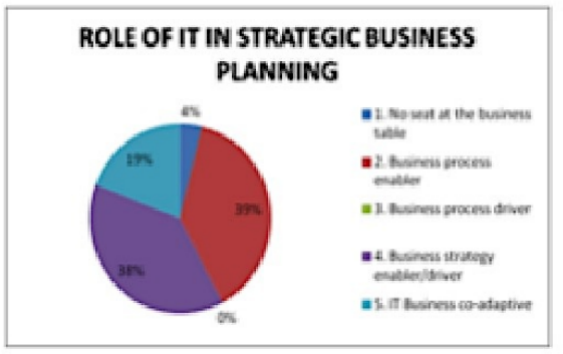

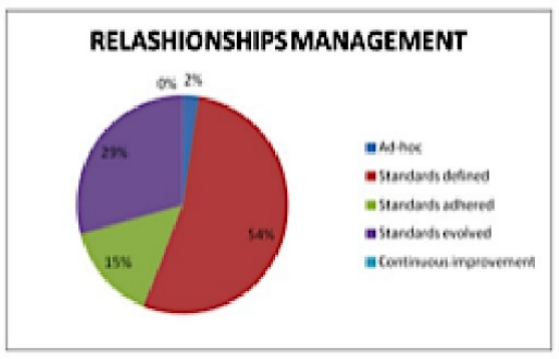

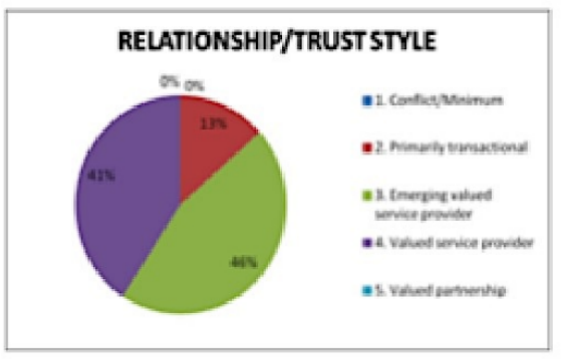

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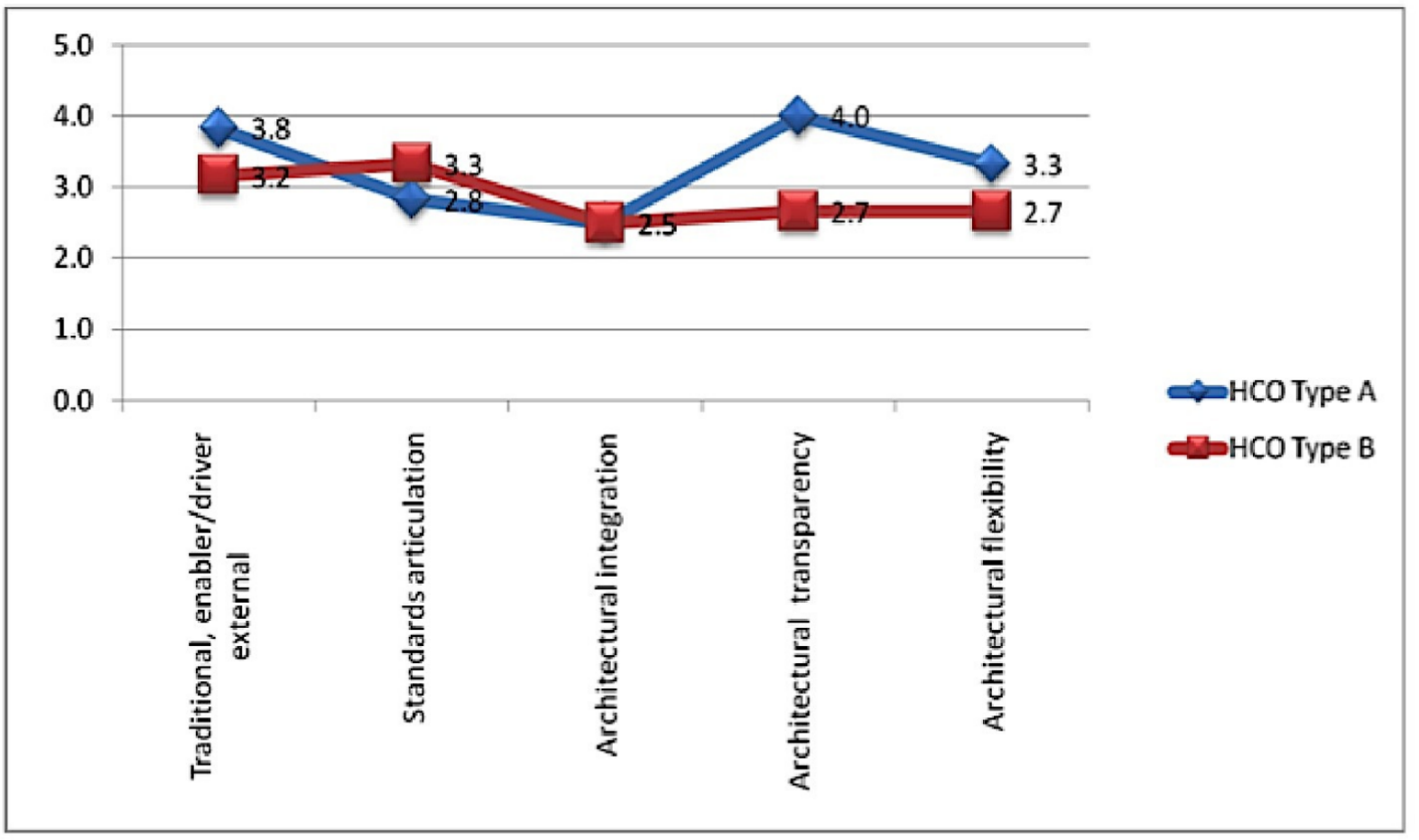

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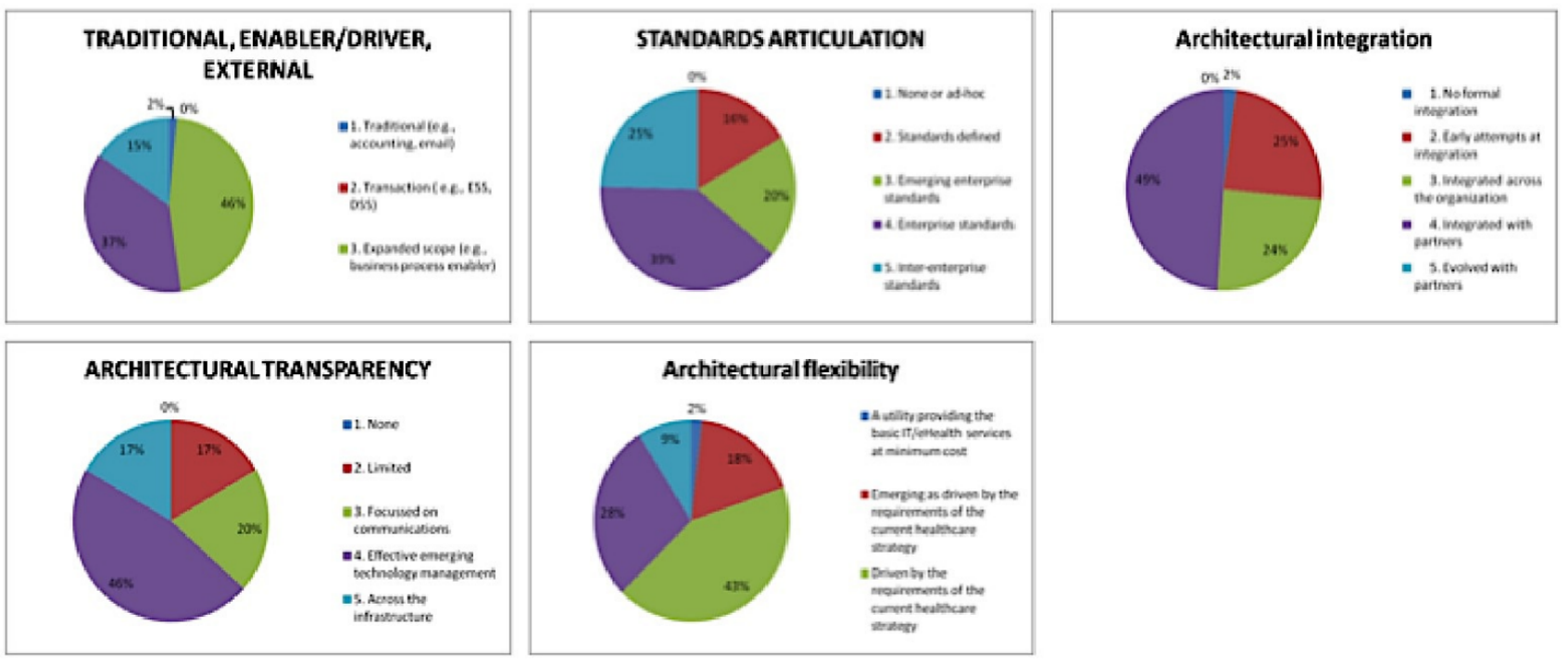

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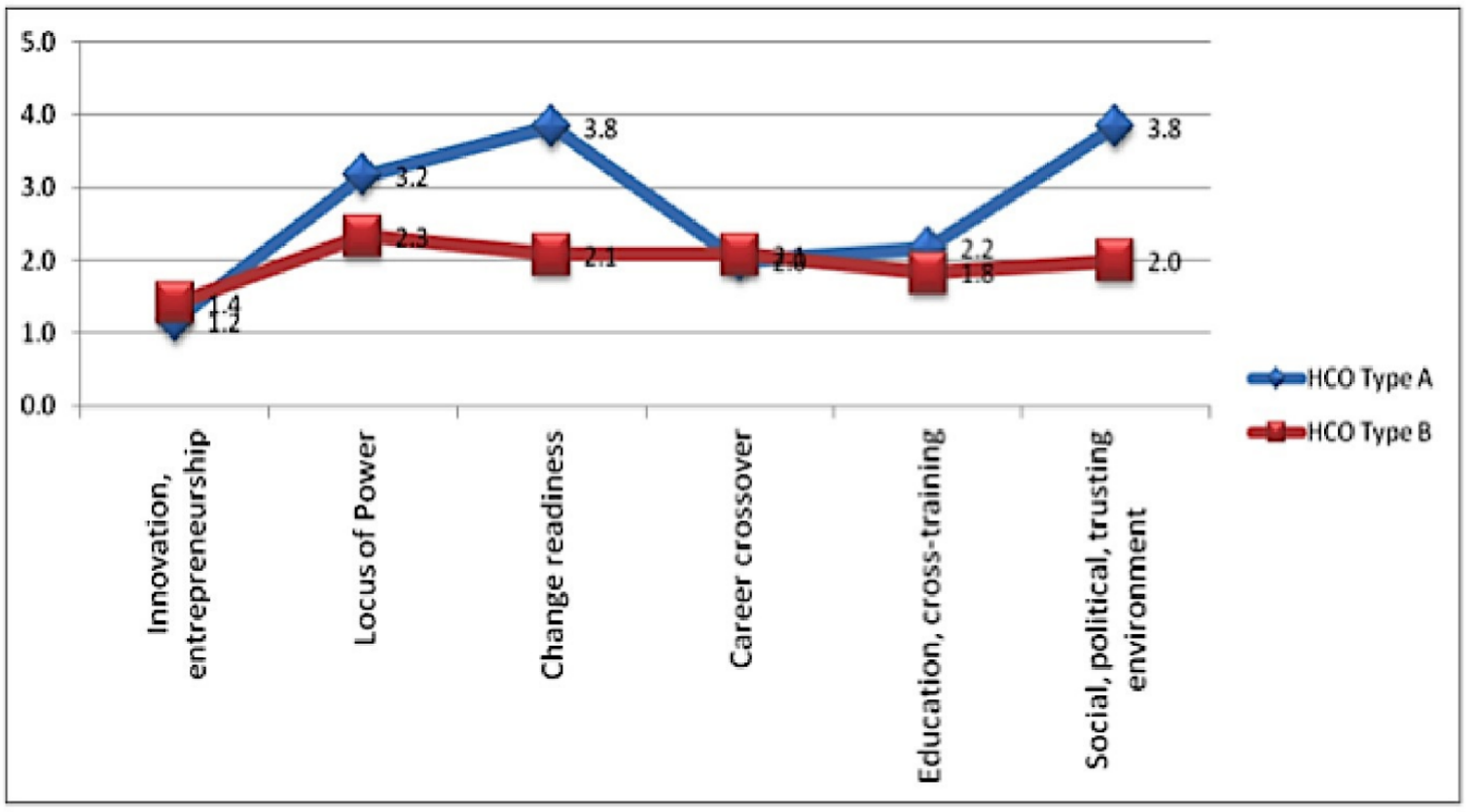

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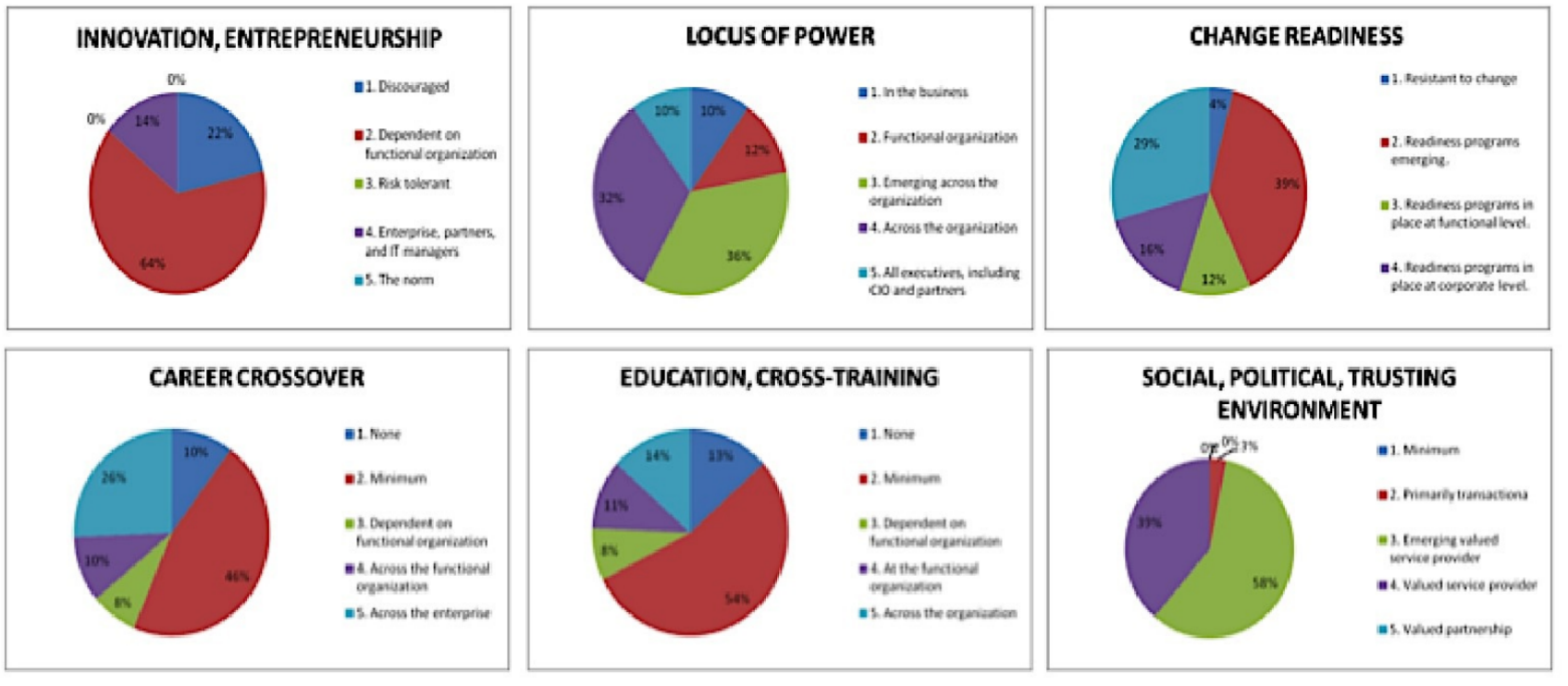

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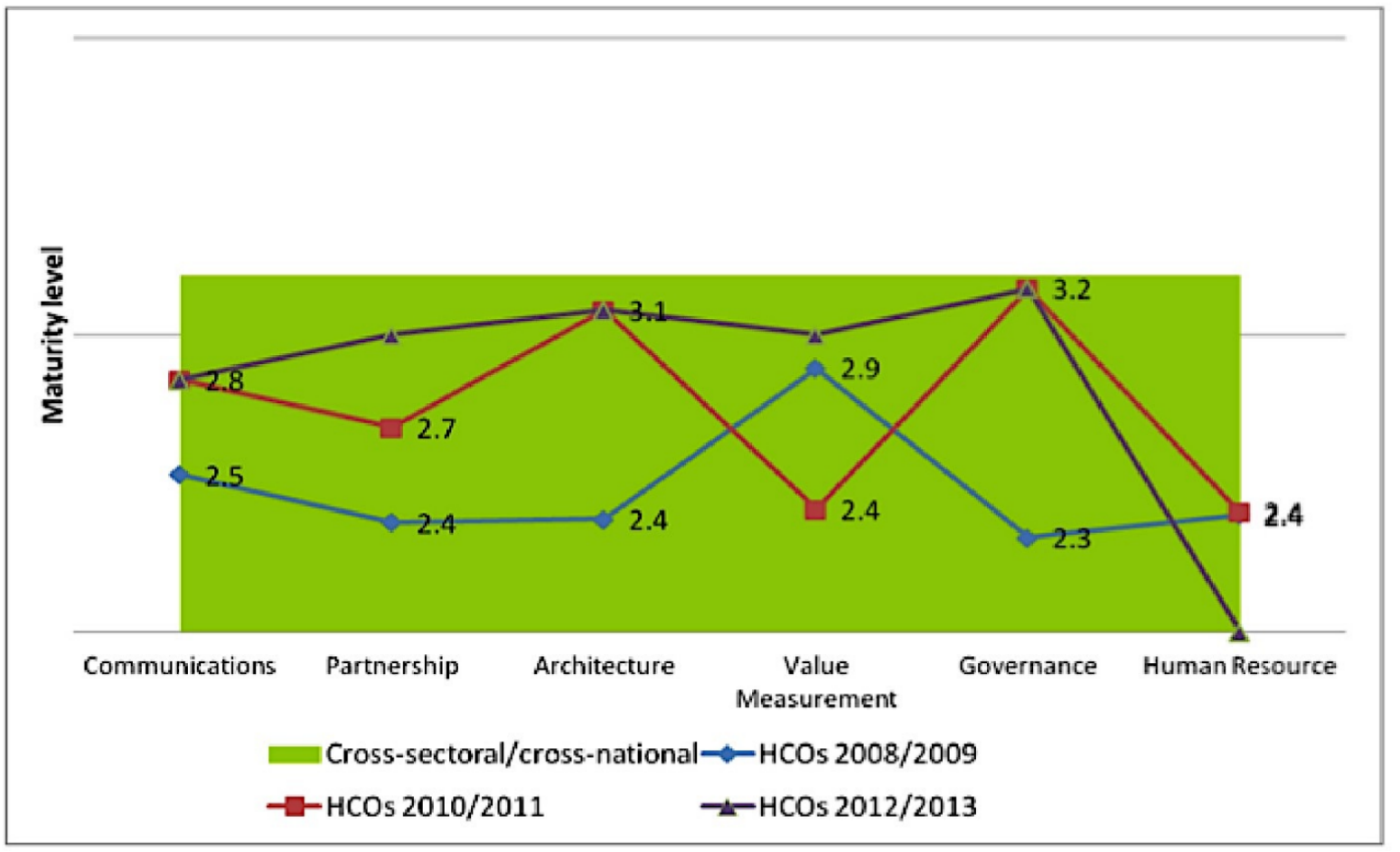

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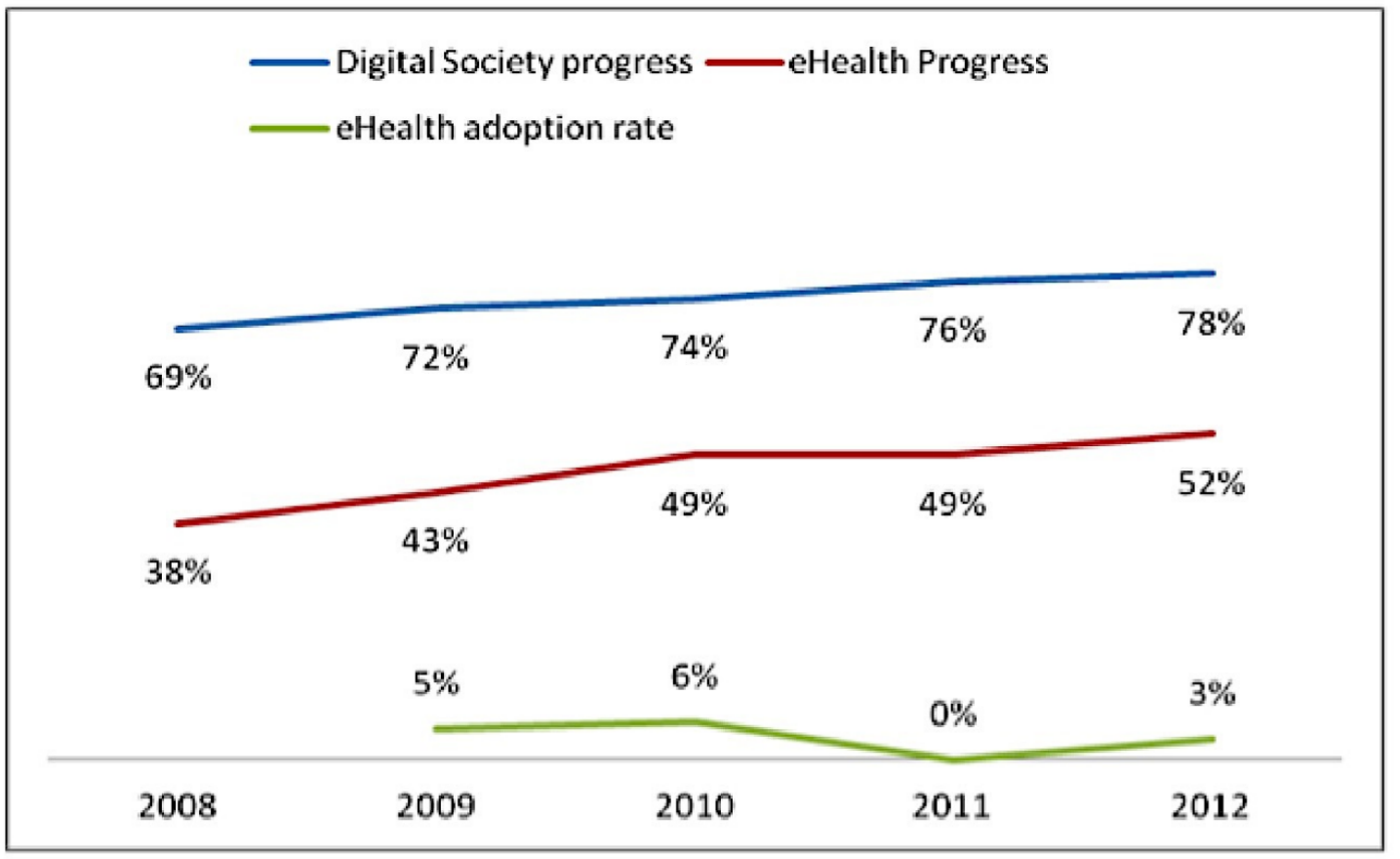

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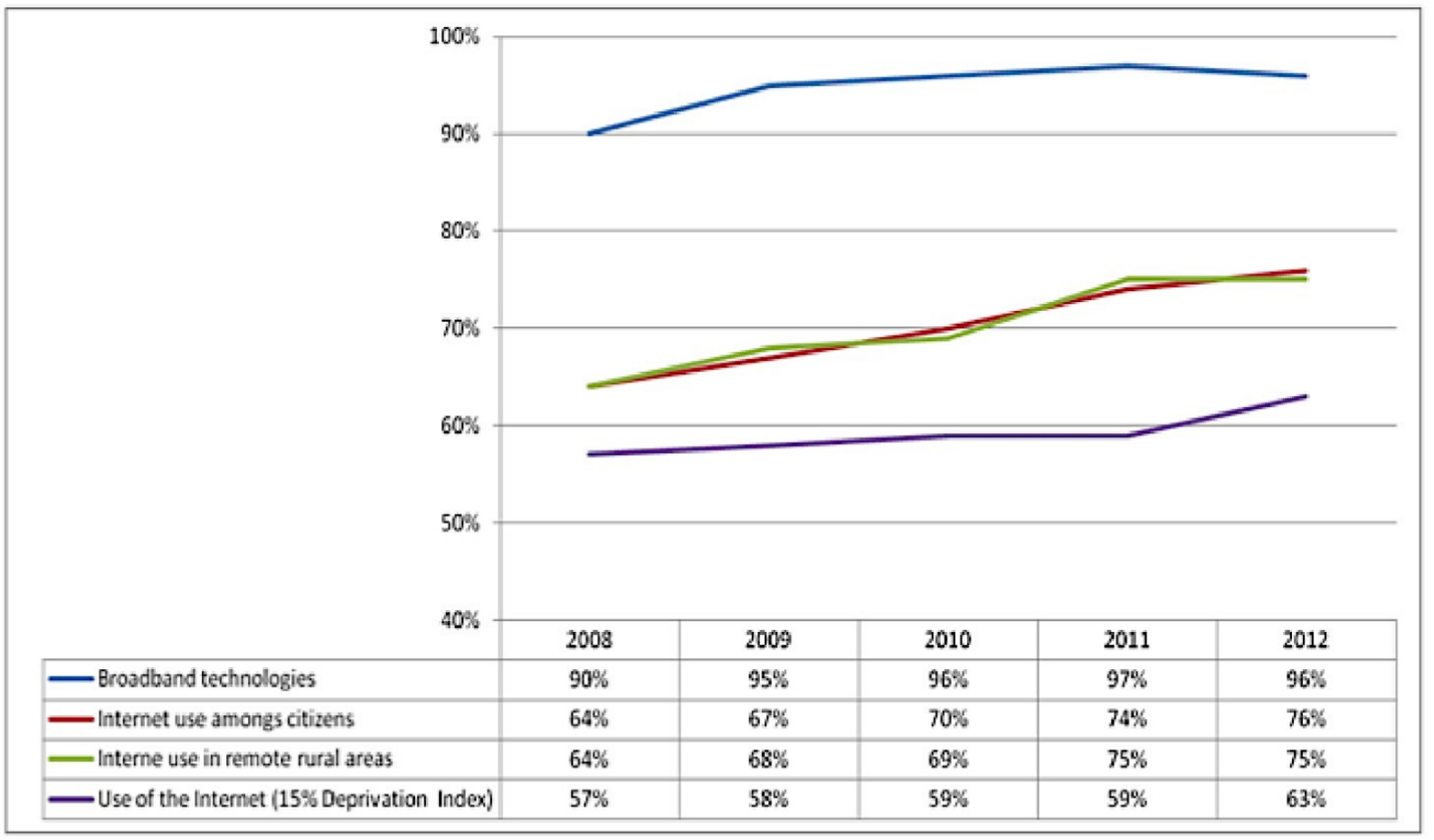
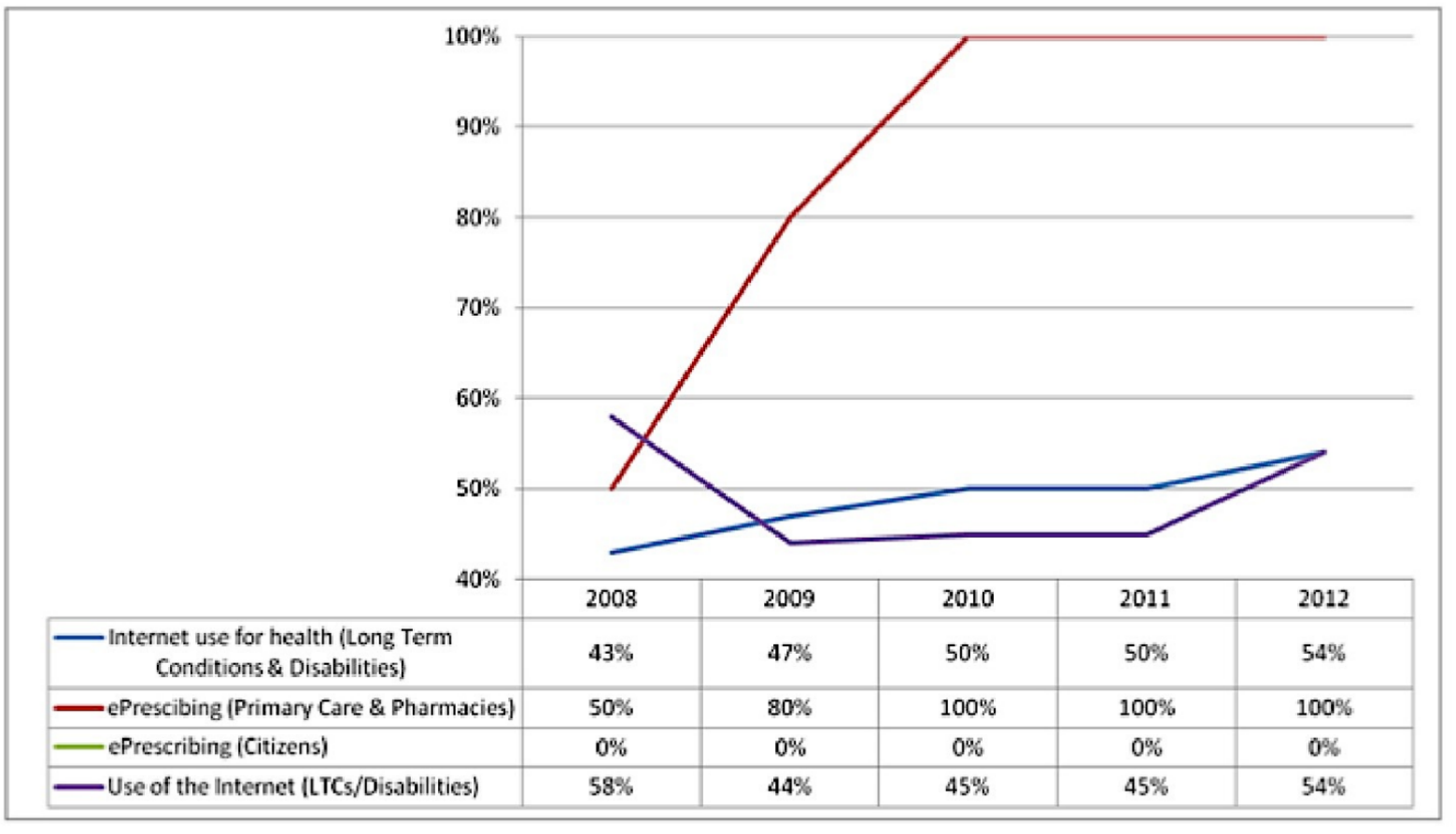


	2008	2009	2010	2011	2012
Broadband technologies	90%	95%	96%	97%	96%
Internet use amongs citizens	64%	67%	70%	74%	76%
Interne use in remote rural areas	64%	68%	69%	75%	75%
Use of the Internet (15% Deprivation Index)	57%	58%	59%	59%	63%

Figure 29



	2008	2009	2010	2011	2012
Internet use for health (Long Term Conditions & Disabilities)	43%	47%	50%	50%	54%
ePrescibing (Primary Care & Pharmacies)	50%	80%	100%	100%	100%
ePrescribing (Citizens)	0%	0%	0%	0%	0%
Use of the Internet (LTCs/Disabilities)	58%	44%	45%	45%	54%

Figure 30

	Strategic Alignment	*Digital society*	*eHealh*
Strategic Alignment			
Digital society	1.00		
eHealh	0.88	0.92	
Governance	0.73	0.78	0.97

Figure 31

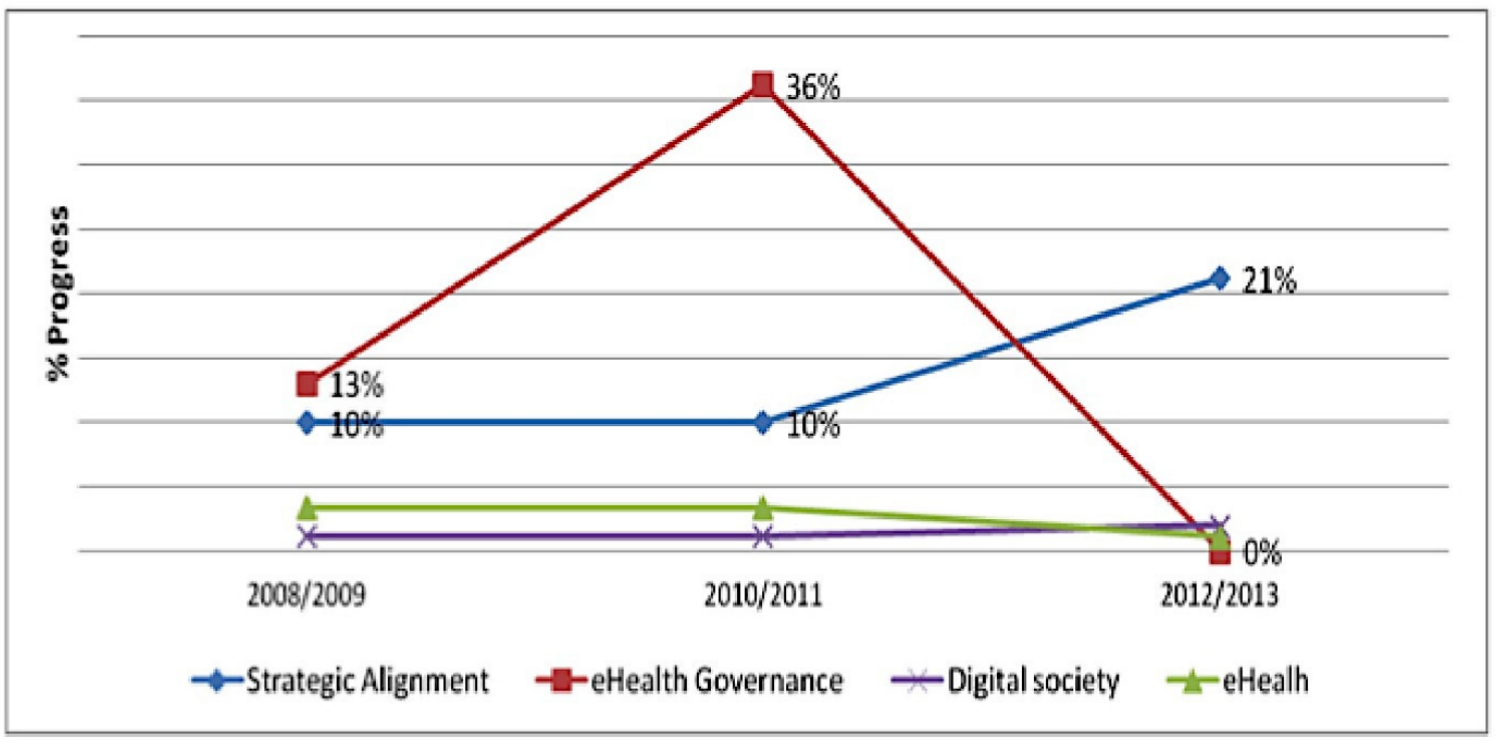


Figure 32

Additional files provided with this submission:

Additional file 1: Demonstrator consent form.pdf, 54K
http://www.biomedcentral.com/imedia/1659583695127809/supp1.pdf
Additional file 2: Participant Information Sheet v1.0draft.pdf, 58K
http://www.biomedcentral.com/imedia/2549612731278092/supp2.pdf
Additional file 3: Invitation participants letter v1.0draft.pdf, 47K
http://www.biomedcentral.com/imedia/2146874350127809/supp3.pdf
Additional file 4: RATS.pdf, 94K
http://www.biomedcentral.com/imedia/9665263221292702/supp4.pdf
Additional file 5: 2011Feb07_Printable Survey MYNAME.pdf, 240K
http://www.biomedcentral.com/imedia/1663139298129270/supp5.pdf

8.13 Appendix 8: Adapted SAM survey for HCOs

Return To:
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Please attach your business card here.

01/8-9

Name: _____

Company: _____
10-11

Title and function: _____
12-13

E-mail: _____

IT/BUSINESS ALIGNMENT

PART I: BACKGROUND INFORMATION

1. Please indicate the perspective from which your facilitator has asked you to respond:

14-1 ☐ the entire corporation

2 ☐ a business unit (e.g., marketing, finance, manufacturing, H/R) (Please specify: _____)
15

2. After quickly reviewing the enclosed *Strategic Alignment Maturity Summary*, which level of strategic alignment maturity do you believe best represents your organization today?

16-1 ☐ Level 1 Initial/ad-hoc process
2 ☐ Level 2 Committed process
3 ☐ Level 3 Established focused process
4 ☐ Level 4 Improved/managed process
5 ☐ Level 5 Optimized process

Parts II through VII of this questionnaire assess your firm's current level of strategic alignment maturity by measuring your response to items related to your IT and business organizations:

Communications	(Part II)
Competency and value of IT	(Part III)
IT governance decisions	(Part IV)
Partnerships	(Part V)
IT infrastructure	(Part VI)
Skills resources	(Part VII)

For each of the questions in these sections, you are asked to choose the **one** response that most closely represents your opinion of the effectiveness of your organization's management practices and strategic choices. If you are unsure how to answer a question without guessing, or if the item is not applicable to your organization, mark the "N/A or don't know" box.

PART II: EFFECTIVENESS OF IT AND BUSINESS COMMUNICATIONS

3. To what extent does IT understand the organization's business environment (e.g., its customers, competitors, processes, partners/alliances):

17-1 ☐ Senior and mid-level IT managers do not understand the business.
2 ☐ Senior and mid-level IT managers have a limited understanding of the business.
3 ☐ Senior and mid-level IT managers have a good understanding of the business.
4 ☐ Understanding of the business by all IT members is encouraged and promoted by senior managers.
5 ☐ Understanding of the business is required (e.g., tied to performance appraisals) throughout the IT function.
6 ☐ N/A or don't know

4. To what extent do the business organizations understand the IT environment (e.g., its current and potential capabilities, systems, services, processes):

18-1 ☐ Senior and mid-level business managers do not understand IT.
2 ☐ Senior and mid-level business managers have a limited understanding of IT.
3 ☐ Senior and mid-level business managers have a good understanding of IT.
4 ☐ Understanding of IT by all employees is encouraged and promoted by senior management.
5 ☐ Understanding of IT is required (e.g., tied to performance appraisals) throughout the business.
6 ☐ N/A or don't know

5. The following statements pertain to methods (e.g., intranets, bulletin boards, education, meetings, e-mail) in place to promote organizational education/learning (e.g., of experiences, problems, objectives, critical success factors). Organizational learning occurs primarily through:

19-1 ☐ Ad-hoc/casual methods (employee observation, anecdote sharing, peer meetings, etc.)
2 ☐ Informal methods (newsletters, bulletin board notices, computer reports, group e-mail, fax, etc.)
3 ☐ Regular, clear methods (training, e-mail, phone-mail, intranet, department meetings, etc.) from mid-level management
4 ☐ Formal, unifying, bonding methods from senior *and* mid-level management
5 ☐ Formal, unifying, bonding methods from senior and mid-level management, *with feedback* measures to monitor and promote effectiveness of learning
6 ☐ N/A or don't know

6. The following question pertains to communications protocol. The IT and business communication style (e.g., ease of access, familiarity of stakeholders) tends to be:

20-1 ☐ One-way, from the business; formal and inflexible
2 ☐ One-way, from the business; moderately informal and moderately flexible
3 ☐ Two-way; formal and inflexible
4 ☐ Two-way; moderately informal and moderately flexible
5 ☐ Two-way; informal and flexible
6 ☐ N/A or don't know

7. The following statements pertain to the extent in which there is knowledge sharing (intellectual understanding and appreciation of the problems/opportunities, tasks, roles, objectives, priorities, goals, direction, etc.) between IT and business:

21-1 ☐ Knowledge sharing is on an ad-hoc basis.
2 ☐ Knowledge sharing is somewhat structured and/or structure is beginning to be created.
3 ☐ There is structured sharing around key functional unit processes.
4 ☐ There is formal sharing at the functional unit level *and* at the corporate level.
5 ☐ There is formal sharing at the functional unit level, at the corporate level, *and* with business partners/alliances.
6 ☐ N/A or don't know

8. The following statements pertain to the role and effectiveness of IT and business liaisons:

22-1 ☐ We do not use liaisons, or if we do, we do so on an ad-hoc, as needed basis.

2 ☐ We regularly use liaisons to transfer IT knowledge to the business and business knowledge to IT. They are the primary contact point for interactions between IT and the business. Liaisons *are not* usually used to facilitate relationship development.

3 ☐ We regularly use liaisons to transfer IT knowledge to the business and business knowledge to IT. *T*hey occasionally facilitate relationship development.

4 ☐ We regularly use liaisons to facilitate the transfer of IT knowledge to the business and business knowledge to IT. Their primary objective is to facilitate internal relationship development.

5 ☐ We regularly use liaisons to facilitate the transfer of IT knowledge to the business and external partners and business knowledge to IT. Their primary objective is to facilitate relationship development across the business and its external partners.

6 ☐ N/A or don't know

PART III: MEASUREMENT OF THE COMPETENCY AND VALUE OF IT

9. The following statements pertain to the metrics and processes used to measure IT's contribution to the business.

23-1 ☐ The metrics and processes we have in place to measure IT are primarily technical (e.g., system availability, response time).

2 ☐ We are equally concerned with technical *and* cost efficiency measures. We have limited or no formal feedback processes in place to review and take action based on the results of our measures.

3 ☐ We formally assess technical and cost efficiency using traditional financial measures (ie ROI and activity-based costing). We are starting to put formal feedback processes in place to review and take action based on the results of our measures.

4 ☐ We formally assess technical, cost efficiency, and cost effectiveness using traditional financial measures (e.g., ROI, ABC). We have formal feedback processes in place to review and take action based on the results of our measures.

5 ☐ We use a weihted multi-dimensional measures approah (i.e. technical, financial, operational, and human-related) . We have formal feedback processes in place to review and take action based on the results of our measures extended to our external partners.

6 ☐ p10

10. The following statements pertain to the use of business metrics to measure contribution to the business.

24-1 ☐ We do not measure the value of our business investments, or do so on an ad-hoc basis.

2 ☐ We are concerned with cost efficiency measures at the functional organization level only. We have limited or no formal feedback processes in place to review and take action based on the results of our measures.

3 ☐ We formally use traditional financial measures (ie. ROI and activity-based costing), across functional organizations. We are starting to have formal feedback processes in place to review and take action based on the results of our measures.

4 ☐ We formally measure value based on the contribution to our customers. We have formal feedback processes in place to review and take action based on the results of our measures and to assess contributions across functional organizations.

5 ☐ We use a multi-dimensional approach with appropriate weights given to technical, financial, operational, and human-related measures. We have formal feedback processes in place to review and take action based on the results of our measures. These measures are extended to our external partners (e.g., vendors, outsourcers, customers).

6 ☐ N/A or don't know

11. The following statements pertain to the use of integrated IT and business metrics to measure IT's contribution to the business.

25-1 ☐ We do not measure the value of our IT business investments, or do so on an ad-hoc basis.

2 ☐ The value measurements for IT and business are not linked. We have limited or no formal feedback processes in place to review and take action based on the results of our measures.

3 ☐ The value measurements for IT and business are starting to be linked and formalized. We are also starting to have formal feedback processes in place to review and take action based on the results of our measures.

4 ☐ We formally link the value measurements of IT and business. We have formal feedback processes in place to review and take action based on the results of our measures and to assess contributions across functional organizations.

5 ☐ We use a multi-dimensional approach with appropriate weight given to IT and business measures. We have formal feedback processes in place to review and take action based on the results of our measures. These measures are extended to our external partners (e.g., vendors, outsourcers, customers).

6 ☐ N/A or don't know

12. The following statements pertain to the use of service level agreements (SLAs):

26-1 ☐ We do not use SLAs or do so sporadically.

2 ☐ We have SLAs which are primarily technically oriented (response time, length of computer downtime, etc.), between the IT and functional organizations.

3 ☐ We have SLAs which are both technically oriented and relationship-oriented (user/customer satisfaction, IT's commitment to the business, etc.) that are between the IT and functional organizations and also emerging across the enterprise.

4 ☐ We have SLAs which are both technically-oriented and relationship-oriented, between the IT and functional organizations as well as enterprise wide.

5 ☐ We have SLAs which are both technically-oriented and relationship-oriented, between the IT and functional organizations as well as at enterprise wide and with our external partners/alliances.

6 ☐ N/A or don't know

13. The following statements pertain to benchmarking practices. *Informal* practices are such things as informal interviews, literature searches, company visits, etc., while *formal* practices are such things as environmental scanning, data gathering and analysis, determining best practices, etc.

27-1 ☐ We seldom or never perform either informal or formal benchmarks.

2 ☐ We occasionally or routinely perform informal benchmarks.

3 ☐ We occasionally perform formal benchmarks and seldom take action based on the findings.

4 ☐ We routinely perform formal benchmarks and usually take action based on the findings.

5 ☐ We routinely perform formal benchmarks and have a regulated process in place to take action and measure the changes.

6 ☐ N/A or don't know

14. The following statements pertain to the extent of assessment and review of IT investments.

28-1 ☐ We do not formally assess and/or review.

2 ☐ We assess and/or review only after we have a business or IT problem (i.e., failed IT project, market share loss).

3 ☐ Assessments and/or reviews are becoming routine occurrences.

4 ☐ We routinely assess and/or review and have a formal process in place to make changes based on the results.

5 ☐ We routinely assess and/or review and have a formal process in place to make changes based on the results and measure the changes. Our external partners are included in the process.

6 ☐ N/A or don't know

15. The following statements pertain to the extent to which IT-business continuous improvement practices (e.g., quality circles, quality reviews) and effectiveness measures are in place.

29-1 ☐ We do not have any continuous improvement practices in place.

2 ☐ We have a few continuous improvement practices in place, but no effectiveness measures are in place.

3 ☐ We have a few continuous improvement practices in place and the use of effectiveness measures is emerging.

4 ☐ We have many continuous improvement practices in place and we frequently measure their effectiveness.

5 ☐ We have well established continuous improvement practices and effectiveness measures in place.

6 ☐ N/A or don't know

16. The demonstrated contribution that the IT function has made to the accomplishment of the organization's strategic goals is:

30-1 ☐ Very weak

2 ☐ Somewhat weak

3 ☐ Neither weak nor strong

4 ☐ Somewhat strong

5 ☐ Very strong

6 ☐ N/A or don't know

PART IV: IT GOVERNANCE

17. The following statements pertain to strategic business planning with IT participation.

31-1 ☐ We do no formal strategic business planning or, if it is done, it is done on an as-needed basis.
2 ☐ We do formal strategic business planning at the functional unit level with slight IT participation.
3 ☐ We do formal strategic business planning at the functional unit levels with some IT participation. There is some inter-organizational planning.
4 ☐ We do formal strategic business planning at the functional unit and across the enterprise with IT participation.
5 ☐ We do formal strategic business planning at the functional unit, across the enterprise, and with our business partners/alliances with IT participation.
6 ☐ N/A or don't know

18. The following statements pertain to strategic IT planning with business participation.

32-1 ☐ We do no formal strategic IT planning or, if it is done, it is done on an as-needed basis.
2 ☐ We do formal strategic IT planning at the functional unit level with slight business participation.
3 ☐ We do formal strategic IT planning at the functional unit levels with some business participation. There is some inter-organizational planning.
4 ☐ We do formal strategic IT planning at the functional unit and across the enterprise with the business.
5 ☐ We do formal strategic business planning at the functional unit, across the enterprise, and with our business partners/alliances.
6 ☐ N/A or don't know

19. The following statements pertain to the organization structure of the IT function. Our IT function is:

33-1 ☐ Centralized, whereby a corporate IT unit (or other central unit) has primary authority for architecture, standards, and application resource decisions.
2 ☐ Decentralized, whereby each functional unit within the organization has primary authority for their IT infrastructure, standards, and application resource decisions.
3 ☐ Federated, whereby a corporate IT 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.
4 ☐ N/A or don't know

20. The CIO reports to the _____
34

21. The following statements pertain to IT budgeting. Our IT function is budgeted as a:

35-1 ☐ Cost center, with erratic/inconsistent/irregular/changeable spending
2 ☐ Cost center, by functional organization
3 ☐ Cost center with some projects treated as investments
4 ☐ Investment center
5 ☐ Profit center, where IT generates revenues
6 ☐ N/A or don't know

22. The following statements pertain to IT investment decisions. Our IT investment decisions are primarily based on IT's ability to:

36-1 ☐ Reduce costs.
2 ☐ Increase productivity and efficiency as the focus.
3 ☐ Traditional financial reviews. IT is seen as a process enabler.
4 ☐ Business effectiveness is the focus. IT is seen as a process driver or business strategy enabler.
5 ☐ Create competitive advantage and increase profit. Our business partners see value.
6 ☐ N/A or don't know

23. The following statements pertain to IT steering committee(s) with senior level IT and business management participation.

37-1 ☐ We do not have formal/regular steering committee(s).
2 ☐ We have committee(s) which meet informally on an as-needed basis.
3 ☐ We have formal committees, which meet regularly and have emerging effectiveness.
4 ☐ We have formal, regular committee meetings with demonstrated effectiveness.
5 ☐ We have formal, regular committee meetings with demonstrated effectiveness that include strategic business partners sharing decision-making responsibilities.
6 ☐ N/A or don't know

24. The following statements pertain to how IT projects are prioritized. Our IT project prioritization process is usually:

38-1 ☐ In reaction to a business or IT need.
2 ☐ Determined by the IT function.
3 ☐ Determined by the business function.
4 ☐ Mutually determined between senior and mid-level IT and business management.
5 ☐ Mutually determined between senior and mid-level IT and business management and with consideration of the priorities of any business partners/alliances.
6 ☐ N/A or don't know

25. The ability of the IT function to react/respond quickly to the organization's changing business needs is:

39-1 ☐ Very weak
2 ☐ Somewhat weak
3 ☐ Neither weak nor strong
4 ☐ Somewhat strong
5 ☐ Very strong
6 ☐ N/A or don't know

PART V: PARTNERSHIPS BETWEEN IT AND BUSINESS FUNCTIONS

26. IT is perceived by the business as:

40-1 ☐ A cost of doing business
2 ☐ Emerging as an asset
3 ☐ A fundamental enabler of future business activity
4 ☐ A fundamental driver of future business activity
5 ☐ A partner with the business that co-adapts/improvises in bringing value to the firm
6 ☐ N/A or don't know

27. The following statements pertain to the role of IT in strategic business planning.

41-1 ☐ IT does not have a role.
2 ☐ IT is used to enable business processes.
3 ☐ IT is used to drive business processes.
4 ☐ IT is used to enable or drive business strategy.
5 ☐ IT co-adapts with the business to enab/e/drive strategic objectives.
6 ☐ N/A or don't know

28. The following statements pertain to the sharing (by IT and business management) of the risks and rewards (e.g., bonuses) associated with IT-based initiatives (i.e., a project is late and over budget because of business requirement changes).

42-1 ☐ IT takes all the risks and does not receive any of the rewards.
2 ☐ IT takes most of the risks with little reward.
3 ☐ Sharing of risks and rewards is emerging.
4 ☐ Risks and rewards are always shared.
5 ☐ Risks and rewards are always shared and we have formal compensation and reward systems in place that induce managers to take risks.
6 ☐ N/A or don't know

29. The following statements pertain to formally managing the IT/business relationship. To what extent are there formal processes in place that focus on enhancing the partnership relationships that exist between IT and business (e.g., cross-functional teams, training, risk/reward sharing):

43-1 ☐ We don't manage our relationships.
2 ☐ We manage our relationships on an ad-hoc basis.
3 ☐ We have defined programs to manage our relationships, but IT or the business does not always comply with them. Conflict is seen as creative rather than disruptive.
4 ☐ We have defined programs to manage our relationships and both IT and the business comply with them.
5 ☐ We have defined programs to manage our relationships, both IT and the business comply with them, and we are continuously improving them.
6 ☐ N/A or don't know

30. The following statements pertain to IT and business relationship and trust.

44-1 ☐ There is a sense of conflict and mistrust between IT and the business.
2 ☐ The association is primarily an "arm's length" transactional style of relationship.
3 ☐ IT is emerging as a valued service provider.
4 ☐ The association is primarily a long-term partnership style of relationship.
5 ☐ The association is a long-term partnership and valued service provider.
6 ☐ N/A or don't know

31. The following statements pertain to business sponsors/champions. Our IT-based initiatives:

45-1 ☐ Do not usually have a senior level IT or business sponsor/champion.
2 ☐ Often have a senior level IT sponsor/champion only.
3 ☐ Often have a senior level IT and business sponsor/champion at the functional unit level.
4 ☐ Often have a senior level IT and business sponsor/champion at the corporate level.
5 ☐ Often have a senior level IT and the CEO as the business/sponsor champion.
6 ☐ N/A or don't know

PART VI: SCOPE AND ARCHITECTURE OF THE IT INFRASTRUCTURE

32. The following statements pertain to the scope of your IT systems. Our primary systems are:

46-1 ☐ Traditional office support (e.g., e-mail, accounting, word processing, legacy systems)
2 ☐ Transaction-oriented (e.g., back office support)
3 ☐ Business process enablers (IT supports business process change)
4 ☐ Business process drivers (IT is a catalyst for business process change)
5 ☐ Business strategy enablers/drivers (IT is a catalyst for changes in the business strategy)
6 ☐ N/A or don't know

33. The following statements pertain to the articulation of and compliance with IT standards. Our IT standards are:

47-1 ☐ Non-existent *or* not enforced
2 ☐ Defined and enforced at the functional unit level but not across different functional units
3 ☐ Defined and enforced at the functional unit level with emerging coordination across functional units
4 ☐ Defined and enforced across functional units
5 ☐ Defined and enforced across functional units, and with joint coordination among our strategic business partners/alliances
6 ☐ N/A or don't know

34. The following statements pertain to the scope of architectural integration. The components of our IT infrastructure are:

48-1 ☐ Not well integrated
2 ☐ Integrated at the functional unit with emerging integration across functional units
3 ☐ Integrated across functional units
4 ☐ Integrated across functional units and our strategic business partners/alliances
5 ☐ Evolving with our business partners
6 ☐ N/A or don't know

35. The following statements pertain to the level of disruption caused by business and IT changes (e.g., implementation of a new technology, business process, merger/acquisition). Most of the time, a business or IT change is:

49-1 ☐ Not readily transparent (very disruptive)
2 ☐ Transparent at the functional level only
3 ☐ Transparent at the functional level and emerging across all remote, branch, and mobile locations
4 ☐ Transparent across the entire organization
5 ☐ Transparent across the organization and to our business partners/alliances
6 ☐ N/A or don't know

36. The following statements pertain to the scope of IT infrastructure flexibility to business and technology changes. Our IT infrastructure is viewed as:

50-1 ☐ A utility providing the basic IT services at minimum cost
2 ☐ Emerging as driven by the requirements of the current business strategy
3 ☐ Driven by the requirements of the current business strategy
4 ☐ Emerging as a resource to enable fast response to changes in the marketplace
5 ☐ A resource to enable and drive fast response to changes in the marketplace
6 ☐ N/A or don't know

PART VII: HUMAN RESOURCE SKILLS

37. The following statements pertain to the extent the organization fosters an innovative entrepreneurial environment. Entrepreneurship is:

51-1 ☐ Discouraged
2 ☐ Moderately encouraged at the functional unit level
3 ☐ Strongly encouraged at the functional unit level
4 ☐ Strongly encouraged at the functional unit and corporate levels
5 ☐ Strongly encouraged at the functional unit, corporate level, and with business partners/alliances
6 ☐ N/A or don't know

38. The following statements pertain to the cultural locus of power in making IT-based decisions. Our important IT decisions are made by:

52-1 ☐ Top business management or IT management at the corporate level only
2 ☐ Top business or IT management at corporate level with emerging functional unit level influence
3 ☐ Top business management at corporate and functional unit levels, with emerging shared influence from IT management
4 ☐ Top management (business and IT) across the organization and emerging influence from our business partners/alliances.
5 ☐ Top management across the organization with equal influence from our business partners/alliances.
6 ☐ N/A or don't know

39. The following statements pertain to your organization's readiness for change.

53-1 ☐ We tend to resist change.
2 ☐ We recognize the need for change and change readiness programs are emerging.
3 ☐ Change readiness programs providing training and necessary skills to implement change are in place at the functional unit level.
4 ☐ Change readiness programs are in place at the corporate level.
5 ☐ Change readiness programs are in place at the corporate level and we are proactive and anticipate change.
6 ☐ N/A or don't know

40. The following statements pertain to career crossover opportunities among IT and business personnel.

54-1 ☐ Job transfers rarely or never occur.
2 ☐ Job transfers occasionally occur within the functional organization.
3 ☐ Job transfers regularly occur for management level positions usually at the functional level.
4 ☐ Job transfers regularly occur for all position levels and within the functional units.
5 ☐ Job transfers regularly occur for all position levels, within the functional units, and at the corporate level.
6 ☐ N/A or don't know

41. The following statements pertain 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. The organization:

55-1 ☐ Does not provide opportunities to learn about support services outside the employee's functional unit.

2 ☐ Opportunities are dependent on the functional unit.
3 ☐ Formal programs are practiced by all functional units.
4 ☐ Formal programs are practiced by all functional units and across the enterprise.
5 ☐ Opportunities are formally available across the enterprise and with business partners/alliances.
6 ☐ N/A or don't know

42. The following statements pertain to the interpersonal interaction (e.g., trust, confidence, cultural, social, and political environment) that exists across IT and business units in our organization.

56-1 ☐ There is minimum interaction between IT and business units.
2 ☐ The association is primarily an "arm's length" transactional style of relationship.
3 ☐ Trust and confidence among IT and business is emerging.
4 ☐ Trust and confidence among IT and business is achieved.
5 ☐ Trust and confidence is extended to external customers and partners.
6 ☐ N/A or don't know

43. The following statements pertain to the IT organization's ability to attract and retain the best business and technical professionals.

57-1 ☐ There is no formal program to retain IT professionals. Recruiting demands are filled ineffectively.
2 ☐ IT hiring is focused on technical expertise.
3 ☐ IT hiring is focused equally on technical and business expertise. Retention programs are in place.
4 ☐ Formal programs are in place to attract and retain the best IT professionals with both technical and business skills.
5 ☐ Effective programs are in place to attract and retain the best IT professionals with both technical and business skills.
6 ☐ N/A or don't know

PART VIII: ACHIEVING STRATEGIC ALIGNMENT OF THE IT AND BUSINESS FUNCTIONS

44. Please indicate to what extent the following items **enable** IT-business alignment in your organization. Check one box only for each item.

	Not Enabling ◄——► Greatly Enabling					N/A
Senior executive support for IT	58-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT involved in business strategy development	59-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT demonstrates strong leadership	60-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT understands the firm's business environment	61-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
Close partnership between IT and business	62-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT efforts are well prioritized	63-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
Good IT/business communication	64-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
Goals and vision are defined	65-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT and the business have close relationship	66-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT resources shared	67-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT meets commitments	68-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT achieves its strategic goals	69-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT applied for competitive advantage	70-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT plans linked to business plans	71-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐

45. Please indicate to what extent the following items **inhibit** IT-business alignment in your organization. Check **one** box for each item.

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	Not Inhibiting ◄——► Greatly Inhibiting					N/A
IT does not understand the firm's business environment	10-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT fails to meet its commitments	11-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT and the business lack close partnership	12-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT efforts are not well prioritized	13-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
Senior executives do not support IT	14-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT management lacks leadership	15-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT and business plans are not linked	16-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
Antiquated IT infrastructure	17-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
Resistance from senior executives	18-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
Budget and staffing problems	19-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT does not communicate well with the business	20-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
IT fails to meet strategic goals	21-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
Goals/vision are vague	22-1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐

46. What are your organization's three most important IT objectives in order of importance?

1. _____
2. _____
3. _____

47. What are your organization's three most important business objectives in order of importance?

1. _____
2. _____
3. _____

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THANK YOU FOR YOUR PARTICIPATION