University of Chester

Factors affecting progress of the National e-Health Strategy in the NHS in England.

A Socio-technical Evaluation.

Thesis submitted in accordance with the requirements of the University of Chester for the degree of Doctor of Business Administration.

Mr K. Richardson

August 2018

Declaration of Originality

The material being presented for examination is my own work and has not been submitted for an award of this or another HEI except in minor particulars which are explicitly noted in the body of the thesis. Where research pertaining to the thesis was undertaken collaboratively, the nature and extent of my individual contribution has been made explicit.

Signed: ………………………………………………………

Date: **20th August 2018**

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Dedication

To my parents, James and Margery Richardson.

Acknowledgement

Key Words

E-health strategy, Electronic Health Records, information technology, systems, interoperability, digital, computers, change management, technology lifecycle, process improvement, health sector, NHS, hospitals, primary care, secondary care, tertiary care, community care, social care.

Summary of Portfolio

Keith has been working as an Information Technology (IT) professional since he graduated with a Business Studies (Hons) degree in 1980 which was sponsored by British Aerospace as part of their Commercial Apprenticeship programme. After that he worked in Management Services as an Analyst until 1983. He then worked for the Bank of Scotland's Finance House, NWS Bank as a Business Analyst, then Project Leader (1983-88). A career move into IT consultancy followed in 1989 at KPMG Peat Marwick McLintock, then Coopers & Lybrand Deloitte, where he worked on many assignments in manufacturing, insurance, government, estate management, transport and leisure, but mainly for the Department of Health and their various agencies, as well the National Health Services (NHS) in England, Wales and Scotland. Assignments included IT strategies, business cases, system developments, procurements and replacements, change management and process improvement initiatives and interim Director level positions. He left consultancy in 1995 to become Information Management & Technology Director at the Countess of Chester Hospital where he developed a new IT Strategy and Business Case that subsequently led to a major overhaul of their IT, including the procurement and deployment of a new integrated, modular Electronic Health Record System (EHR).

Having delivered the strategy he left after 8 years in 2003 to set up his own IT consultancy business, NHS Consulting, which won assignments with NHS hospitals and NHS Strategic Health Authorities, mainly related to either interim hospital Chief Information Officer roles, or on the National Programme for IT (NPfIT) in England, which was the national e-health strategy at the time. His largest NPfIT assignment was leading the successful North West Strategic Health Authority's Picture Archiving and Communications System & Radiology Information Systems Programme. That was a £200 million contract to deploy those systems to hospitals in the North West, for which he was given a national EHI Award in 2013 for "Outstanding work in healthcare imaging informatics".

He acquired a number of residential rental properties from 2010 onwards. Then in 2014 he closed NHSC Consulting and, as well as undertaking this research, he now runs the property business part time, is Chairman of another property management limited company, raises funds for charities, runs an online shop for a charity and maintains his contact with the IT profession by working as a volunteer Treasurer and Social Media lead for a branch of the British Computer Society.

He holds an MSc Information Systems (Distinction) awarded by the University of Liverpool in 2009, studied at Chester. This supplemented his professional experience with academic learning. Wishing to continue to grow academically, he began the Doctorate of Business Administration (DBA) programme in September 2011, initially sponsored by NHS Consulting. He completed a range of modules including Personal and Professional Review, Negotiated Experiential Learning, Action Learning and Research Methods. The latter covered research philosophies, strategies, methods and the construction of a doctoral research proposal. That gave Keith valuable insights into how to conduct academic research at doctoral level. .

Abstract

Background: This is a formative socio-technical study of the "middle out" NHS e-health strategy in England. It began in 2015 with an objective to become "paperless at the point of care by 2020", focussing nationally on the "electronic glue", (interoperability), to facilitate the inter-organisational exchange digital communications of patient data and leaving the choice of EHRs to local organisations. No academic research has been published into the strategy and similar studies rarely include sample groups of suppliers or IT consultants. So this study seeks to fill both gaps in knowledge. Such strategies are prevalent across westernised developed countries and can consume large sums of government funding and local resources. In consequence, their failure can be very costly. This study seeks to mitigate that risk whilst recognising that, as they operate in highly complex environments, choosing any particular type of "bottom up", "middle out" or "top down" strategy construct does not guarantee success. Their outcome is dependent upon the successful navigation through a mix of factors, known and unknown, across technical, human and social, organisational, macro-environmental and wider socio-political dimensions through time.

Findings: The "middle out" strategy is broadly more appropriate, rather than "bottom up" or "top down", but the target, of becoming "paperless by 2020", is unattainable. Major cultural barriers include resistance by powerful clinicians, who can perceive such strategies as threats to the moral order and their traditional role as gatekeepers of access to patient data. Other barriers include inadequate and delayed national funding; disruption caused by government reorganisations; major premature programme re-structuring and a shift away from the original intent, resulting in the inappropriate selection of single organisation pilot sites rather than multi-organisational community wide ones to promote interoperability. New factors found include: the threats of cyber security incidents and the need for protective measures; the mismatch between strategy timescales and local procurement cycles; the quality of IT suppliers and the competing demands of similar change management programmes for scarce local NHS resources.

Proposition: To reflect those findings a new socio-technical model is proposed that incorporates those additional factors as well as two further cross cutting dimensions to reflect "Lifecycle" and "Purpose", drawing on elements of both Change Management and Technology Lifecycle Theory. "Lifecycle" reflects the "passage of time" as the evidence suggests that factors affecting progress may vary in their presence and impact over time as a strategy moves though its lifecycle. The addition of a "Purpose" dimension supports a reflection on the "why". Some support is found for the proposal that a "middle out" strategy is more likely to facilitate progress than "bottom up" or "top down" ones. However a shift in approach is advocated. It is proposed that "middle out" e-health strategies are more likely to be successful if their "purpose" shifts away from promoting EHRs, per se, like with single organisation pilot sites, towards inter-organisational clinical and social care workflow improvement across health and social care economies. To achieve that, the focus should shift towards interoperability and cyber security programmes. Those should promote and mandate the use of national interoperability infrastructure, national systems and national standards. They should also provide national funding support to health economy wide clinical and social care workflow improvement pilots and initiatives that span those economies.

Abbreviations

ACRONYM	TITLE
A&E	Accident & Emergency Department in most NHS acute hospitals
ANT	Actor Network Theory
API	Application Programme Interface – a "pull data interchange standard
BMA	British Medical Association
CAQDAS	Computer Assisted/Aided Qualitative Data Analysis System e.g. NVivo
CCIO	Chief Clinical Information Officer
CIO	Chief Information Officer
CNIO	Chief Nursing information Officers
CCG	Clinical Commissioning Group [England]
CODE	Centres of Digital Excellence (England)
CfH	Connecting for Health (England)
CQC	Care Quality Commission
CQUINs	NHS Standard Contract component.
DHA	District Health Authority
DoH	Department of Health
DOI	Diffusion of Innovation Theory
DMI	Digital Maturity Index [England]
DEP	Dossier Medical Personnel (France)
EDI	Electronic Data Interchange
ERDIP	Electronic Record Development and Implementation Programme [England]
EHR	Electronic Health Record System
EMR	Electronic Medical Record
EPS	Electronic Prescription Service
eGK	Elektronische Gesundheitskarte (Germany)
ECR	Emergency Care Summary (Scotland, Northern Ireland)
EHI	Electronic Health Intelligence, currently known as Digital Health
ERS	e-Referral Service
GDP	Gross Domestic Product
GP	General Practitioner
GP2GP	GP to GP data exchange system
HIE	Health Information Exchange Programme (USA)
HIT	Health Information Technology
HiMSS	Healthcare Information and Management Systems Society
HSCN	Health and Social care network (replacement for N3)
HL7 UK	UK part of Health Level Seven International
HSCIC	Health & Social Care Information Centre
HISS	Hospital Information Support System [England]
IHE UK	A non-profit association - promotes interoperability in health information technology
ICT	Information and Communication Technology
IT	Information Technology
IDCR	Integrated Digital Care Records Programme [England]
LDPs	Local Delivery Plans, aka "*local digital roadmap*"
LMC	Local Medical Committee
MDU	Medical Defence Union
MUP	Meaningful Use Programme (USA)
MyEHR	My Electronic Health Record (Australia)
NAO	National Audit Office (England)
N3	NHS National Network (for data interchange)
n-EPR	National Electronic Patient Record (Holland)
NHITB	National Health IT Board (New Zealand)
NHIS	National Health Information System
NHS	National Health Services
NIB	National Information Board
NPfIT	National Programme for IT (England)

ACRONYM	TITLE
NPT	Normalisation Process Theory
NEHTA	National E-Health Transition Authority (Australia)
ONC	Office of the National Coordinator for Health Information Technology (USA)
PCEHR	Personally Controlled Electronic Health Record [Australia)
PHC2020	Personalised Health and Care 2020
PACS	Picture Archiving and Communications System
RIS	Radiology Information System
ROI	Return on Investment
SHA	NHS Strategic Health Authority
SCR	Summary Care Record
SSEHR	Single shared electronic record
STPs	Sustainability and Transformation Programmes / Plans
TAM	Technology Acceptance Model
TALCM	Technology Adoption Life Cycle Model
TechUK	Represents the technology industry in the UK
TOE	Technology, Organization, and Environment Framework
TPB	Theory of Planned Behaviour
UTAUT	Unified Theory of Acceptance and Use of Technology

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Appendices

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1   Introduction

1.1   Background

This research focusses on the national e-health strategy in the National Health Service (NHS) in England with the aim of exploring factors affecting its progression. That was first announced in 2014, as a component of the government's overall health strategy, which they articulated in a publication known as the "*5 year Forward View*" NHS England (2014). That set out the strategic plan for the NHS in England from 2015 to 2020. It was followed by a series of publications that expanded on each policy component and the e-health element of that was articulated in a publication in November 2014, illustrated in Figure 1, Personalised Health and Care 2020 below (National Information Board, 2014):-

Figure 1, Personalised Health and Care 2020
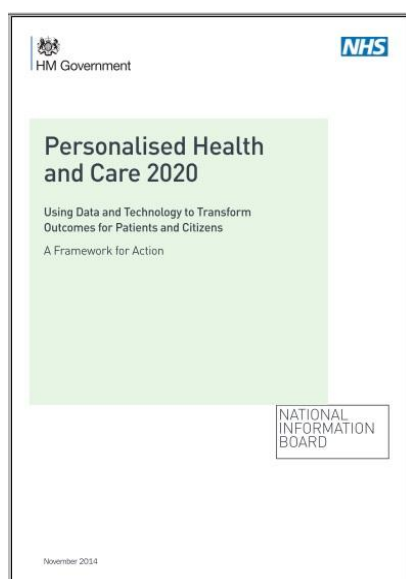
The key *'electronic glue'* theme of the e-Health component set out in the "*5 year Forward View*" was stated as follows (NHS England, 2014) page 32:-

> "*In future we intend to take a different approach. Nationally we will focus on the key systems that provide the 'electronic glue' which enables different parts of the health service to work together. Other systems will be*

for the local NHS to decide upon and procure, provided they meet nationally specified interoperability and data standards."

The implementation approach was amplified in "*Personalised Health and Care 2020*" (National Information Board, 2015a) page 5: -

"Clinical Commissioning Groups will be required to submit their plans - local digital roadmaps - for how their local health and care economies will achieve the ambition of being paper-free at the point of care by 2020".

The above national e-health strategy is not the first. History shows that often one e-health strategy is seen as failing, or too associated with other political ideologies of ousted governments, and is followed by another, and then another, as one fails to deliver desired outcomes often in different ways, or is seeking to deliver politically undesired outcome (Heeks, 2006). This succession is illustrated below:-

Figure 2, NHS e-Health Strategies
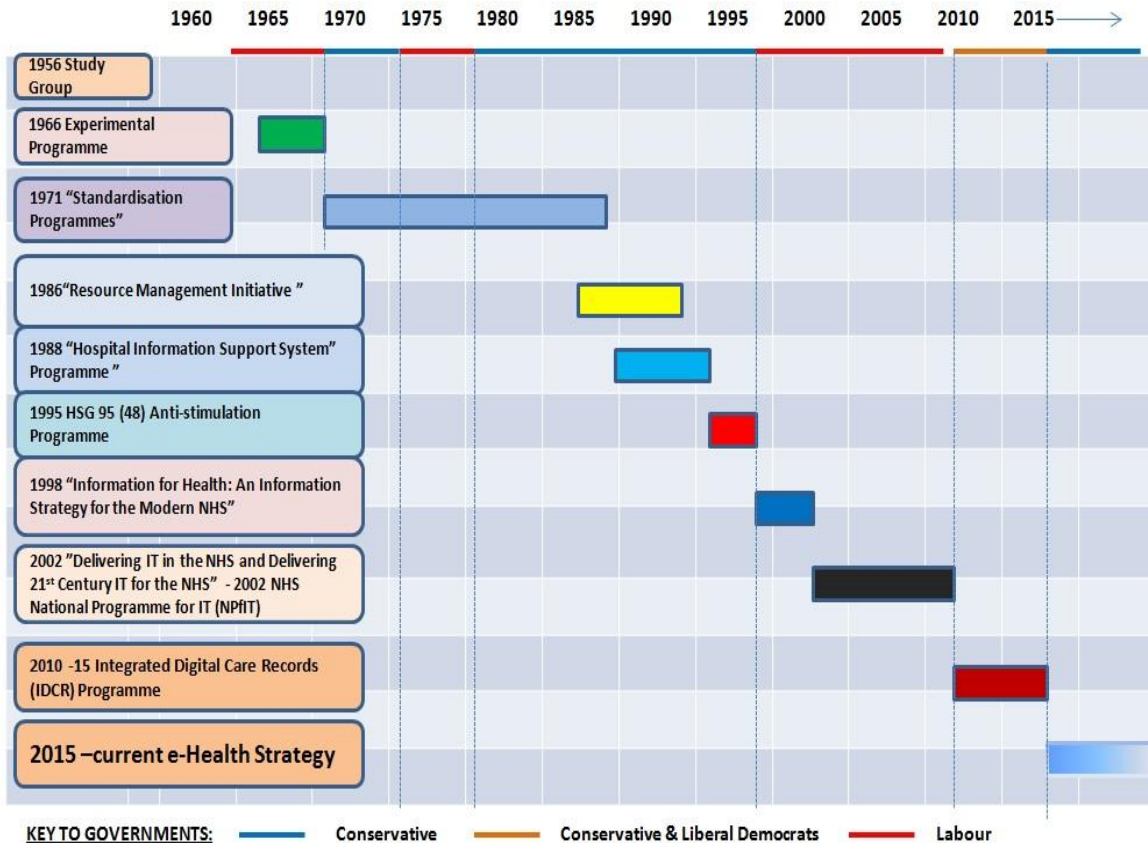
This lists a progression of nine e-health strategies from 1966 after the initial Study Group was set up in 1956 (Richards, 2001), (D. J. Protti, 2002), (Brennan, 2007), (Hayes, 2008), (Department of Health, 2010), (Department of Health, 2011), (Department of Health, 2012) and (NHS England, 2013). That gives an average lifespan of 5.5 years each, with seven being replaced, or initiated, following the election of a different government.

1.2   Research Questions

This research explores *"Factors affecting the progress of the e-health strategy in the NHS in England".* In order to address that, four questions are included:-

Table 1, Research Questions

	Questions
1	Which Information Technology (IT) adoption theories are suitable to inform this research?
2	What factors affect the adoption of other national government e-health strategies?
3	What factors affect the adoption of the e-health strategy in the NHS in England?
4	What insights, experiences and lessons does this research highlight that could be used to inform future plans for the e-Health strategy, and other national strategies in other countries?

1.3   Contribution to Knowledge & Practice

This study fills an important gap in knowledge and practice and also identifies theoretical changes to the socio-technical model. There are a number of studies of the previous e-health strategies in many countries, including in the NHS in England. These include studies by Coiera (2009), Robertson (2010), and latterly (McLoughlin, Garrety, & Wilson, 2017). However, no other academic published peer reviewed studies are available at time of writing which examine factors affecting the strategy. Indeed, there is independent academic recognition that the gap is significant and one which should be filled (Scott, 2015). So this study fills an important gap in knowledge and practice. It identifies factors affecting its progression and proposes a series of "do differently" recommendations which, if adopted, should improve its progression. Also in terms of making a contribution to theory, this research builds on a number of

socio-technical models put forward by other studies and proposes an adapted model that combines elements of previous ones and adds new factors affecting progress and additional "time" and "purpose" dimensions.

1.4   Overview of the Thesis

Chapter 2, Literature Review, begins by conducting a high level exploration of literature relating to IT adoption theories and assesses their suitability to address Research Question 1. It then explores peer reviewed literature relating to other national government e-health strategies to identify factors affecting the adoption of other national government e-Health strategies in order to address Research Question 2. It explores how other academic studies have conceptualised e-health strategies in terms of what "it" is that governments are trying to stimulate the adoption of (the EHRs, infrastructures and associated digital technologies), why they say they are doing that and what factors are affecting their progression. The review shows that there are wide variations in both definitions and socio-technical models used to study e-health strategies.

Chapter 3, Methodology, sets out academic arguments as to why an exploratory socio-technical conceptual model and methodology are deemed to be the most appropriate way to qualitatively study this formative research topic and by doing so address both Research Question 3 and 4.

Having set out the wider field of study for this formative research, Chapter 4, Data Presentation and Analysis, then focusses on the e-health strategy in the NHS in England itself to explore factors that are affecting its adoption. It does so by co-constructing an understanding based on the perceptions of 18 purposively selected "knowledgeable individuals" in 2 sample groups consisting of 8 IT Consultants and 8 Suppliers of EHRs and associated products and services to the NHS in England. Each participant was interviewed to ascertain how they made sense of the strategy. As such this research took a qualitative interpretive research approach with a relativist ontology, where meaning was sought from the experience of the strategy that those participants have had, rather than a single truth in a quantitative, realist sense (Blaikie, 2007). It did so by exploring participants' opinions on whether they felt that the NHS is progressing the strategy, or not, and why they felt that

(Silverman, 2013). The "why" focussed on the factors affecting progress and whether they were acting as barriers or facilitators to gather data needed to answer Research Question 3 and 4. As such this study took an ontological stance that multiple mental constructions and perceptions of reality are possible and, therefore, that there can be several "truths", aka "realities", and that these are influenced by experiences and social interactions of participants. No one mental construction was necessarily seen as more "true" than another. Each participant therefore had their own reality and each was considered to be correct (Saunders, Lewis, & Thornhill, 2012). In that sense this research was emic or *verstehen,* not etic or *erklaren,* research (Stokes, 2011). It investigated how participants perceived and categorized the "world" of the strategy, its meaning for them, how they imagined it was progressing, or not, and how they explained that, focussing on the factors they felt were affecting that progress (Gill and Johnson (2010).

In summary the findings were that all the factors in the version of the socio-technical model at the point it was derived from the Literature Review, bar one, (Medico-legal issues in the Technical Dimension) were identified as relevant by one or more interviewee. Chapter 4, Data Presentation and Analysis, goes into that in more detail and also identifies new factors that emerged, which represents new knowledge, in both the Organisational Dimension and the Macro-environmental & Socio-political Dimension.

Finally Chapter 5, Conclusions & Implications, compares the Literature Review results with the data generated for each of the Research Questions to assess the extent of agreement or disagreement between the two and why. Exploring this topic with "knowledgeable individuals" provided valuable insights into what could be done differently moving forward, by exploring a complex and rich mix of socio-technical factors that are at play during the process of adoption. This addresses Research Question 4 by describing insights, experiences and offering lessons that could be used to inform future plans for the e-Health strategy, and other national strategies in other countries. That "do differently" guidance is also aimed at policy makers and practitioners going forward to improve strategy design and performance, as well as that of other current and future e-health strategies. It also presents a critique of the adopted approach and explores the variation in approaches highlighted by the

Literature Review and that taken here and how that affects the transferability of the findings to other studies. It also sets out a number of limitations of this study, as well as a range of recommendations and implementation plans. That is followed by suggestions about opportunities for further research, as well as publishing plans. Most importantly, it also sets out the perceived contribution to knowledge and practice where a revised socio-technical model is proposed that builds on this research.

So having introduced the thesis, Chapter 2, Literature Review, follows with an exploration of studies of national government e-health strategies and identifies factors affecting their adoption.

2   Literature Review

2.1   Introduction

This chapter describes the results of the Literature Review in detail. The primary aim is to address the first two Research Questions:-

- *Research Question 1: Which Information Technology (IT) adoption theories are suitable to inform this research?*

- *Research Question 2: What factors affect the adoption of other national government e-health strategies?*

It begins with Section 2.2, which defines the scope of the Literature Review within the context of the above questions. Following that, the review then addresses the first question in Section 2.3, IT Adoption Theories. That analyses the results of the search to locate, and assess the suitability of, a number of those theories. Having introduced each in turn, that then sets out arguments in favour of taking an approach based on an interpretative research philosophy and Socio-technical Theory based research strategy to study this topic. Further arguments are set out that are intended to enhance this study by also drawing on some elements of the Diffusion of Innovation Theory, Change Management Theory and Grounded Theory.

That is followed by Section 2.4, Factors Affecting National E-health Strategies, which addresses the second Research Question. It explores several national government e-health strategies, as well as previous ones in the NHS. That review also adds weight to the conclusions of the previous section. It highlights that an interpretative research philosophy and a socio-technical research strategy are frequently adopted to study national e-health strategies. The literature also highlighted that this is an immature field of study in the sense that there is a wide degree of variation in terminology as set out in Section 2.5, Wide Variation with Terminology. That is followed by Section 2.6, Gaps in the Literature, which explains firstly, that there are no peer reviewed academic studies of the e-Health strategy in England and that secondly, previous studies rarely include IT consultants or suppliers in their sample frames. So this study seeks to fill both those gaps in knowledge. Section 2.7,

Rationale for Selection of Key Themes, and subsequent sections, identify a number of prominent themes drawn from the Literature Review. These provide a good indication of a wide range of factors that affect e-health strategies. That review commences with Section 2.8, Overall Strategy, which explores the factors affecting an e-health strategy's conception and construction. Following that, Section 2.9, Stakeholder Engagement, explores various approaches to stakeholder engagement identified in the literature, especially the ways that various strategies address the softer cultural issues and the change management approaches attempted to steer the strategy through those. Section 2.10, Governance and National Resources, then explores governance arrangements to oversee and monitor progress. It also explores various measures to supply resources (manpower and financial) to fuel the engine of the strategy. Finally, Section 2.11 explores implementation approaches and targets designed to deliver the strategies and the chapter ends with Section 2.12, Conclusion, which draws all of the above together and sets the scene for subsequent chapters.

2.2   Scope of the Literature Review

This research is based on a review of academic peer reviewed literature, as well as other sources, such as books, government reports, official communiqués, and web based content, accessed directly, or via the online University of Chester Library Services, as well as those sources accessed directly via internet search engines, such as Google Search and Scholar.

To address Research Question 1, the search strategy aims to identify the various research philosophies and research strategies others use to study factors affecting the adoption of information technology (IT). That includes IT Adoption Theory, Diffusion of Innovation Theory, Change Management Theory, Socio-technical Theory and Grounded Theory. The search strategy to address Research Question 2 focusses on literature that studies national government e-health strategies, what EHRs and associated infrastructures are that they are seeking to promote the adoption of, the conceptualisation of those strategies and the factors affecting their progress. That is supplemented by a content analysis government reports and other publications that indicate their view of what the national e-health strategy in the NHS in England "is".

2.3 IT Adoption Theories

Turning first then to Research Question 1: *"Which Information Technology (IT) adoption theories are suitable to inform this research?"*, a number of potential approaches are reviewed to assess their suitability to study this topic. Those approaches are explored in Section 2.3.1, Technology Adoption Theory; Section 2.3.2, Diffusion of Innovation Theory; Section 2.3.3, Change Management Theory; Sector 2.3.4, Actor Network Theory; Section 2.3.5, Socio-Technical Theory; and Section 2.3.6, Grounded Theory. Finally Section 2.3.7, Conclusion, explains why an interpretative research philosophy, primarily informed by Socio-technical Theory, is considered to be the most appropriate lens through which to conduct this research.

2.3.1 Technology Adoption Theory

Beginning then with Technology Adoption Theory, the literature illustrates that a positivist philosophy is frequently chosen to inform the study of technology adoption at a "micro level", such as an individual user level, team, or group of users or department, or within, say, a single organisation (Blaikie, 2007). A positivist philosophy is considered to be less appropriate here to study this highly complex topic, subject as it is to a multitude of factors, both known and unknown through time that cannot be controlled for. The reasons for that stance are further explained in Section 2.3.5, Socio-Technical Theory. Researchers that adopt Technology Adoption Theory typically develop computer based quantitative models along scientific principles and test the theoretical validity of hypotheses using data that indicates the extent of end user adoption. The aim is usually to identify which variables are statistically significant, or dominant, and reflect "reality" to some degree by modelling or reflecting the adjustment of various variables (such as computer system usage changes) and typically relies heavily on existing constructs and measures (Cresswell, 2009), (Saunders et al., 2012), (Blaikie, 2007), (Gill & Johnson, 2010), (Easterby-Smith, Thorpe, & Jackson, 2012), (Stokes, 2011).

This grouping includes the Theory of Planned Behaviour (TPB), (Ajzen, 1991), and the Technology Acceptance Model (TAM) based on the Theory of Reasoned Action, (Holden, 2010), (Davis Jr, 1986), (Davies, Bagozzi, & Warshaw, 1989) and (Chuttur, 2009). TAM has been expanded to include TAM 2, (Venkatesh & Davis, 2000), and

the Unified Theory of Acceptance and Use of Technology (UTAUT), (V. Venkatesh & Davis, 1996), (Venkatesh et al. 2003) and TAM 3 (Venkatesh & Bala, 2008).

Positivist research into information technology adoption in the health sector typically takes place at a "micro" level within, say, a specific professional group, such as a sample of doctors or nurses, or staff in a clinical department, or looks at the adoption of specific module of an EHR in an professional group or department (Hattona, Schmidtb, & Jelenc, 2012), (Jeongeun & Hyeoun-Ae, 2012). (Wilkins, 2009), for example, uses (TAM) as a theoretical foundation for a quantitative survey based study of 94 health information managers, one per healthcare provider organisation, where some had adopted EHRs and some had not (control group). Like Wilkins (2009), the data collected typically includes end users EHR usage data, patterns and variables that might affect those. However, it is not always used to study adoption at the micro level. One TAM EHR adoption study, across multiple healthcare providers in the greater New York region by Otto (2013) for example, uses a computer based simulation model to assess the potential impact of changes in various factors using secondary and theoretical datasets.

2.3.2   Diffusion of Innovation Theory

There are other studies that adopt a positivist philosophy that also focus on a higher "mid level" such as a whole organisation, but not often nationally. These typically adopt a research strategy based on the Diffusion of Innovation Theory (DOI) (Rogers, 2004), the Technology Adoption Life Cycle Model (TALCM) (Moore, 2014), the Technology, Organization, and Environment (TOE) framework (Tornatzky, Fleischer, Tornatzky, & Fleischer, 1990) and the Technology Assimilation Gap (Fichman & Kemerer, 1999). These are also deemed less appropriate here within the context of the interpretative position being taken.

However, that is not to say Diffusion of Innovation Theory should be rejected out of hand. Some e-health strategy researchers that adopt an interpretative research philosophy have found this to be a useful framework to draw on to inform their studies. So for example, a qualitative study of national e-health strategies by Greenhalgh (2013) draws on elements of the Diffusion of Innovation Theory, within the context of a socio-technical framework, to illustrate the diffusion nature of the

process and the influence of the passage of time on factors affecting its progress. The study concludes those factors vary and are influenced by which diffusion stage the strategy has reached at the time. Different factors may vary in their presence and strength of effect on the strategy's progress as it moves though various stages in its lifecycle. In fact this researcher sees merit in exploring factors affecting adoption through time and draws on the work by Greenhalgh (2013) and others to inform the develop of the initial model set out in Section 2.8, Overall Strategy. That also influences the conclusions drawn and the final proposed model set out in Section 5.10, Contribution to Knowledge & Practice.

2.3.3 Change Management Theory

Some e-health strategy research is also informed by elements of Change Management Theory in the interpretative research tradition to support their studies. These typically conceptualise initiatives, such as e-health strategies, as change management agents whose supporters believe will be beneficial once deployed correctly (By, 2005). They typically postulate that, by following a series of "correct" processional change management steps, a desired outcome is more likely to be achieved (Barnard & Stoll, 2010). Or they seek to explain why a desired outcome was not achieved, because these steps were not correctly followed. Research typically examines how to make a change happen and the factors that may affect the rate of progress, or analyses why change did, or did not, happen as planned.

EHR implementation is typically also conceptualised in these studies as affected by a mix of interacting variables that are either barriers or facilitators that affect how successful, or not, the change is (Filipova, 2013), (Ajami & Bagheri-Tadi, 2013), (McGinn et al., 2011) and (Holden, 2011). A typical research topic might explore how an EHR can improve the delivery of health care and sustain that improvement. These EHR studies typically focus on the mid, organisational as opposed to macro level, (a single hospital, or sometimes several), but they are generally qualitative and built on an interpretative philosophy with results sometimes presented as EHR case studies (Amirhossein Takian, Sheikh, & Barber, 2012) (Wang, Wongsuphasawat, Plaisant, & Shneiderman, 2011). Research in this area has shown that a successful outcome is not guaranteed, even if best practice change management approaches

are adopted, indicating that other unidentified factors are at play (Greenhalgh, 2009), (Clegg et al., 2011).

However, as previously stated above in relation to Diffusion of Innovation Theory, the researcher takes the view that drawing on elements of Change Management Theory adds value to this study. Indeed there are studies in the post 2009 e-health strategy literature that are informed by elements of Change Management Theory to illustrate the typical lifecycle of such strategies (Cresswell, 2013), (Murray, 2011). The four stage Technology Lifecycle Model put forward by Cresswell (2013) is illustrated below for example:-

Figure 3, Technology Lifecycle Model

1. Establishing the need for change

2. Selecting an approach

3. Implementation planning

4. Implementation, Maintenance & Evaluation

Informed by Cresswell (2013)
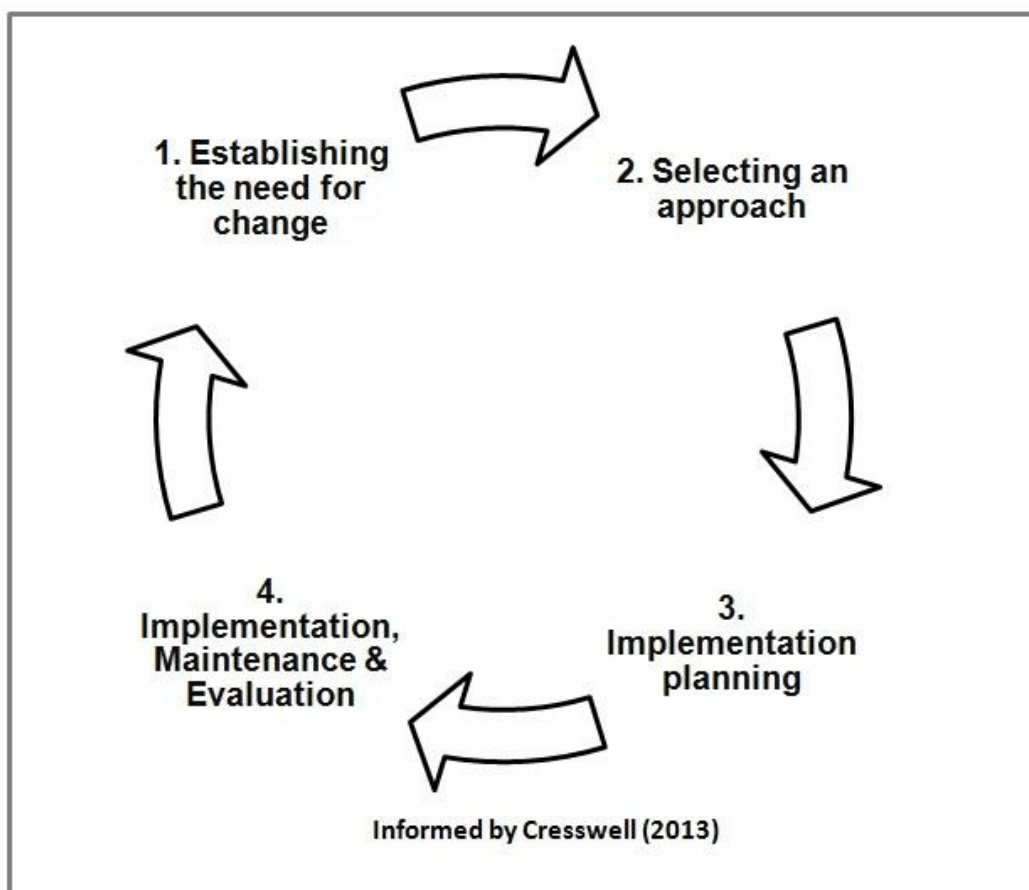
An adapted version of the above model informed the development of **Error! Reference source not found.** in Section 2.8, Overall Strategy. That also provides a "discussion framework" for interviewees during the data collection process. It also supports an exploration of   the influence of the passage of time on factors affecting

its progress. That in turn feeds into the development of Chapter 5, Conclusions and Implications, especially Section 5.10, Contribution to Knowledge & Practice.

2.3.4 Actor Network Theory

Some researchers that adopt an interpretative philosophy explore socio-technical change and study EHR adoption through the lens of Actor Network Theory (ANT). Applications of ANT can include the study of process improvement initiatives at a local organisational level among, say, a clinical team, or department such as Pathology (Papadopoulos, 2011). The actors in the network are typically conceptualised as people, processes, ideas, concepts, money, documents and the systems and associated infrastructures. An example of an EHR related network is shown below (Cresswell, 2010):-

Figure 4, EHR ANT Network
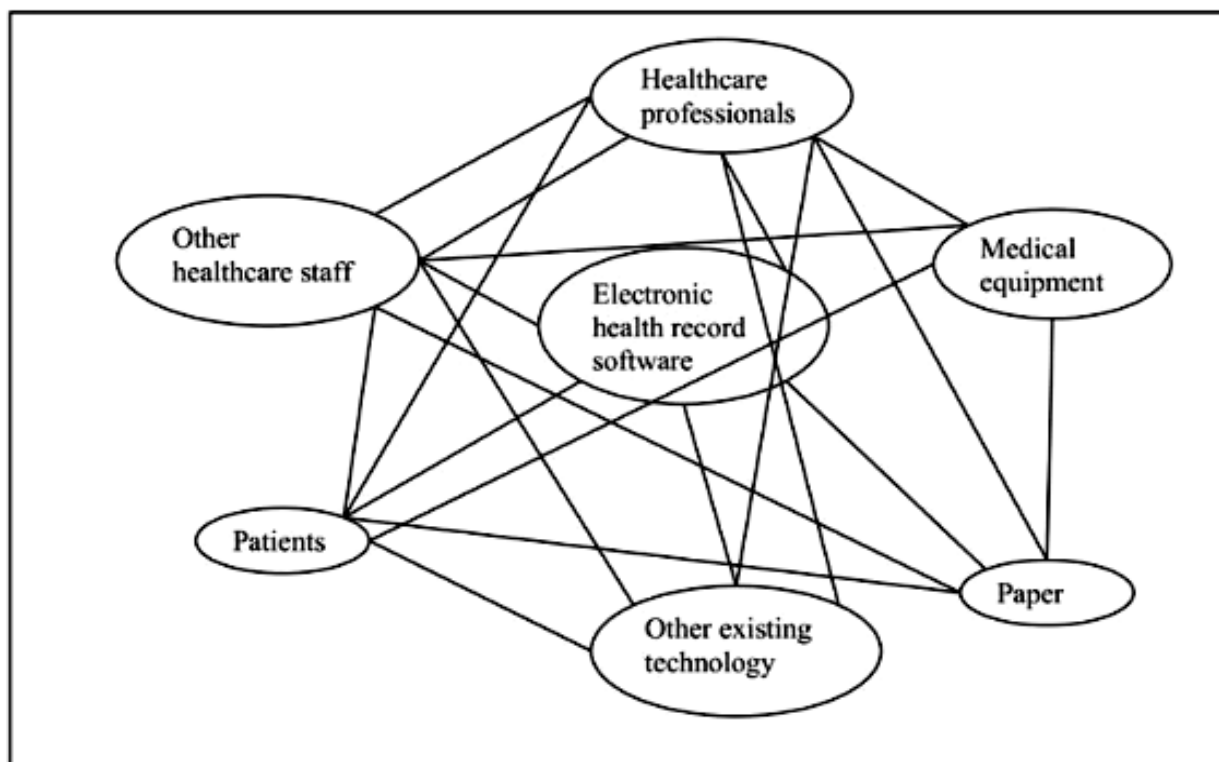
ANT can also be combined with the Lean process improvement methodology (D'Andreamatteo, 2015), (Lawal, 2014), and to study EHR implementation at a hospital level (Cucciniello, 2015). Some studies use ANT to explore changing power

relationships due to both healthcare reforms and IT introduction according to Cresswell, (2010) who cites an example of Lowe, (2001). Lowe draws on ANT to explore accounting system changes in a large regional hospital resulting from national government health sector reforms in New Zealand. However, no studies were located that use ANT to study national IT strategies in other sectors, or national e-health strategies. So whilst recognising that future studies may explore their subject through ANT a choice is made not to use it here and arguments in favour of the chosen approach follows.

2.3.5 Socio-Technical Theory

Socio-technical Theory falls with the interpretative research philosophy and is typically used by researchers to conduct studies at the mid and macro level to study complex environments (Emery & Trist, 1960), (Ropohl, 1999). It was first used in the context of coal industry labour studies by the Tavistock Institute in London in the 1950's in an attempt to understand why miners' sickness absence was high and productivity was failing to improve, despite significant investment in new, more advanced, machinery (the technical dimension) that should have resulted in increased output (Emery & Trist, 1960), (Ropohl). Since then it has also been used to understand why IT strategies and their underlying programmes with sound business cases, adequate resources, and good project management processes, often fail to fulfil their promise even when the software had been successfully deployed elsewhere (Mumford, 1995a).

Like this researcher, those who adopt a Socio-technical Theory perspective to research e-health strategies, believe that the technical dimension at the core, (the systems, tools, infrastructures and technologies that support and enable work processes), needs to be considered within the context of a wider social system. That is typically classified into human, social, organisational, macro-environmental and wider socio-political dimensions. They are affected by known and unknown factors (aka barriers and facilitators) that have been repeatedly found in the literature to be important determinants of progress and outcomes. Several e-health strategy studies publish details of their socio-technical models which are typically illustrated as onion layers, or concentric circles, of dimensions (Cresswell, 2009), (Rozenblum, 2011),

(Zimlichman, 2012), and (Zinszer, 2012). An example of one by Cresswell (2009) is shown below:-

Figure 5, Socio-technical environmental dimensions based model
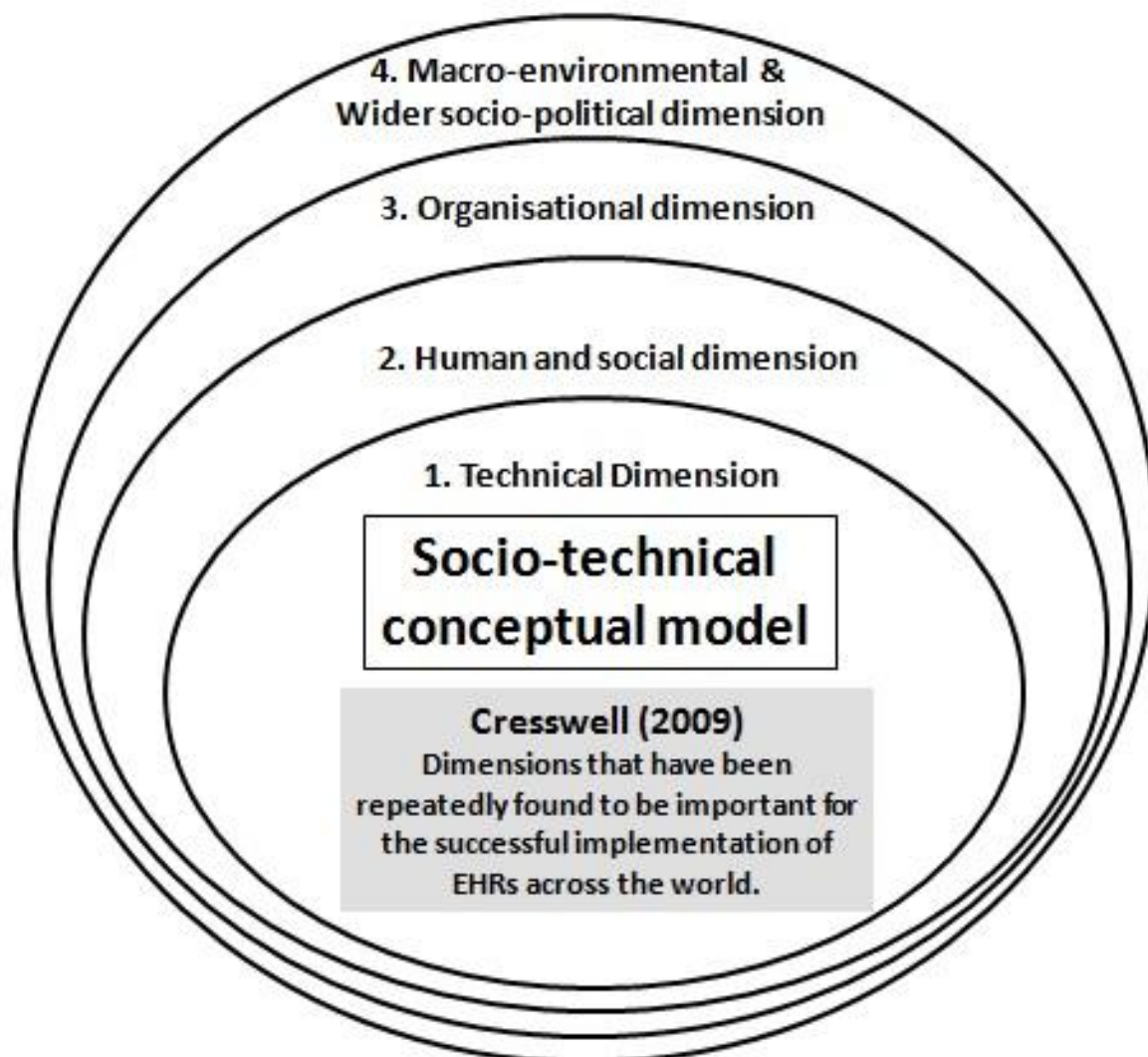
These studies typically conclude that successful adoption depends on recognition of, and successful navigation through, not just the technical, but also all those other dimensions too, (Bowden & Coiera, 2013), (Takian et al, 2012), (Hillestad et al, 2005). These dimensions are seen as collectively forming a single highly complex system that interacts with each other in a myriad of ways over time. They are not seen as independent, sequential or hierarchical, but rather as interdependent and inter-related concepts similar to compositions of other complex adaptive systems (Sittig & Singh, 2010).

To facilitate change, such as via an e-Health strategy, proponents of the socio-technical approach, including this researcher, believe that they operate in complex environments and, as such, those "change agents" within the strategy need to be designed to take all those dimensions into account in a way that one positively supports the others. By doing so this should improve the chances of achieving the desired strategic outcomes. Focussing too much on one dimension alone is likely to be sub-optimal, waste time and resources and will almost always fail to deliver the full benefits, (Clegg et al., 2011), (Mumford, 1995a). So the way in which these dimensions interact through time is a key determinant of a strategy's outcome, and the way in which each dimension's variable factors interact over time takes place across porous boundaries in a highly unpredictable and complex way.

For example, the outcome can be even more unpredictable because an e-health strategy can also be interpreted differently by various stakeholders. To illustrate, some doctors may view a government e-Health strategy as a very unwelcome change that they perceive will fundamentally change their working practices for the worse, (a threat to the long established moral order where they are custodian and gatekeepers of data held within EHRs), so they may not support it. Whereas other stakeholders, such as patients, suppliers, management and government may perceive it as highly beneficial, believing that investment in EHRs should improve the overall productivity, effectiveness and efficiency of the health sector (McLoughlin, 2017).

Those researchers, and this researcher, take a position that national e-health strategies, and the environments in which they exist, are far too complex to identify which variables are statistically significant, or dominant, in a positivist sense. For example, several studies of NPfIT conclude that it should have been successful given that a record sum of over £9.8 billion of national government funding had been invested in its deployment, but it failed due to local cultural rejection of nationally imposed "top down" EHR solutions and due to the failure of suppliers to deliver reliable EHR solutions to specification, with timescales and to budget ((House of Commons Committee of Public Accounts, 2013), (Waterson, 2014). Similarly, the Dutch n-EPR strategy should also have been as successful as the very similar strategies in Scotland, Wales and Northern Ireland that deployed similar technical

solution sets, but fell short due to doctors' concerns over "medico-legal issues", indicating complex and deeper cultural concerns (Zwaanswijk, 2013).

Adopting an interpretative philosophy and within that, a socio-technical approach, seems to be the dominant approach among academic researchers to study factors affecting national e-health strategies. A total of 21 out of 22 post 2009 e-health strategy studies reviewed adopt an interpretative philosophy and, of those, 18 took a socio-technical approach with six of those also being informed by modified elements of Grounded Theory principles of coding and theme abstraction. All but one of those studies, (Otto, 2013), adopt an interpretative research philosophy Further details can be found in Appendix 1, Methodologies Used to Study e-Health Strategies. All studies, including Bowden (2013), conclude that technical factors are typically the least challenging and that the majority of barriers to progress reside within higher level factors which the studies typically classify within human, social, organisational and macro-environmental dimensions. Boonstra, (2010), Takian, (2012) and Cresswell, (2013), also draw on elements of Change Management Theory to develop a range of facilitators that could be deployed to stimulate progress as time progresses and the e-health strategy processes through its lifecycle. Similarly, Cresswell, (2013), also draws on elements of a Technology Adoption Theory, specifically on elements of a Technology Lifecycle approach, to highlight key considerations that are time dependent during the lifecycle of a strategy, For example: establishing the need for change, selecting a system, implementation planning, and maintenance and evaluation. Finally, Greenhalgh, (2013), draws on elements of the Diffusion of Innovation Theory to illustrate the influence of the passage of time. As introduced briefly in the Abstract and amplified in Section 5.10.3, The Addition of "Passage of Time" & "Purpose" Dimensions, these studies especially inform the development of a significant additional contribution in the form of a new e-Health Strategy Combined Socio-technical and Lifecycle Model to reflect "Lifecycle" and also "Purpose" drawing on elements of both Change Management Theory and Technology Lifecycle Theory.

2.3.6 Grounded Theory

The researcher took the view that, as this is a constructivist study, it should commence with a neutral model informed by similar studies and develop a proposition based model informed by the collected data. In that sense, like Robertson, (2010), Rozenblum, (2011) and Salzberg, (2012), this study is informed by elements of Grounded Theory where the researcher draws back from making propositions then, through an abductive process, ascertains whether the data provides supporting evidence for a new proposition or not (Saunders et al., 2012), (Silverman, 2013).

The argument for adopting a research strategy that begins with a neutral socio-technical model, which draws on elements of Grounded Theory to set a "direction of travel", is that it reduces the risk of contamination by preconceived ideas and theoretical preconceptions. This research seeks to determine which dimensions and factors within those are more or less relevant (as in affecting adoption rates), and in what way, and why, as those emerge from the data analysis process (*Research Question 3*), and use that to generate insights that could be transferable to others (*Research Question 4*), (Blumer, 1954), (Morse, 1994), as seen in Gill & Johnson (2010). The alternative choice, proposition based socio-technical models, on the other hand, are deductive and typically seek to preconceive a degree of theoretical explanation, or dimensional, or "purpose", dominance. They do so usually by giving weight to one or more of the dimensions that make up the model and, or, the attributed weight to some of the factors that make up that model based on their relative strength as a factor influencing progression. These are typically refined in the light of data analysis. Socio-technical examples include Coiera's (2009), "Power Source" proposition model ("Top Down", "Middle Out" and "Bottom Up") and Eason's (2013), "Technical Coupling Model" as shown below:-

Figure 6, Eason's Technical Coupling Model

Nature of Coupling	Technical Strategy	Description	Range and Scope	Examples
Tight	Comprehensive, shared database systems	All patient data is held on a single database	Wide scope, large user population	NPfIT DCRS (England)
	Summary care records	A sub-set of patient Information is shared by many healthcare agencies	Limited data widely shared	NPfIT SCR (England)
	Process support systems	A limited set of data is transferable from one local system to another	Limited data locally shared	1. E-Prescription 2. Test results
Loose	Portals	Web based system that provides access to a range of databases	Wide scope, large user population	1. The Welsh Portal 2. P-CEHR (Australia) 3. FUSION (Walsall, UK)

2.3.7 Conclusion

So in relation to Research Question 1*: "Which Information Technology (IT) adoption theories are suitable to inform this research?",* the literature strongly indicates, and this researcher concurs, that the adoption of an interpretative research philosophy and a research strategy based on Socio-technical Theory is an appropriate way to address the study of national e-health strategies. It also provides support that that can be supplemented by drawing on elements of Diffusion of Innovation Theory, Change Management Theory and Grounded Theory. Further expansion of that argument can be found in Chapter 3, Methodology.

2.4   Factors Affecting National E-health Strategies

Turning to Research Question 2, "What factors affect the adoption of other national government e-health strategies?", out of a total of 1,342 peer reviewed studies of EHR adoption identified during the search, the vast majority of those (997) focus their attention on EHR adoption within specific healthcare provider organisations and, or, among professional groups, such as doctors within those organisations, and so are classified as less relevant to inform this macro level national topic. Of the remaining 345, a further 306 conduct research into local EHR adoption across multiple organisations in, say, a smaller geographical area, but not within the context of a national e-health strategy. So again these were classified as less relevant. Both groups of studies do provide some useful background evidence though on local factors and several are referenced appropriately in the literature review. Out of the remaining 39 studies found that specifically examine national government e-Health strategies, including the factors affecting their progression, those published prior to 2009 (17) are classified as less relevant as they represent less current knowledge, but some are referenced as appropriate to, for example, illustrate the history of national e-health strategies. The decision to cut off at 2009 is a subjective assessment based initially on an assumption that pre-2009 studies are less up to date and may not reflect the capability of more recent information technology system, solutions and services (all of which continue to evolve rapidly). The remaining 22 studies, which are described here on in as core studies, are sourced from a number of reputable journals and recently published (2009 onwards). So they are more likely to represent recent knowledge of factors affecting e-health strategy progression. During later stages of the research additional studies published mainly between 2016 and 2018 are also reviewed.

The core studies are systematically reviewed in two Microsoft Excel spreadsheets to identify a range of data elements to inform this review. The first spreadsheet format collects information on a range of characteristics of the studies as illustrated in the following table:-

Table 2, Systematic Literature Review Data Extraction Grid Format

Systematic Review	Year	Key Findings	Research Philosophy	Countries studied, + selection criteria	EHR described as:	E-Health Strategy described as	Type of E-Health strategy	Method used
Study 1								
Study 2 etc								

Systematic Review	Barriers Facilitators described as:	Why have a E-Health Strategy	Benefits	Stimulants used	Objectives, Topic, focus, questions	Study design	Data collection methods
Study 1							
Study 2 etc							

Systematic Review	Study Participants	Selection approaches
Study 1		
Study 2 etc		

A further Microsoft Excel "Data Extraction Grid" framework spreadsheet is used to systematically analyse national e-health strategy literature using top down deductive socio-technical (Bowden & Coiera, 2013) coding to assess which factors affect the adoption of other national government e-Health strategies (Gale, Heath, Cameron, Rashid, & Redwood, 2013), (Bryman & Bell, 2015), (Silverman, 2013), (Saunders et al, 2012) and (Savin-Baden & Major, 2013). The grid's development is especially informed by post 2009 e-health strategy studies which include sufficient factor level details of the socio-technical models and grids they use, including Boonstra (2010), Cresswell (2012), Robertson (2010), Sheikh (2011), Cresswell (2013), McGinn (2012), Deutsch (2010)   , Zimlichman (2012), McGinn (2011), Greenhalgh (2013), Zimlichman (2012), and Deutsch (2010). Factors affecting progress contained in each study are copied into a Microsoft Excel Spreadsheet to generate a new comprehensive list. These are then visually cross mapped, and, where possible, matched with identically described and similar elements (iteratively) to inform the development of a new socio-technical model. Note that no detailed definitions behind many of the terms are available in those studies, so assumptions are made that the meaning implied by the author is similar across studies. The majority of studies adopt a conceptual model with a technical dimension at the core, with human, social, organisational, macro-environmental and wider socio-political dimensional levels emanating out from that core. An example of a divergent model is found in Boonstra (2010) which adopts the commonly used technical, social and organisational

dimensions, but diverges to include financial, time, psychological and legal dimensions. This study samples the views of physicians working inside hospitals, so perhaps the data reflects that context, or the questions asked do not seek to explore the macro-environment as much. A comparison with other studies shows that each of Boonstra's (2010) different dimensions are typically sub-dimensions within the human, social, organisational, macro-environmental and wider socio-political dimensional levels used by others.   For example, Boonstra's (2010) "Finance" dimension is subsumed, albeit usually with a different label of "cost", within the organisational dimension adopted by others (Sheikh, 2011), (Cresswell, Bates, & Sheikh, 2013), and (McGinn et al., 2011). As another example of variation is Robertson (2010), who includes 11 factors within the Technical dimension, whereas Sheikh (2011) includes four, of which three are common to both (system usability, performance and adaptability) and one (cost) is absent from Robertson (2012). So Robertson (2012) includes eight factors within Technical that are absent from Sheikh (2011).

Like the model, the Grid consists of the Technical, Human and Social, Organisational and Marco-environmental dimensions and factors affecting those within each. This grid supports the data analysis process throughout, not just during the literature review, but also during the analysis of the data gleaned from the interview transcripts when it, and they, are imported into NVivo 11 (a CAQDAS package).   This framework evolves as the study progresses as additional information on factors affecting progress emerge. Its development is illustrated in Figure 7, Differences in Socio-Technical Data Extraction Grids, below:-

Figure 7, Differences in Socio-Technical Data Extraction Grids

Data Extraction Grids in Literature analysed to inform development of the initial grid used during Literature Review informed by (Salzberg., 2012), (Boostra, 2010), (Cresswell, 2012), (Cresswell, 2013), (Robertson., 2010), (Sheikh, 2011a), (McGinn, 2010), (McGinn, 2011), (McGinn, 2012), (Deutsch, 2010), (Zimlichman., 2012), (Greenhalgh, 2013), and (Rozenblum, 2011).

Data Extraction Grid
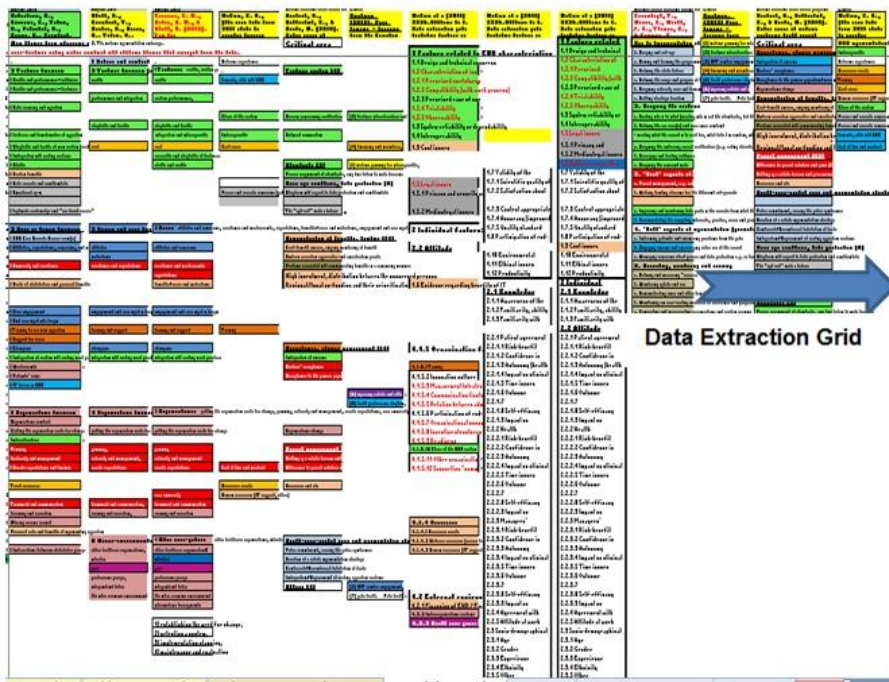
Socio-technical model
1.0 Technical Dimension
1.01. Technical architecture
1.02. Technical infrastructure
1.03. Choice of EHR system - best of breed v modular, on-site v off-site
1.04. Data cleansing and migration
1.05. Software usability, reliability, integration, stability and performance
1.06. Hardware usability, reliability, availability, integration, stability and performance
1.07. Complexity, limitations, features and functionalities of application
1.08. Adaptability and flexibility of new system (customisability)
1.09. Data quality - accuracy and completeness
1.10. Integration and interoperability with existing systems
1.11. Data protection, security and confidentiality
1.12. Patient privacy and security ~"opt-out" model
1.13. Legitimate relationships and "role based access"
1.14. Medico-legal issues
2.0 Human & Cultural Dimension
2.1. Presence and influence of ~champions~
2.2. Cultural attitudes, expectations, concerns, and motivations - Motivation, inertia, readiness to use EHR resistance to use the EHR
2.3. Engagement and user input in design.
2.4. Training and support, e.g. computer skills of end users.
2.5. IT professionals - skills, competencies, regulation, attitiudes
2.6. User ownership, resistance and expectations.
2.7. Integration with existing work practices.
3.0 Organisational Dimension
3.01. Organisational context, size and type
3.02. Getting the organisation ready for change and driving it through (innovation culture, organisational support).
3.03. Decision making and governance structure.
3.04. Perceived risks and benefits of implementing EHRs.
3.05. Business case, Return on Investment (ROI), Cost-benefit analysis (Start-up costs, Ongoing costs). Productivity.
3.06. Resources, local Incentives, targets, Financial & human resource.
3.07. Teamwork and Communication, (included promotional activities)
3.08. Planning.
3.09. Leadership, management, project management
3.10. Time~ Realistic expectations and timelines
3.11. Learning and evaluation.
3.12. Sharing lessons learned.
4.0. Macro-environmental & Socio-economic Dimension
4.1. The wider economic environment & pressures, including the nature and pace of health and social care sector organisational changes and initiatives
4.2. International developments.
4.3. Policy - Govt Political commitment to Health-policy, National EHR ASP Strategy within context of Health Policy. including the nature and pace of health and social care sector organisational changes
4.4. Overall EHR Strategy - EHR ASP National Policy, Strategy and Vision
4.5. National Governance, Leadership and National Resourcing.
4.6. Implementation Approach and Targets (Contracts - National EHR ASP delivery model).
4.7. National Incentives, targets, financial resources .
4.8. National interoperability standards and infrastructure, common systems, WAN.
4.10. Stakeholder Engagement.
4.11 National Cyber Security

The colour coded columns illustrate the list of dimensions and factors found within each study that provide a basis for, and influence the progress of, the e-health strategies they study. These are subjectively mapped across (based on the

judgement of the researcher) to form the socio-technical model used here, as illustrated on the right above.

This new model comprehensively brings together all of the factors found within those studies into one and proved to be a robust method of collating the data to inform the Literature Review. It is illustrated in Figure 8, Socio-Technical Model Derived from the Literature Review:-.

 Figure 8, Socio-Technical Model Derived from the Literature Review

Factors affecting progress found during the Literature Review
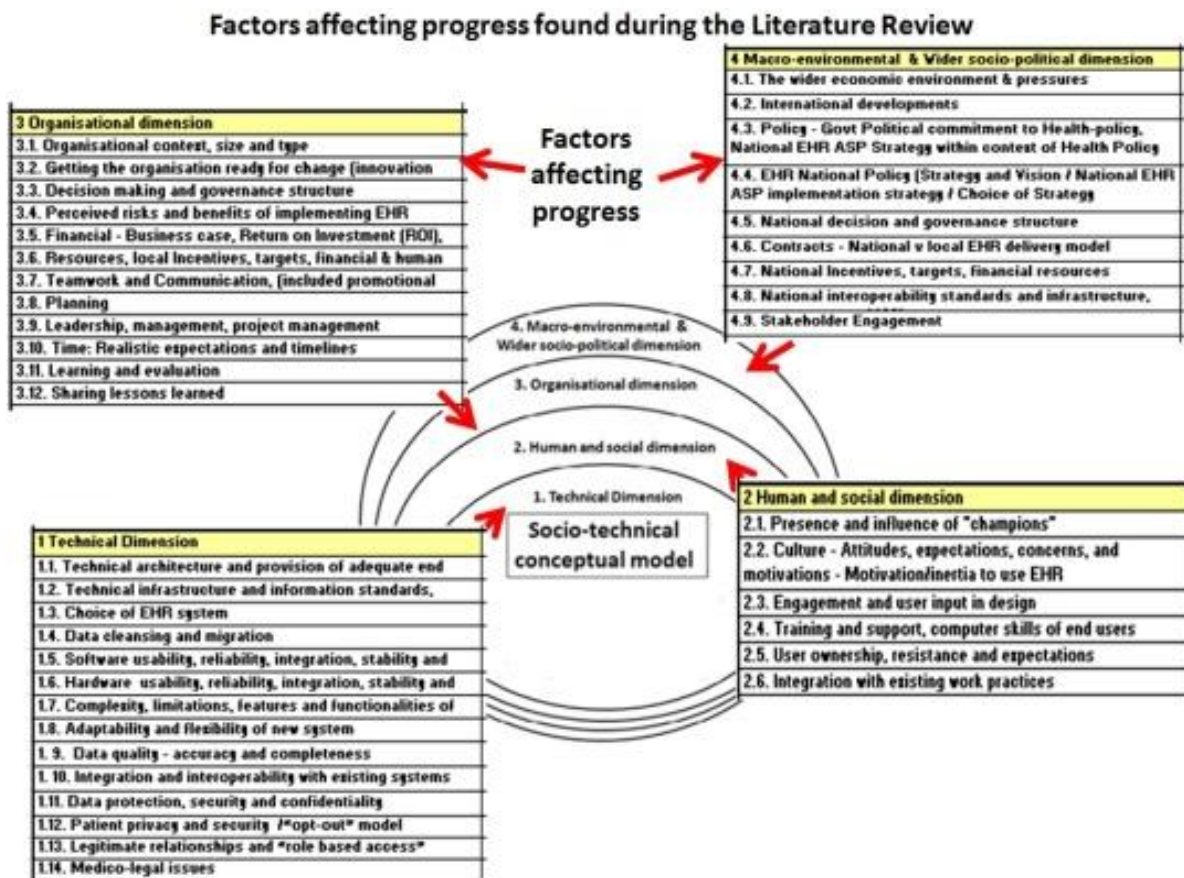
The new model is then used to analysis factors affecting e-health strategies as illustrated in the figure below:-

Figure 9, Literature Review Data Extraction Grid

In the representation of the Grid shown above, the shaded intersection cells indicate where that study contains references to each factor. In the actual spreadsheet itself the shaded cells contain data (copy and paste text relating to that factor extracted from each study). That process is undertaken in full recognition that firstly, socio-technical dimensions and sub-dimension labelling and boundaries are subjective and open to variation and interpretation. Secondly, the process of allocation of factors to cells is subjective and also open to alternate interpretation. The review is supplemented by other relevant studies that came to light as the research progressed (Heimly, Grimsmo, & Faxvaag, 2011), (Amirhossein. Takian, Petrakaki, Cornford, Sheikh, & Barber, 2012), (Eason & Waterson, 2013) and more recent academic studies of national e-health strategies (Essén et al., 2017), (McLoughlin et al., 2017). The following table shows a count of the factors (data items) found in the reviewed studies with most relating to the organisation and technical dimension:-

Table 3, Data Extraction Grid Summary

Factors found in the literature by Data Extraction Grid Socio-technical dimension	Total data items
1 Technical Dimension	140
2 Human and social dimension	104
3 Organisational dimension	153
4 Macro-environmental & Wider socio-political dimension	116
TOTAL	**513**

To draw a conclusion that a ranking of importance is implied by the above table is not necessarily safe, e.g. that the organisational dimension is more important than the others because more mentions of factors relating to that occur more frequently in the studies. Organisational related factors may be viewed as the most important from one person's perspective, but others may disagree. The view is taken here that each cannot be counted or weighed objectively.

An observation, indicated by the above analysis is that the literature yields adequate data on the factors affecting the adoption of other e-health strategies and further discussion on those can be found in subsequent key themes sections of the Literature Review commencing with Section 2.8, Overall Strategy.

The core literature also has a broad geographical range across 12 countries, with 13 studies collecting and comparing data on factors affecting e-health strategies from more than one country. A total of five European countries are covered with 19 studies of the UK and one each for Denmark, Holland, Switzerland and Germany. Of the 19 UK studies, 12 relate to England, three to Scotland, two to Wales and two to Northern Ireland. There are 15 studies that cover North America with eight studies of the USA and seven in Canada. Also Australia in New Zealand are included in six studies, four for Australia and two for New Zealand. Of those, 8 studies focussed on one country, the rest did not. Further details can be found in Appendix 2, Countries in Scope of Previous Studies.

2.5   Wide Variation with Terminology

A further observation is that there does not appear to be a commonly accepted set of terminology used to describe and name the subject matter, such as "national e-health strategies", "EHRs" and associated "infrastructures" that national e-health strategies are typically seeking to promote the adoption of, or the "factors" that promote (act as facilitators) or inhibit (act as barriers) the progression of national e-health strategies. In light of that a decision is made to adopt an inclusive approach during the literature review, and to assume that the various naming conventions are essentially describing the same subjects. To illustrate, e-health strategies, are also described as healthcare strategies, nation-scale health IT,   health information technology strategies (Bowden & Coiera, 2013); mega-programmes (Cresswell, 2009), national EHR strategies, (Deutsch, Duftschmid, & Dorda, 2010); e-health initiatives, (Murray, 2011); policy interventions, interventions for improved adoption (Otto, 2013), e-health strategies, e-health plans, (Rozenblum et al., 2011), national policy initiatives, (Salzberg et al., 2012),   national n-EPR Programmes (Zwaanswijk et al., 2013) and as national experiments (Scott, 2015).

There are wide variations in the terminology used to describe "EHRs" and associated "infrastructures" that national e-health strategies are typically seeking to promote the adoption of. In summary, across the core studies, there are 36 different ways of naming an EHR. "EHR" is used in 14 studies including (Bowden & Coiera, 2013), and Deutsch (2010). Next, "Health Information Technology" (HIT) is used in seven papers, including Cresswell (2013), Salzberg (2012) and Zinzer (2013). Others include "Electronic Patient Record" (EPR), (Greenhalgh, 2009), (Zwaanswijk, 2013) and "Electronic Medical Record" (EMR), (Boonstra, 2010). A subjective decision is made by the researcher to refer to such technologies here using the most prevalent label of "Electronic Health Records" (EHRs).

Moving on now to factors that promote (act as facilitators) or inhibit (act as barriers) the progression of national e-health strategies, it also became apparent that there are a range of terms used to describe those too. In summary these include "barriers and facilitators" (Salzberg et al., 2012), "factors" (Waterson, Hoonakker, & Carayon, 2013), "barrier-related interventions" (Boonstra & Broekhuis, 2010), and "challenges

and successes" (Zinszer, 2013).   Further details can be found in Appendix 3, Terminology Variations.

2.6   Gaps in the Literature

The literature review also identifies two main gaps. Firstly, the most immediately apparent gap is that, despite calls for research to be undertaken (Scott, 2015), no peer reviewed papers have been published to date into the e-Health Strategy. One hospital level case study (presented as a Conference Paper) does explore the general theme of clinician 'engagement' with one hospital's strategic plan to deliver the aims of the e-health strategy and become "paperless" by 2020, namely the digitisation of their health records (Gimba, 2016). However, it does so only at a local, as opposed to national level at the beginning of the strategy. In fact studies into one of the previous "top down" e-Health strategies in the NHS in England, NPfIT, and why elements of it failed, are still being published   (McLoughlin et al., 2017), (Moghaddasi, 2017).

Secondly, the literature review shows that prior research rarely includes suppliers or IT consultants in their sample frames. Of the 22 core studies, for example, only two state that they collected data from suppliers (Salzberg, 2012), (Greenhalgh, 2013). Neither study isolates data in relation to suppliers from other sample groups. They generalise their findings, which makes direct, precise comparisons with this study impossible. One study by Cresswell (2015), does sample supplier perspectives of implementing EHR Order Entry (one of many EHR functions) in English hospitals during the predecessor to the e-health strategy, the Integrated Digital Care Records (IDCR) Programme. However it does not do this at an overall national strategy level. No studies state that they include IT Consultants as a discreet independent sample group. So, as will be explained further in Chapter 3, Methodology, this research seeks to contribute towards filling those gaps and provides further arguments in favour of that in Section 3.5.9, Justification for the Selection of Supplier and IT Consultants.

All of the above form part of the analysis process, and, through a process of several iterations, led to the development of a number of key themes which are explored further in the following sections.

2.7 Rationale for Selection of Key Themes

Whilst a fully comprehensive description and analysis of all factors affecting e-health strategy progression in the literature is out of scope of this research, an illustrative thematic selection of evidence is included in the sections that follow. The rationale for the selection is based on an interpretation of themes found in the literature that appear to be the most influential (the most significant determinants of an e-health strategy's adoption rates in terms of their impact or weighting, either as barriers or facilitators). Whilst that selection is informed by the systematic review of the core studies, it is recognised that as this is an interpretative study, there is a subjective element to that selection. Those in turn informed the development of the socio-technical model. All of the main themes form part of the high level macro-environmental dimension of the model as shown below in Table 4, Scope of Key Themes:-

Table 4, Scope of Key Themes

Scope of Key Themes	Factors
Overall Strategy	Wider economic environment & pressures International developments Govt Policy e-Health strategy
Governance and National Resources	National decision and governance structure National Incentives, targets, financial resources
Implementation Approach and Targets	Implementation approach and targets National interoperability standards and infrastructure
Stakeholder Engagement	Stakeholder engagement especially to address the softer cultural aspects.

There are a number of other lower level factors in the organisational, human and social and technical dimensions of the socio-technical model that are not headlined here as key themes. The rationale for that is that the macro-environmental level of the chosen themes is a more appropriate entry point for this national level exploration. The framing of that exploration draws on Technology Lifecycle Theory in a similar way to Cresswell (2013), Robertson (2010), Rozenblum (2011), Salzberg (2012), Zimlichman (2012), Zinszer (2013) and Zwaanswijk (2013). As high level entry points, they are best placed to illustrate the complex interplay of factors affecting e-Health strategies and how those can change through time as the strategy processes through its finite lifecycle. That complex interplay, in turn, influences the choice of research philosophy and strategy to study the complex environment in

which they exist, as set out in Chapter, 3, Methodology. Each of the themes also directly influences decisions around topic selection, content and the design of the data collection instrument, which is described in Section 3.5.7, Research Instrument Design. The chosen interview topics and questions directly reflect the key themes of the literature review. These themes also inform the discussions in Chapter 5, Conclusions and Implications, and directly influence the development of a proposed new e-health Strategy Lifecycle Model as set out in Section 5.10, Contribution to Knowledge & Practice, .

2.8 Overall Strategy

The exploration begins by looking at factors that can affect the conception of the overall strategy. It does so by focussing on three elements consistently found in the literature to be key determinants of a strategy's construction: [1] the range of stimulants that governments are frequently subjected to that lead to their perception that a national e-health strategy is required (leading to its conception at the start of its lifecycle); [2] the factors affecting the selection of a strategic approach from the many variations that are possible; and [3] the selection of a technical solution set from several available to deliver that approach. The above is described more fully below beginning with factors that are frequently found to establish the need for change, followed by those that influence the selection of an approach and the technical solution set the e-health strategy is seeking to promote the adoption of.

2.8.1 Stimulants on Governments

Governments in many westernised developed countries, like England, have strategies in place to stimulate the increased adoption of EHRs and other supportive information technologies (IT) and infrastructures to facilitate the flow of patient data across their health sectors as a part of an overall health reform strategy (Morrison, Robertson, Cresswell, Crowe, & Sheikh, 2011), (Waterson et al., 2013), (Deutsch et al., 2010). Indeed as explained in Section 1.1, Background, the NHS has had a constant progression of nine e-health strategies covering that last 56 years up to 2018 with an average life span of just over 5.5 years each. The literature strongly indicates that the conception of these strategies typically appears to be stimulated by

a combination of factors, many of which are common to westernised developed countries including [1] a desire by governments to use IT to transform their country's health sector; [2] as a means of countering resistance to change; [3] to bring an order and structure to the process; [4] address macro-environmental pressures; and [5] respond to changing citizen and patient expectations. Each of these stimulating factors is explored further below. These, in turn, strongly influence the development of the new socio-technical model proposed in Section**Error! Reference source not found.** 5.10, Contribution to Knowledge & Practice.

Firstly then, in relation to using IT to transform a health sector, there appears to be a generally accepted belief among successive governments that the transformational nature of IT experienced in other government branches and across other sectors, such as retail, banking, and manufacturing, can, and should, be replicated in the health sector whose IT adoption rates are slower (McLoughlin et al., 2017), (Deutsch (2010). So governments typically conceptualise EHRs and associated infrastructures as transformational opportunities, or change agents, and therefore, as a means of delivering significant change and with that, considerable hoped for quantitative and qualitative benefits (Berger, 2013), (Silow-Carroll, Edwards, & Rodin, 2012), (McLoughlin, 2017). These can include [1] Improved oversight; [2] More efficient administration and cost control; [3] Improved clinical outcomes; [4] Improved transaction rates to meet growing demand; [5] Financial savings by reducing or slowing the rate of cost increase by replacing paper based workflows with computerised ones, speeding up data transfer and transaction rates and [6] Improve clinical effectiveness and safety by reducing clinical risk.

Secondly actions to stimulate investment are required to counter factors linked to resistance to change (Zwaanswijk et al., 2013). According to McLoughlin (2017), IT is seen as being capable of providing more product or service for less investment in human resources, funding and other assets. When applied to healthcare, an information intensive sector that generates very large quantities of patient, workforce, financial and estates related data, utilising IT to manage that efficiently and effectively is often seen by governments and other stakeholders to be the only way to transform workflows to make that data more readily accessible. That is, for patient care and various other purposes within, and across, organisational,

geographical and professional boundaries in a timely way that mirrors the real life patient flow process (World Health Organization, 2014), (World Health Organization, 2013).

Thirdly, such strategies are often seen to be required by governments to try to bring national order to a high risk process that might otherwise be chaotic if left purely to local choice ("bottom up") and lead to a proliferation of propriety standards and systems with undesirable consequences. Health care is becoming increasingly too complex, costly and high volume to operate and manage efficiently without the aid of those systems (Hillestad & Bigelow, 2005), (Buntin, Burke, Hoaglin, & Blumenthal, 2011), (Silow-Carroll et al., 2012).   According to Deutsch (2010), many government policy-makers subscribe to that argument. They perceive there is a reluctance of local organisations and staff to adopt those changes and conclude that they need to have e-health strategies to counter that resistance. Indeed the prevalence of such strategies across many westernised developed countries, as mentioned earlier, adds to that conclusion.   The need for government led e-health strategies is also supported by several other studies of local EHR adoption. They also conclude that EHR implementations within healthcare provider organisation, such as hospitals, which are culturally complex environments, are high risk undertakings that are fraught with difficulties, unforeseen and unintended consequences and can often result in a lack of willingness to participate in those endeavours by those organisations and staff working within those, especially clinical staff if left entirely to their own endeavours (Harrison, Koppel, & Bar-Lev, 2007), (Mair et al., 2012), (Berger, 2013), (Stroetmann, Artmann, & Stroetmann, 2011) and (Menachemi & Collum, 2011). According to these studies, those consequences can include [1] Higher than anticipated EHR purchase costs; [2] Prohibitive ongoing maintenance costs; [3] Implementation failures; [4] Extended timescales; [5] Cost overruns; [6] Mismatched expectations; [7] Inadequate stakeholder cooperation, both active or passive resistance; and [8] Disruptions to workflows. All of which can contribute to a reluctance to change locally, and when some progress is made, to unfulfilled benefits and losses in productivity as staff struggle to adapt to an often fraught and ongoing change.

Fourthly, another typical argument in support of establishing the need for a national e-health strategy is often couched as a response to stimulating macro environmental pressures arising from demographic pressures and increasing costs. All westernised democracies are witnessing a demographic shift towards an ageing population, resulting in increasing demand for healthcare as life expectancy rates improve (Menachemi & Collum, 2011). However older people have more complex and costly health needs, while the numbers of younger working age taxpayers available to fund that is declining (World Health Organization, 2014).

As a consequence the health expenditure per capita has at least doubled between 1995 and 2014 across most westernised developed economies, as illustrated below in Figure 10, Health Expenditure per Capita (World Bank, 2018):-

Figure 10, Health Expenditure per Capita
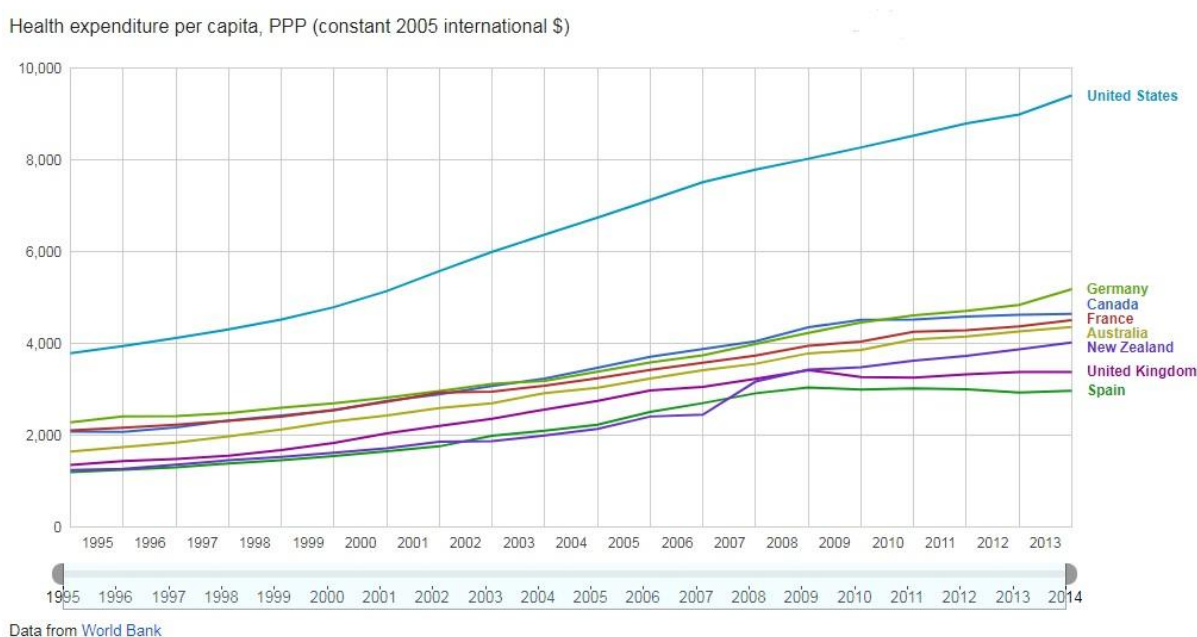
Similarly, the percentage of many westernised developed economies Gross Domestic Product (GDP) consumed by their health sector is growing and putting pressure on budgets for other areas of government expenditure, leading to difficult and possibly unpopular spending priority choices and taxation decisions (World Bank, 2018). At the same time, governments are aware that advances in the range and availability of evidence based care pathways, genetics, drugs, clinical treatments

and procedures are continuing, exacerbating the supply side problem even more as more patients benefit and, in turn, add to the ageing population problem. For example, UK healthcare sector expenditure rose from 6.69% of GDP in 1995 to 9.03% in 2014, an increase of 74% (World Bank, 2018).

Finally, the literature highlights that governments are increasingly stimulated into action as a response to changing patient and citizen expectations. They perceive that citizens are becoming better informed and demanding as access to health knowledge via the internet rises (McLoughlin et al., 2017). Coupled to that is an increasing unwillingness to defer to professional clinical opinion and the provision of almost universal access to the internet many citizens are demanding and getting greater online access and control over their own EHR data (Frosch, Suepattra, Rendle, Tietbohl, & Elwyn, 2012). They can use this online access to enquire and transact with health services to, for example, make appointments and query their data online, as well as add to it and to choose to share it with other organisations (Essén et al., 2017).

2.8.2   Selecting an Approach

Moving now to explore stimulating factors leading to a perception that a strategy is needed, its conception, to the "strategic response by government", in terms of selecting an approach, the literature highlights that there are several choices. To illustrate those, one way of classifying national e-Health strategies, albeit with blurred boundaries, is Coiera's (2009) *"Power Source" Socio-Technical Model"* which suggests a classification of strategies into *"top down", "middle out"* and *"bottom up"*. Another is Eason's, (2013), *"Technical Coupling Model".* Both suggest that there are three broad choices along a mandatory-voluntary compliance spectrum (with blurred boundaries). These include:- [1] Replace local EHRs with national standard EHRs, aka "top down", or "tight coupling"; [2] Implement a central portal EHR containing a subset of patient data, interfaced to local EHRs using nationally defined technical infrastructures and information standards to facilitate inter-organisational data interchange, aka "middle out", involving looser coupling (this typically has a focus on interoperability to develop and mandate data interchange standards to deliver information sharing of patient data between local EHRs); [3]. To leave local

organisation to progress at their own pace, with some encouragement from government to move towards adoption, aka "bottom up", or loose coupling.

Eason's (2013) "Technical Coupling" proposition is that "top down" is more likely to fail because such strategies require more "technical coupling", [defined as the degree of human, social and organisational changes, especially cultural, needed to fit the promoted technical architecture into local working practices]. The more coupling is required, the more it acts as a barrier to progress and the greater the risk of cultural rejection locally. Eason cites NPfIT as an example of such a failed e-health strategy that sought to replace local EHRs with national standard ones.

Coiera's (2009) proposition is similar and concludes that the NPfIT "top down" strategy failed to deliver its desired outcomes, because it sought to replace local EHRs with nationally procured ones. That is a view shared by others, including (Amirhossein Takian, 2012) and (McLoughlin et al., 2017). Robertson (2010), also concludes that the NPfIT style "top-down" centrally negotiated EHR contracts, leaves hospitals, with no direct contractual relation with suppliers and little or no ownership as a consequence, resulting in cultural rejection by many local healthcare provider stakeholders. Those findings are also supported by Sheikh (2011), who concludes that "top down" nationally procured EHRs can have a number of local adverse consequences. These include delays relating to unrealistic national expectations about EHR capabilities at a local level such as underestimation of the: [1] time needed to build, configure, and customise EHRs locally; [2] work needed to ensure that EHRs support provision of patient care; and [3] needs of end users for training and support.

Coiera (2009) also suggests that a "top-down" NHS NPfIT type strategy would be virtually impossible to replicate in countries with predominantly independent private sectors such as in the USA. The "bottom up" "Hospital Information Support System" (HISS) and "Electronic Record Development and Implementation Programme" (ERDIP) programmes that preceded NPfIT, selected and funded a small number of hospitals and other healthcare providers as "willing volunteer" pilot sites in the hope that others would see the benefits and follow suit using their own funding thereafter, which did not happen (Brennan, 2007). Robertson (2010) also suggests that NPfIT was, in part, a frustrated government reaction to a lack of progress to the previous

largely voluntary nature HISS and ERDIP strategies, which were at the voluntary end of the mandatory-voluntary compliance spectrum. Robertson (2010) finds that HISS encouraged EHR adoption by promoting a small number of funded pilot projects and hoping others would follow, rather than attempting to mandate it. Robertson (2010) also finds that few hospitals succeeded in getting locally funded business case approval to emulate the HISS e-health strategy pilots and national funding was not available to fill the funding gap so wide spread adoption did not follow.

2.8.3 Technical Solution Sets

The above describes how factors that are frequently found influence the selection of an approach and the following explores some of the technical solution sets the e-health strategy is seeking to promote the adoption of.   There are several other examples of national e-health strategies with "middle out" characteristics aimed at stimulating the exchange of patient data between healthcare provider organisations that studies conclude are usually more successful than "top down" or "bottom up" counterparts. Some of these deploy a technical solution set whose primary component is a national overarching "portal" EHR with summary datasets and network infrastructure that pulls, and, or, pushes data from local EHRs using nationally defined interoperability data and format standards. The portal is made available for enquiry by clinicians in multiple organisations caring for those patients, typically across a whole country. Technical solution set examples include:-

- Scotland's and Northern Ireland's Emergency Care Summary (ECR) (King et al., 2012);
- Holland's n-EPR, (Tange, 2008), (Zwaanswijk, 2013);
- Australia's My Electronic Health Record (MyEHR) (Morrison et al., 2011), (Xu, 2013);
- Germany's Elektronische Gesundheitskarte, (eGK), (Deutsch et al., 2010);
- Wales' Individual Health Record (IHR) (Greenhalgh, 2013) (King et al., 2012);
- England's national systems such as the Summary Care Record (SCR), a legacy component of NPfIT still in operation today (Greenhalgh, 2008, 2010), ((Coiera,

2011); the Message Exchange for Social Care and Health (MESH),(NHS Digital, 2017c); and the e-Referral Service (e-RS), (NHS Digital, 2017a);

- The USA's Health Information Exchanges (HIE) (Moghaddasi, 2017), (Heath, 2017);
- Norway's National Summary Care Record (Dyb, 2018); and
- China's Population Health Information Platforms (PHIP) (Zhang, 2017).

A example with a slight technical solution set variation is France's "Dossier Medical Personnel", (DEP), which also includes a citizen held smart card (that stores citizen's health records) that they can carry from place to place and share and update during each encounter (Bourret, 2010; Metzger, Durand, Lallich, Salamon, & Castets, 2012).

However, it would be wrong to assume that adopting a "middle out" approach is a guarantee of success. Studies suggest that the complex interplay of known and unknown factors can lead to a range of unexpected outcomes even when very similar technical architecture is being promoted. For example, the pace of technological change can be a factor. Technology solution set choices can be a barrier if the chosen solution set becomes obsolete before it is fully normalised into day to day working practices (Boonstra, 2010), (Zwaanswijk, 2013), and (Morrison, 2011). Computer processing power, storage capacity and internet enabled communication channels with their growing bandwidth capacity continue to expand. That also means that the process of adoption is never complete and solution choices can be obsolete if not upgraded. As (Yen, McAlearney, Sieck, Hefner, & Huerta, 2017) puts it:-

> *"….technical features are not static; rather they frequently change over time as new versions of the software are promulgated. As such, adoption is not an end state; it is the application of an arbitrary end point to facilitate our understanding.*"

Another example of unexpected outcomes is in a study by Zwaanswijk, (2013) of Holland's e-NPR e-health strategy. That finds that medico-legal concerns about data sharing among clinicians over who is legally liable to be sued for clinical errors occurring as a consequence of diagnostic decisions relying on, what might turn out

to be, inaccurate patient data input by others at earlier points in the care process in other healthcare providers. Yet Scotland's and Northern Ireland's Emergency Care Summary (ECR) strategies adopt very similar solution sets to n-EPR and are found to be successful. The difference is attributed to active inclusion of leading clinicians in their change management programme consultation and decision making processes from the beginning (King et al., 2012).

In conclusion, the evidence suggests that the technical architecture and choice of EHR that the e-health strategy is seeking to promote is very important and has complex interactions with other socio-technical dimensions, and especially the human and social dimension, where a similar technical architecture can result in different levels of engagement, or resistance, especially from clinicians. That suggests that whether a 'push' or 'pull' interoperability method of populating a "middle out" centrally hosted EHR is adopted or not, the e-health strategy may well be resisted for other human and social reasons.

So having identified some of the complex factors arising from stimulants on government and factors affecting the selection of a technical solution above, the Literature Review now moves onto the implementation planning, maintenance and evaluation stages of a strategy's typical life cycle. To reiterate briefly, the framing of that exploration draws on Technology Lifecycle Theory in a similar way to Cresswell (2013), Robertson (2010), Rozenblum (2011), Salzberg (2012), Zimlichman (2012), Zinszer (2013) and Zwaanswijk (2013). The literature review identifies a number of key components which are explored further in Section 2.9, Stakeholder Engagement (the approaches taken to engage with a range of stakeholders to address softer cross-cutting cultural issues as part of a change management programme); Section 2.10, Governance and National Resources (arrangements put in place to govern the decision making process and the nature and quantity of the human and financial national resources); and Section 2.11, Implementation Approach and Targets (the approach taken toward implementation and the targets the strategy is seeking to meet and how those are evaluated and changes made, or not, as a consequence).

2.9   Stakeholder Engagement

Stakeholders is a broad term that can include, for example, health and social care organisations (Zimlichman, 2012), doctors (Rozenblum, 2011), nurses (McGinn, 2012), and different professional and labour groups representing doctors, nurses, administrative staff and managers (Cresswell, 2013) independent bodies, (Sheikh, 2011), the press and patients or more broadly citizens (Robertson (2010), McGinn (2011). This section explores softer cross cutting cultural aspects of implementation; especially the need for effective stakeholder engagement drawing forward the conclusion above about the Dutch n-EPR, compared to Scottish and Northern Ireland ECR strategies that use similar "middle out" solution sets, but have differing outcomes. The key themes covered in this section are illustrated below:

Figure 11, Stakeholder Engagement Key Themes
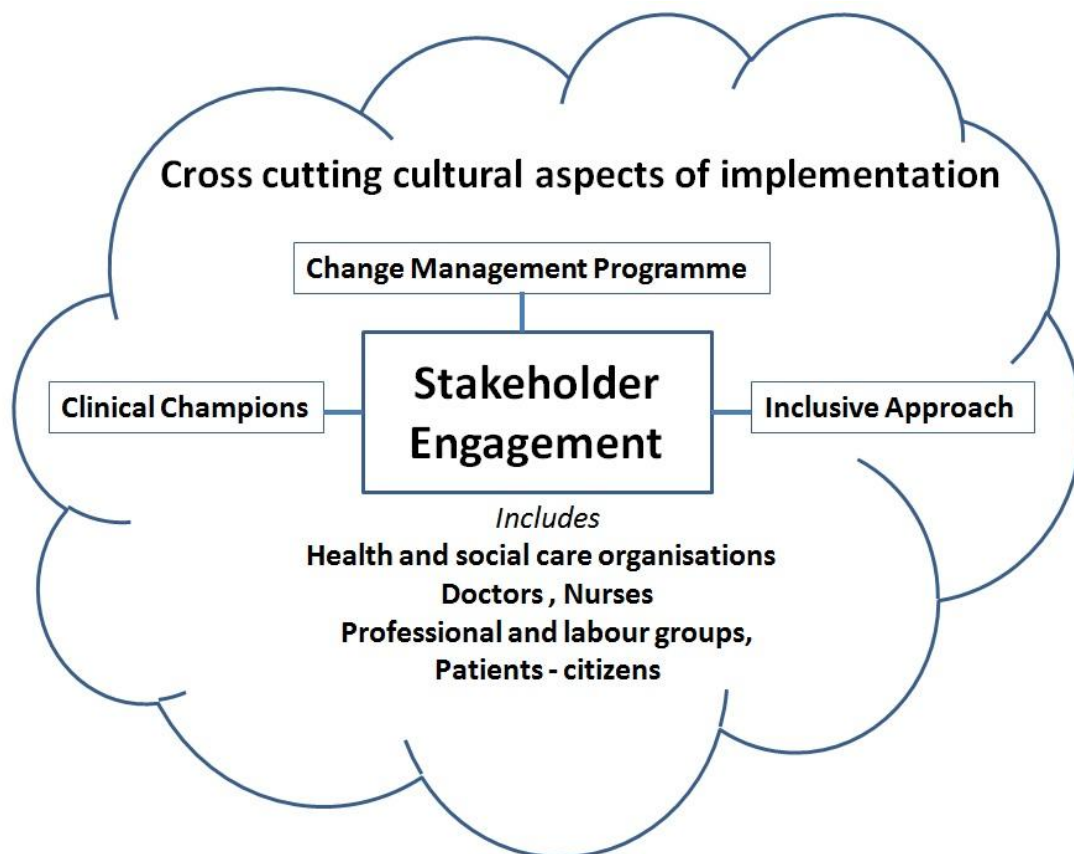
2.9.1 Change Management Programme

An e-health strategy that does not have a change management programme to encourage local user engagement at the design stage, especially among clinicians, is more likely to be impeded during implementation, especially in relation to their engagement with change management activities (Morrison, 2011), (Greenhalgh, 2013). So Morrison et al (2011) for example, in their study of the e-health strategy in the USA (the Meaningful Use Programme, or MUP), England's NPfIT and Australia's previous PCEHR strategy, finds that a failure to set clinician expectations results in a poor appreciation of the disruptive nature of EHRs which, as awareness of that disruption increases, results in increased cultural resistance. Several other studies that include NPfIT in their scope, also conclude that a lack of EHR choice at a local level is a major barrier, resulting in lack of buy-in from clinician and persistent, varied, contrary and negative translations of the e-health strategy by clinicians and other stakeholders (Robertson, et al, 2010), (Boonstra, et al, 2010). The literature also highlights several change management strategies that can be deployed by governments to reduce resistance and facilitate progress such as the use of clinical champions and secondly, by taking an inclusive approach, which are explored below.

2.9.2 The Value of Clinical Champions

Selecting experienced, respected clinicians as project champions can help to generate enthusiasm among their peer groups towards EHR adoption by their example and through peer group pressure (Cresswell, 2013), and (McGinn, 2011). These champions can reduce resistance to change by meaningfully engaging with all relevant stakeholders to gain their support and buy-in, (Deutsch et al, 2010). This is because not all stakeholder groups believe that introducing EHRs is a change for the better. McGinn, (2012) for example, who cites evidence found in Lorence et al (2005) from the USA, finds that only half of doctors surveyed believe that patient data accuracy is improved after implementing EHRs.

2.9.3 Taking an Inclusive Approach

McGinn, (2012) citing evidence from a study Audet, (2004) in Canada, concludes that too much haste can cause issues with stakeholder acceptance later on if their

input is not actively sought during the procurement and implementation process. This is echoed by Boonstra, (2010) who also finds that lack of belief in EHRs by many clinicians, and lack of their support during deployment, can be a major barrier, but these barriers can be countered by being inclusive and discussing and communicating the usefulness and advantages of EHRs, and through the use of incentives. These can include financial incentives, proof of concept projects, trial periods, and system demonstrations to show ease of use. Also, resistance can be reduced and progress facilitated by adopting a clinical-needs-first, highly inclusive approach to clinical stakeholder engagement, (Rozenblum, et al, 2011). Poor, or delayed, integration of clinicians into the e-health strategy can also result to far-reaching additional costs and delays and the consequent diversion of resources to address clinician resistance, (Deutsch, (2010), citing Coiera, (2007).

2.10 Governance and National Resources

Moving on now from Stakeholder Engagement to Governance and National Resources, this refers, in this context, to the arrangements put in place by government to operate the decision making process designed to put the strategy into effect, including: [1] a national coordinating body; [2] the use of national funding incentives to stimulate local compliance; and [3] providing mechanisms to disseminate knowledge, such as pilot sites, case studies and various communication channels to disseminate knowledge, as illustrated in Figure 12, Governance and National Resourcing:-

Figure 12, Governance and National Resourcing

National Coordinating Body

England's NHS Digital
Australia's National E-Health Transition Authority
USA's Office of the National Coordinator for Health Information Technology
New Zealand's National Health IT Board

National Funding Incentives

Support local business cases and to stimulate local compliance

Mechanisms to Disseminate Knowledge

Pilot site case studies, Conferences (physical and online) ,reports, press releases, web sites, social media.

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Each of these is explored further below.

2.10.1 National Body

A national decision making, coordinating and governance body is a common feature of e-health strategies (Morrison et al, 2011) (Rozenblum et al, 2011). Example of national coordinating bodies include the Australian National E-Health Transition Authority (NEHTA) tasked with setting out and delivering the Australian PCEHR programme, (Xu, 2013), (Muhammad, 2018); Connecting for Health (CfH) in England which ran the NPfIT (Cresswell, 2009); the Office of the National Coordinator for Health Information Technology (ONC) which runs the USA's Meaningful Use Programme (Salzberg , 2012), (Moghaddasi, 2017) and New Zealand's National Health IT Board (NHITB) (Bowden, 2013). Finally, the e-health strategy in England is run by NHS Digital (NHS Digital, 2017b). Such bodies typically facilitate various complex interrelated e-health strategy elements and are supported by national resources that include [1] staff (Deutsch, 2010) who cites evidence found in Egk (2007); [2] the use of national funding incentives to support local business cases and to stimulate local compliance (McGinn, 2012), (Rozenblum, 2011). Typically problems can arise if such bodies take too much time to make decisions that are required to adhere to targets and deadlines set out in the strategy (Robertson, 2010).

2.10.2 National Funding Incentives

With regards to the second element, the use of national funding incentives to support local business cases and to stimulate local compliance, McGinn, (2012) cites evidence in DesRoches et al (2008) from a national survey of physicians, that a major facilitator of the USA's MUP is the availability of financial incentives that are available to doctors and organisations to support the purchase and enhancement of accredited EHRs. Morrison (2011) also cites MUP as an example of how to use financial incentives extensively and successfully as a facilitator to stimulate both hospitals and clinician adoption of EHRs. The provision of national funding addresses, to a greater or lesser degree, a common theme in the literature that it is difficult to build local business cases justifying local investment funded by financial savings. Both (Rozenblum et al., 2011) and (Zimlichman et al., 2012), for example, identify perceived uncertainty surrounding the return on local investment as a barrier

to progress in Canada's Health Infoway e-Health Strategy, and conclude that direct engagement with local healthcare organisations is required to help them develop a clear business case that, in turn, facilitates their local investment, approval and action. However, even the USA's MUP suffers from the complex interplay of factors such as clinician's privacy concerns and a lack of stakeholder buy-in which counter the facilitating influence of national funding incentives (Almoaber & Amyot, 2017).

2.10.3 The need for Mechanisms to Disseminate Knowledge

Finally, disseminating knowledge to health provider organisations and other stakeholders is a common role of national bodies typically using pilot site case studies, conferences (physical and online) ,reports, press releases, web sites and social media (Bowden, 2013).

Having explored governance and national resource factors above the following now discusses the fourth strategic component: Implementation Approach and Targets.

2.11 Implementation Approach and Targets

The literature suggests that factors can have varying influence, either as barriers or facilitators, depending on where the e-health strategy is in its lifecycle.

2.11.1 Selecting an approach and implementation planning

Looking first at factors mainly affecting the first stages in a strategy's lifecycle, namely, selecting an approach, implementation planning and procurement, the provision of adequate resources to complete the task in a reasonable time is crucial. That includes time and resources needed to define requirements, build affordable business cases and get them approved, then to select and purchase cost-effective and affordable systems. That cannot be very protracted, because such strategies have a time limited lifespan and typically targets are set that fall within the expected lifecycle (around 5.5 years in the NHS as illustrated in Section 1.1, Background), (Boonstra & Broekhuis, 2010), (Zimlichman et al., 2012). (McGinn, (2012), citing DesRoches et al (2008).

2.11.2 Implementation

Moving now to the next lifecycle stage, implementation, even if initial stages are completed quickly to target, the functional and technical capability of the solution set the strategy is seeking to promote, comes to the fore as crucial factor. If timescales are very protracted and targets are repeatedly not met, perhaps because of problems deploying the solution set that can also adversely impact on local acceptance if disillusionment sets in, which in turn could slow the rate of progress (Sheikh, 2011). Poor choices can lead to unexpected outcomes, especially if the solution set is not sufficiently adaptable, user friendly and flexible enough to meet the range of organizational and clinical requirements on a variety of levels. Taking too long to adapt systems can again adversely impact on targets and increasingly affect the credibility of the strategy (McGinn, (2012), citing Thakkar et al (2006), (Cresswell et al, 2013), (Cresswell et al 2012).

Customisation, the ability to customise the solution set to meet local variations in requirements, is a significant factor that is frequently found to affect local cultural acceptance according to Cresswell et al, (2009, 2013) and Boonstra et al (2010). They find that choosing solution sets that can be customized can mitigate some cultural acceptance barriers at clinician level by accommodating variation in local care pathways and working practices. On the other hand, customising can cost more to implement, take longer than expected to do, impact on targets and consume more money and staff resources to maintain and operate. That means that compromises need to be made between timescales, affordability and desired functionality. They conclude that growing implementation costs can become a barrier to progress if these are badly underestimated. One way to address those barriers might be by short circuiting the customisation process through closer cooperation and proximity between clinicians and developers (Deutsch, 2010). Still staying within the overall theme of the implementation stage in a strategy's lifecycle, and recognising that adoption does not end the day after the solution set goes live, the following section explores post go live factors.

2.11.3 Post Go Live

After "go live" other factors come more to the fore, such as the reliability, usability and performance of the software and hardware availability to access it, as well as

training and support of end users.   Unreliable, poorly performing and inflexible systems frequently slow down the working practices of individual users, despite often improving overall health economy and organizational efficiency. As a consequence they can be strongly resisted if they lead to overloading of front-line staff, especially clinicians, which in turn can lead to workload stress, fatigue and disillusionment (Lovelock, 2017), (Cresswell et al, (2013) citing evidence in Aarts, (2004), McGinn, (2012) citing evidence in DesRoches, (2008) from the USA.. On hardware availability, Boonstra, (2010) finds that the lack of computers and other local hardware (where the end user comes into contact with the EHR via a computer terminal or similar) can act as a barrier. Latterly, the evolution of handheld touch pads and smart phones together with EHR apps is improving accessibility of EHR data for clinicians and patients in many locations whilst on the move, freeing them from fixed terminals (Essén, 2017), (Liberati, 2017). McGinn, (2012) citing Sequist, (2007) concludes that technical limitations of computers, such as slow response times, can also be a significant barrier to progress. Unreliable solution sets could be partially mitigated against by, for example, pre-procurement test certification and accreditation of software, hardware and their suppliers, (Boonstra & Broekhuis, 2010). Accreditation is a feature of the Danish e-health strategy (Deutsch et al., 2010), and the USA's MUP e-health strategy (Cresswell et al., 2013), (Amirhossein. Takian et al., 2012).   Professional hosting of NPfIT software in fully managed resilient data centres was cited as a positive facilitator by Deutsch, (2010).

The resources required to operate the solution set post go live can also be a barrier given competing demands on local and national resources. Cresswell, et al, (2013), for example, finds that the on-going costs and resources required to support the solution set are often under-estimated as are costs relating to system upgrades and organisational changes. One way to mitigate the risk of these post go live cost related barriers is to have stricter contractual agreements for change control payments to suppliers for according to the National Audit Office (NAO) in their progress reports on NPfIT (National Audit Office, 2008a, 2008b, 2008c, 2008d) (National Audit Office, 2011), (National Audit Office, 2013). These NAO reports are also examples of evaluation exercises scheduled in during the course of the strategy's lifecycle to see what might be no going as well as expected and "do differently" adjustments might be beneficial going forward ranging from slight to

abandonment and replacement. The same conclusion, about stricter contractual agreements, was drawn from studies of e-health strategies in Denmark and Spain, (Protti, Johansen, & Perez-Torres, 2009), (Deutsch et al., 2010). Finally, another way to mitigate the risk of these cost related barriers could be to deploy national staffing more locally. In Canada, for example, some national staff are deployed locally to provide training and support services which also helps to facilitate acceptance by clinicians (Deutsch et al., 2010).

That concludes the exploration of key themes and the factors within those that can affect adoption of e-health strategies framed within the context of the typical lifecycle of such strategies. The following section draws a number of conclusions from that.

2.12 Conclusion

The most important conclusion is that the literature review provides an indication of a wide range of factors that affect other e-health strategies and so adequately addresses Research Question 2:-

> *"What factors affect the adoption of other national government e-Health strategies?"*

That information forms a good base from which to explore knowledge of factors affecting the e-health strategy in the NHS in England. However as explained in Section 2.6, Gaps in the Literature, there are significant gaps that justify the need for this research. The first and most significant gap is that there are no peer reviewed academic studies of the e-Health strategy in England. The second is a sampling gap. No previous studies stated that include IT consultants as a sample group and only two previous studies include suppliers of EHR systems and infrastructures in their sample frames and even then, they did not dissect out their data from those of others. The majority draw their data from healthcare provider and government sector employees. Therefore the study seeks to fill all those gaps in knowledge and Chapter 3, Methodology, which follows sets out how that will be done.

The literature also indicates that the common aim of national e-health strategies is to typically act as change agents, to stimulate adoption of information technology

technical solution sets, and especially EHRs and associated infrastructures, by organisations in their country's highly complex healthcare sector. Those attempts are manifested through actions arising as a consequence of human efforts in response to stimulants, and various forms of information that describe them. These add "visibility" to give them a presence (such as from the presence of government published materials, conferences, teams, meetings, money and actions). Their complexity and lack of a physical form means especially that e-Health strategies can be defined by various stakeholders in different ways. Those stakeholders may have differing vested interests, cultural beliefs and attitudes and, as a consequence, have multiple mental constructions, perceptions, manifestations, meanings and interpretations of reality attributed to them (including by the researcher who is not seen as neutral).

A systematic review of post 2009 studies that closely match this research topic, yield a number of socio-technical dimensions and a wide range factors affecting adoption within those. That analysis yields an adequate quantity of over 500 data items (factors affecting their adoption), allocated subjectively based on the researcher's judgement on which factor is best fit, either to a technical, human and social, organisation or macro-environmental dimension in the socio-technical model developed from those, as used in similar studies and adopted here. These in turn support the development of the themes that demonstrate the complexity of the subject matter and the environments in which they exist as set out above in previous sections.

That exploration begins by looking at factors that can affect the conception of the overall strategy as illustrated below in Figure 14, Strategy Formation:-

Figure 13, Strategy Formation
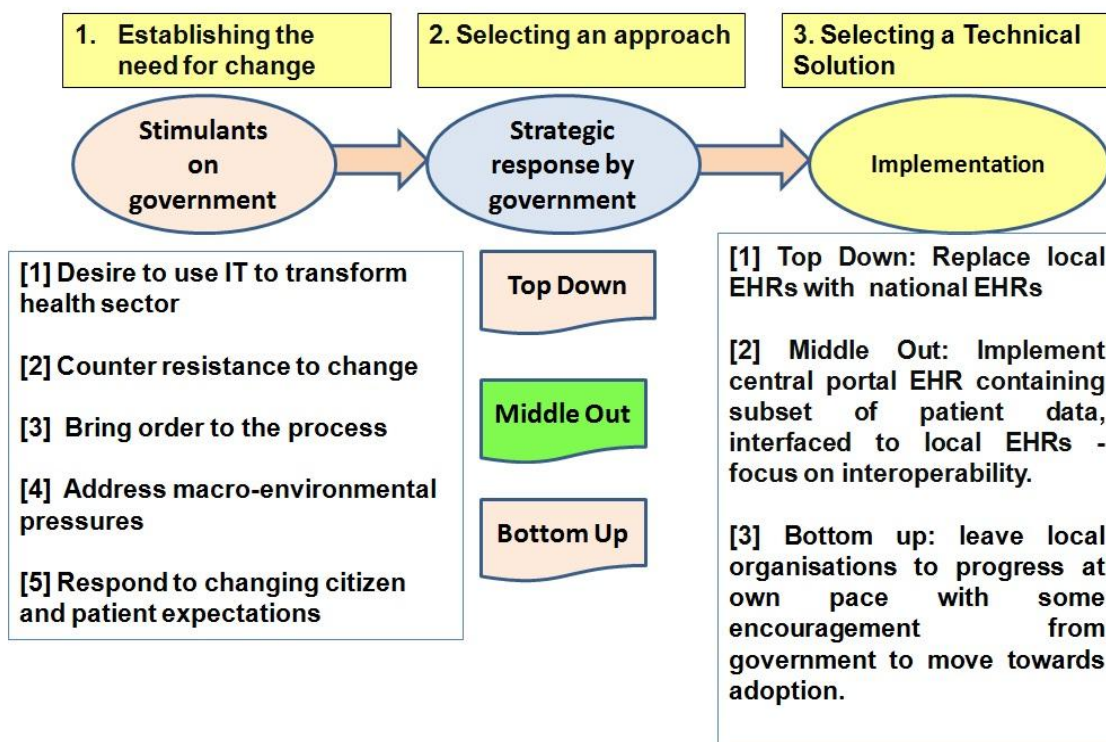
The above model is described more fully below, beginning with factors that are frequently found to establish the need for change, followed by those that influence the selection of an approach and the technical solution set the e-health strategy is seeking to promote the adoption of.

As well as the strategy design itself the literature also suggests that there are a number of other key strategic components that play an important role. These are many, but the literature indicates that the most significant of those are the strategy's construction including its technical solution set, stakeholder engagement especially to address cultural issues, national governance and national resources (staff and funding), and implementation approach and targets. These themes are carried forward into the data collection design and incorporated into the interview instrument.

The literature also strongly suggests that the use of national e-health strategies to promote adoption of EHRs and associated infrastructures as a core part of national healthcare reform strategies, policies and programmes is pervasive in westernised

developed countries. So they are not unique to the NHS in England. Prior studies include in their scope many countries in North America, Europe, Australasia and previous strategies in UK. They all have such strategies in place. These e-health strategies, which researchers can also typically conceptualise as "virtual" entities with no physical form, are typically designed and deployed to respond to various stimuli, which are many and varied, but often include attempts to contain cost pressures arising from rising expectation, medical advances and demographic shifts towards an older, more dependent, population. They are also often attempts to speed up the rate of change to counter a perceived cultural reluctance among healthcare providers, especially clinicians, to change quickly enough in comparison with other sectors and benefit from new technology.

Such strategies can take several design forms such as "top down", "middle out" or "bottom up", drawing on the Coiera's (2009) classification. However the literature shows that choosing any one particular type of strategy design is not a guarantee of success, subject as such strategies are highly complex interactions of factors in a continually changing environment as they progress through their finite lifecycles. As politically-initiated, highly complex, challenging, and large-scale programmes which operate at a macro level they can have unpredictable outcomes with unintended consequences, like the previous NPfIT and Dutch n-EPR e-health strategies. They are dependent upon a successful navigation through an interacting mix of variables, barriers and facilitators within, and across, not just technical, but also human, social, organisational; macro-environmental and wider socio-political dimensions. Also different factors can vary in importance and impact depending on where the strategy is in its lifecycle.

Given that complexity and unpredictability, the majority of studies of e-Health strategies adopt a qualitative, interpretative research philosophy, in the socio-technical research tradition. This complexity is a major influencing factor when it comes to choice of methodology and is a major component of the answer to the Research Question 1: *"Which Information Technology (IT) adoption theories are suitable to inform this research?"* as set out in Section 2.3, IT Adoption Theories, and developed further in Chapter 3, Methodology which follows. Several studies also put forward propositions suggesting that strategies with "middle out" characteristics are

most likely to be successful as these may have a greater chance of striking an appropriate balance between local choice and national priorities. Further discussion on a proposed proposition based model, in the light of data collected, can be found in Chapter 5, Conclusions and Implications.

3 Methodology

3.1 Introduction

Chapter 2, Literature Review, explores a number of IT adoption theories to assess their suitability to inform this research and describes the factors affecting a number of past and present national e-Health strategies across a number of countries, identifies gaps in the literature and implications for the choice of methodology for this research. This chapter builds on that by setting out reasoned arguments for the chosen methodology to identify factors affecting the adoption of the e-Health strategy in the NHS in England.

It advances two arguments, each of which supports the same conclusion. The first argument is based on an assessment of the suitability of either a positivist or an interpretative research philosophy and a number of technology adoption theories within those. That argument is influenced by the views of the researcher which are set out in Section 3.2, Researcher's Position. The second is based on an analysis of the philosophies adopted and methodologies used by others to study factors affecting national e-health strategies. Those arguments both support the choice made to conduct this research within the context of an interpretative research philosophy as explained in Section 3.3, Research Philosophy, an exploratory socio-technical relativist constructivist research strategy, as set out in Section 3.4,. Research Strategy and a data collection method based on semi-structured interviews of purposively selected knowledgeable individuals as set out in Section 3.5, Research Method Design and amplified further in subsequent sections. Finally, Sections 3.6 to 3.9 set out positions on reliability, validity, triangulation and research ethics, before Section 3.10 summarizes the chosen methodology as a whole.

3.2 Researcher's Position

The researcher recognises that, as a qualitative researcher, how they discuss the research topic with participants and how the researcher interacts and co-constructs interpretations of those with them, is inevitably influenced by the researcher's prior knowledge, understanding and experiences. The Summary of Portfolio provides an overview of that. As Greene (2014), points out, this is particularly true for insider

research, concerned as it is, with the study of one's own group (community, profession, sector, social group or society). The opposite of that (along a continuum) is outsider research (no a priori knowledge of the group under study, nor its members) according to Merton (1972) as seen in Greene (2014).

So evidenced by the researcher's Summary of Portfolio, the researcher is an insider member of multiple relevant groups as a consequence of having shared characteristics. That includes: [1] the "IT professional" group generally (for over 40 years professional work experience and knowledge); [2] the "NHS / health and social care sector" group (30 years); [3] the NHS "IT suppliers" group who they have worked for at various points in a consultancy capacity; and [4] the "IT consultant" group (16 years) working for the NHS, the government and for other sectors. As well as exposure to health and social care services in a professional capacity he also has over 30 years exposure to a wide range of health and social care services and organisations in primary, secondary, tertiary, mental health, community and social care in a personal capacity due to family members having profound and multiple health and social care needs. That has provided many insights and experiences, not only from inside organisations, but also from the outside as a carer to those consuming those services.

Therefore, the researcher recognises that, unconsciously, or otherwise, that background and the knowledge gained, influences their research and they acknowledge their own biases. So, for instance, the researcher's extensive prior knowledge of the primary subject matter, e-health strategies, their complexity and that of the environments in which they exist, means that they have formed a strong view that an interpretative research philosophy is the most appropriate to adopt to study that topic, as set out in Section 3.3, Research Philosophy.

The researcher recognises that there are advantages and disadvantages to conducting this research as an insider (Greene, (2014) (Morse, 2008) (Silverman, 2013), (Saunders, 2012). Advantages include familiarity and knowledge of the research context, culture, environment, language and participants, so the researcher blends in better and is able to understand the language and subtle nuances that

outsiders might miss. As a consequence they suggest that they were able ask more meaningful questions as the discussions evolved with participants.

In addition the participants were purposively selected and knew the researcher and their professional standing. So they were interacting with a fellow group member and were more likely to be trusting and open than they might be otherwise. On the other hand the researcher acknowledges that there were disadvantages which needed to be acted on to minimise their impact. So for example, insider research is likely be inherently more biased due to assumptions being made, consciously or unconsciously, and conclusions drawn, that may be influenced by the researcher's prior knowledge and experience, rather than solely based on the data collected. There are a number of mitigating actions and techniques that can and have been taken to reduce bias to counter methodological challenges, improve the trustworthiness of the collected data and therefore improve reliability, (explained in Section 3.6), validity, (Section 3.7), credibility via triangulation, (Section 3.8.) and address ethical challenges via adherence to a set of research ethics and through the provision of an audit trail (including supporting research documentation such as reviewed literature signed Participant Consent Forms and interview transcripts) (Section 3.9). So having set out the researcher's position and the background to the proposal the following section sets out arguments in support of a decision to adopt an interpretative research philosophy.

3.3 Research Philosophy

To do so, this section begins with an assessment of the suitability of research philosophies to conduct research on national e-health strategies. This analysis draws on a classification informed by Greenhalgh, (2009) and Cresswell, (2009). They suggest that the philosophical choices to carrying out research into information technology adoption can be via Technology Adoption Theory within a positivist philosophy or Information Systems Research within an interpretative philosophy, but with a spectrum of options between along a continuum. It is the view of the researcher that the choice made here needs to be compatible with the complexity of national e-health strategies and the equally complex macro environments in which they exist through time as demonstrated in Chapter 2, Literature Review.

To recap briefly, the Literature Review illustrates that national e-health strategies can be conceptualised as "virtual" change agents that exist for a period of time and typically have a common aim to stimulate adoption of information technology, and especially EHRs and associated infrastructures, by organisations in their country's healthcare sector. They usually operate in highly complex macro level environments, and are subject to a constantly changing mix of interacting variables that cannot be controlled, or all known. They are frequently dependent on the recognition of, and successful navigation through, not just technical, but also a range of human, social, organisational, macro-environmental and wider socio-political dimensions and many factors (known and unknown) within those. Those factors can be highly complex and interlinked.

The lack of a physical form and complexity adds to the potential that e-Health strategies are defined by various stakeholders in a variety of different ways ranging from a highly beneficial to highly undesirable change. Those stakeholders may have differing vested interests, cultural beliefs and attitudes and, as a consequence, can have multiple mental constructions, perceptions, manifestations, meanings and interpretations of reality attributed to them (including by the researcher who is not seen as neutral).

As a consequence the researcher takes a position that e-health strategies, given the high degree of complexity of them and their environment, are best studied through the lens of an interpretative research philosophy from a relativist ontological perspective and epistemologically, a constructivist approach to knowing (Emery & Trist, 1960) (Greenhalgh, 2009), and (Edmondson & Mcmanus, 2007). That means that both research participants and the researcher are co-authors, or co-constructors, of the research findings (they socially construct that). As such and to use a term put forward by Greene, (2014), and as explained above in Section 3.2, Researcher's Position, the researcher is effectively an "insider". Such an emic co-constructivist approach seeks to obtain knowledge from the experience of research participants in order to search for several socially constructed "meanings", "truths" and "realities" of what an e-Health strategy "is", what factors are positively or negatively affecting its progress and what could be done differently moving forward.

If this research chose to take an opposite view and adopted a positivist philosophy, it would be looking for a single "truth" or "reality", which this researcher believes is not possible given the highly complex nature of the subject matter. Studies that adopt a positivist philosophy typically believe that "reality" is knowable. Adopting a positivist etic epistemology, or approach to knowing, where the researcher sees himself as being on the outside, where they can obtain an objective measure of the research topic and a truth can be found objectively through those models, is therefore inappropriate here. This researcher believes that it is not possible to be on "the outside". Neither is it appropriate, from a positivist axiological perspective, to be neutral and objective, or draw a conclusion free of their own prejudice and values, (Bryman, 2015), (Silverman, 2013).

3.4   Research Strategy

As explained in Section 2.3, IT Adoption Theories, a number of different theories were explored to assess their suitability to address Research Question 1: "*Which Information Technology (IT) adoption theories are suitable to inform this research?".* An interpretative research philosophy in the Information Systems Research tradition coupled to a research strategy drawing on Socio-technical Theory, were deemed to be the most appropriate way forward to address Research Question 2: *"What factors affect the adoption of other national government e-health strategies?".* It also explains that this research draws on some elements of the Diffusion of Innovation Theory, Change Management Theory and elements of Grounded Theory to support that. Therefore, those arguments are not fully repeated here, but in summary, the chosen strategy is an exploratory socio-technical relativist constructivist strategy informed by modified elements of Grounded Theory principles of coding and theme abstraction (Glaser, 2017), (Strauss, 2015), (Corbin, 1990). In terms of addressing Research Question 3: *"What factors affect the adoption of the e-health strategy in the NHS in England?",* this grounded approach facilitated a process to draw out themes as they emerged from the data collection process.

To address Research Question 4: *"What insights, experiences and lessons does this research highlight that could be used to inform future plans for the e-Health strategy, and other national strategies in other countries?",* and recognising that such

strategies exist through time, this strategy also draws on some elements of Change Management Theory and Technology Lifecycle Theory to support the co-construction of a number of recommendations that could also improve future strategies. That is similar to the approaches taken to study e-health strategies by Robertson (2010), Rozenblum (2011), Salzberg (2012), Zimlichman (2012), Zinszer (2013) and Zwaanswijk (2013). That subsequently informed the development of a new proposition based model set out in Chapter 5, Conclusions and Implications (Saunders et al., 2012), (Silverman, 2013).

3.5 Research Method Design

3.5.1 Introduction

This research begins the data collection stage with a grounded neutral stance to see what emerges from the research data, rather than putting forward propositions to see if the data collected supports those (drawing on elements of Grounded Theory). This section develops that further, firstly in favour of the most appropriate method to complete the literature review, including the use of various software package based tools; and secondly, for the sampling and associated data collection approach adopted here (semi-structured interviews of two sample groups). Finally the chapter ends by setting out positions on reliability, validity; ethics, and additional arguments supporting the adopted research method.

3.5.2 Use of Tools

The research method design included the use of several computer based applications. For the literature review, Endnote X7 was sourced from the University and used to create an indexed and searchable library of reviewed literature (Lewins & Silver, 2009), (University of Surrey, 2013) (University of Surrey, 2014), (Burnard, 1994). Importation of citations was typically performed using the citation repository functions of host sites and others were manually input.

Digital voice recorders were used to record interviews and Microsoft Office 10 Speech Recognition software was used to transcribe recordings. After validation with interviewees the interview transcripts were imported into the NVivo 11, along

with sample group characteristics and the socio-technical data extraction grid. Interviewee transcripts were then read and text segments (data) were then indexed against the most appropriate factors in the socio-technical grid. The resulting data sets supported analysis using the NVivo 11 reporting functions to segment data, to for example identify*: "what did members of the Supplier sample group say about "Stakeholder Engagement"?.* These report sets were used to iteratively read and develop themes as set out in Chapter 4, Data Presentation and Analysis,

3.5.3 Data Collection & Analysis

This section describes and justifies, firstly the methods that were rejected, followed by those adopted to collect and analyse data collected from interviewees relating to the national e-health strategy to identify factors affecting adoption and "do differently" suggestions. This research adopted a bottom up abductive approach to support primary data collection on the barriers and facilitators affecting the e-health strategy. The chosen data collection method consisted of two phases to improve validity. Firstly a pilot phase (a small scale trial run), to test the approach and refine it which is explained further in the following section (Teijlingen & Hundley, 2002), (Owen, 2011), (Saunders, 2012). Secondly, the full data collection phase via one to one semi-structured interviews which is explained further in the section following that (Teijlingen & Hundley, 2002), (Alshenqeeti, 2014), (Owen, 2011). That is illustrated below in Figure 14, Data Collection Method:-

Figure 14, Data Collection Method
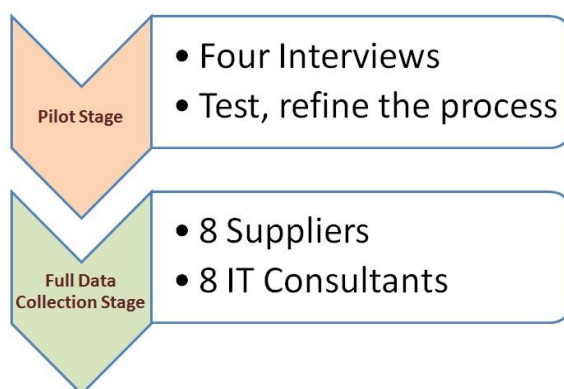
Further explanation of those can be found in Section 3.5.3, Data Collection Pilot Stage and in Section 3.5.8, Interviewee Selection & Process.

3.5.4   Rejected Research Methods

A range of research methods were considered, but rejected. These are shown in Table 5, Rejected Research Methods below:-

Table 5, Rejected Research Methods

Rejected Methods		
Workshops	Organisational case study design	Online and paper based structured surveys
Structured interview questions	Critical incident techniques	Repertory grids
Research diaries	Secondary analysis of interview data collected previously	Projective techniques
	Protocol analysis	

The inclusion of workshops was initially considered during the pilot process to supplement the interviews (Bryman & Bell, 2015) (Blaikie, 2007) (Silverman, 2013). Workshops have been used in other similar studies in the various countries including the USA, (Seto & Friedman, 2012), Norway, (Heimly et al., 2011), Canada (McGinn et al., 2012), (Wiljer et al., 2008) and Germany (Brender, Ammenwerth, Nykanen, & Talmon, 2006).   The aim would have been to use techniques, such as the Delphi technique, to identify barriers, facilitators and "things that could be done differently" as seen *by the participants* (Brender, 2006), (McGinn et al., 2012) (Easterby-Smith et al., 2012). Initial approaches to possible workshop participants, who were widely dispersed across the country, highlighted that workload issues, many diary clashes, the lack of a budget to pay their expenses and venue room and catering expenses meant that participant's appetite to meet face-to-face as a group was not great. Neither did it prove to be practical. Meeting virtually via the internet was considered, but that proved not to be practical logistically either as all of the participants were senior level staff with very busy diaries.   So whilst workshops were rejected they could form an element of a future funded study. This option was ultimately found to be unnecessary, in the opinion of the researcher, when it became clear that the interview process had produced a sufficiently rich source of data.

This study also chose not to follow the example of some recent e-health strategy socio-technical studies that adopt an organisational case study design using purposively selected local hospitals with the aim of inducing wider macro level conclusions about the e-health strategy from those case studies (Robertson, (2010), (Greenhalgh, (2011), (Sheikh, 2011). These studies are typically much larger scale than this study and involve much greater time input by several researchers to conduct multiple surveys, workshops, interviewees and content analysis of multiple types of documentation involving one or more hospitals. Sheikh, (2011) for example, carried out 431 semi-structured interviews with staff in "early adopter" hospitals of NPfIT. The reasons for rejection were time constraints, timescale and resource difficulties acquiring ethical approval from each NHS organisation's Ethics Committee, a perception that there could be a risk of increased bias due to possible hospital management demands for influence over who participated and possible pressure to review and edit transcripts, increased logistical issues and the lack of a research budget to do that at scale.

Other rejected data collection methods include online and paper based structured surveys and structured interview questions. So whilst the interview format is properly formatted and laid out the questions are designed to stimulate open discussion and the researcher used these as a guide. This research took the view that the use of less open questions was an inappropriate way to collect data in an interpretative study of a complex area like this, (King, 2004) as seen in (Saunders et al., 2012). A structured approach, with its emphasis on the use of a specific set of ordered questions with little or no divergence from those from one interview to the next, risks not responding to new avenues of inquiry as and when they arise during the interview process. It was felt that this might miss important data as a consequence. A highly structured instrument is less compatible with the interpretative, exploratory approach adopted here and may be more likely to miss opportunities to have less constrained interactions with the interviewees and is less likely to produce a rich and complex interdependent analysis of socio-technical factors affecting complex national e-health strategies. Such a structured approach is deemed to be less supportive of the co-constructivist nature of this research (which seeks to construct consensus based meaning from complex and rich interactions between the

researcher and interviewees as co-authors). In terms of axiology, as this research is subjective and bound in values where the researcher is unavoidably part of research (rather than a neutral observer), the researcher believes that bias is less likely to be reflected in a semi-structured interview instrument than in a more structured one (McGinn, et al, 2011).

Finally, a range of other qualitative research data collection methods were considered and rejected (Gill & Johnson, 2010), (Easterby-Smith et al., 2012),. These include [1] critical incident techniques (used mainly to explore human behaviour at an individual person level), [2] repertory grids structured interview techniques (to explore cross-cultural differences and how individuals perceive and differentiate between products and services), [3] research diaries (to explore individuals lives over time typically in longitudinal studies), and finally [4] secondary analysis of interview data collected previously (no prior studies of the e-health strategy are available), but the data collected during this study could be used in a future study), [5] projective techniques, used widely in market research to explore deep seated feelings that underpin buy or not buy decisions and [6], protocol analysis widely used in market research to uncover the elements and stages (protocols) in buying decisions.

3.5.5 Reasons for selecting one to one semi-structured interviews

The choice of data collection method was informed by an analysis of the methods used by others to study national e-health strategies. An illustration of the range of methods used can be found in Appendix 4, Data Collection Methods Used by Similar Studies. The researcher agrees with conclusions drawn by several researchers, above including Murray (2011), Robertson (2010) and Salzberg (2012), that use of purposively selected knowledgeable individuals and one-to-one semi-structured interviews have advantages over other data collection approaches when studying complex socio-technical systems within an Interpretivist epistemology, such as national e-health strategies. It encouraged interviewees to iteratively explore additional themes as they emerged and helped to understand the meanings that interviewees ascribed to the topics or phenomena under discussion (Saunders, et al, 2012), (Silverman, 2013). It also encouraged flexibility and helped to identify what

interviewees saw as the most relevant and important aspects of the topic under discussion as well as provide opportunities to be flexible, to probe and build on responses (Bryman, 2015), (Saunders, et al, 2012), "Do Differently" suggestions are set out in Chapter 4, Data Presentation and Analysis and in Chapter 5, Conclusions and Implications, which compares and contrasts interview data with the Literature Review as well as the formation of the propositions (Saunders, et al, 2012), (Perry, 1998).

It was recognised in advance that the meaning that interviewees ascribed to the topics could be key to reaching that understanding. Having identified the wide variation in key terms used to describe key components, such as EHRs, as set out in Chapter 2, Literature Review and Appendix 3, Terminology Variations, the language used in the instrument was guided by a content analysis of government reports and was also tested during the pilot stage to check understanding..

3.5.6 Data Collection Pilot Stage

Having designed the method the importance of including a pilot stage was recognised as a means of pre-testing the research instrument. It was recognised that whilst it did not guarantee success in the main study, the pilot did increase the likelihood of that (Teijlingen & Hundley, 2002). A draft interview instrument pack was used during the Pilot to test its suitability to acquire the data needed to support delivery of the research questions. Some adjustments were made to the wording on the instrument following that, but the overall structure and language used was felt to be sound and fit for purpose (Bryman & Bell, 2015). So for example, various terms were defined and discussed to select the most familiar ones and to provide some initial structure as to whether the strategy was "appropriate", Coiera's (2009) classification of national government strategies was tested as a way to frame the discussion on that topic. A sample of four interviewees were selected for the Pilot, two suppliers and two IT consultants and three were interviewed face-to-face and one over the telephone in September 2016. Between them, the Pilot group had over 70 years of HIT professional experience, an average of just over 17 years each. The pilot interviewees were unable to participate in the next stage due to their work pressures.

3.5.7 Research Instrument Design

Each interviewee was provided with documents by email in advance (and on paper on the day for face-to-face interviews) including a Participant Consent Briefing. Consent Form and Semi-Structured Questionnaire. Further details can be found in Appendix 5, Research Instrument.   Given the nature of this research there were no right or wrong answers. It was interviewees' world view, actual opinions and perceptions that were sought. Further exploratory and supplementary questions were asked as the interviews progressed to explore the "why" behind answers. Interviewees were very much encouraged to promote their own views. There may be other factors that were not covered by the listed topics and interviewees had opportunities to introduce those.

The semi-structured questionnaire supported an abductive sampling strategy to collect qualitative data in line with the chosen research philosophy and strategy to identify factors that affect adoption of the e-Health strategy. One of the most important aspects to point out here is that those interview topics were strongly guided by the findings of the Literature Review and an interpretation by the researcher of what the e-Health strategy "is" built on the content analysis of purposively selected government reports to interpret the key e-health strategy elements, language used and construction from that perspective (Easterby-Smith et al., 2012). The researcher recognises that whilst those non peer reviewed government publications are abstractions, in that they don't necessarily contain all the information needed to understand the e-health strategy, a view is taken that those can be a source of useful qualitative primary data ((Pierce, 2008).. Unlike an interview, which consists of an account given to the researcher, government publications are viewed here as specimens of the research topic, and as a result put the researcher in closer touch with the e-health strategy as seen through the eyes of their government authors ((Denzin & Lincoln, 2011). The researcher concurs with Bowen (2009), and Coffey (1996), who argue that social life in today's modern world is mediated by written texts and as such these texts and can provide an abundance of useful informative material for qualitative researchers

The criteria used to select publications for content analysis were several: [1] recent prominent, [2] publically available, [3] official Government e-health strategy publications relating directly to the e-health strategy. Press articles and publication from others (PricewaterhouseCoopers, 2013), (McKinsey., 2014) were out of scope. The following national publications fitted the selection criteria and printed copies were available during interviews for reference if required:-

- The "5 Year Forward View", (NHS England, 2014);
- "Personalised Health and Care 2020. Using Data and Technology to Transform Outcomes for Patients and Citizens. A Framework for Action" (National Information Board, 2014),
- The "Health and Social Care Information Centre Strategy 2015–2020" (HSCIC, 2015);
- The "Wachter Review", which is an advisory report rather than government policy. Its official title is "Making IT Work: Harnessing the Power of Health Information Technology to Improve Care in England" (Department of Health, 2016b).

Note: These could have been supplemented by "Fit for 2020. Report from the NHS Digital Capability Review" (NHS Digital, 2017b), but this was published after the end of the data collection and analysis process.

In summary, the Interview topics were structured as shown in Figure 15, Topic Entry Points, where items 2 to 6 mirror the main themes of the Literature Review as set out in Section 2.8 to 2.11 :-

Figure 15, Topic Entry Points

The overall aim was to explore how interviewees made sense of the e-health strategy (Robertson et al (2010), (Alshenqeeti, 2014) and to support subsequent comparison in Chapter 5, Conclusions and Implications (Bryman, 2015). These "topic entry points" are located within the *4th "Macro-environmental & Wider Socio-Political",* dimension of the Socio-Technical Model used to inform this research. It was also designed to help explore interviewees' opinions on items 2 to 7 on what the government and other stakeholders could do differently moving forward to address the fourth Research Question.

The interviews all began with a section entitled "Checking Understanding" informed by findings of the Literature Review set out in Section 2.5, Wide Variation with Terminology, and the content analysis of government reports. The aim was to reduce the risk that the language to be used during the discourse was comprehensible and relevant to the interviewees as suggested by Bryman, (2015). So ways of describing key elements were discussed, such as Electronic Health Records (EHRs), e-Health

strategies and factors affecting the rate of adoption to explore the extent to which those definitions resonated with the interviewees, or whether alternatives could be more appropriate. The aim was to reduce the risk of inadvertent misunderstandings between interviewer and interviewee based on widely differing preconceptions of what these core names and definitions at the heart of this research topic actually mean to each.

Following that, each of the subsequent interview topics provided data to ultimately support Research Question 3 and 4, by discussing factors affecting progress and describing insights, experiences and offering lessons that could be used to inform future plans of the e-Health strategy and other national strategies ("do differently" suggestions). So with that aim to the fore the first topic listed on the instrument, "Overall e-health Strategy", began the exploration at the macro-environmental level of the socio-technical model given a consistent theme in the literature that the choice of overall strategy type can have a fundamental impact on progress and can also be influenced by a wide range of factors such as culture, funding, the wider economic environment, international developments, government general and health policy (Bowden, 2011; K. Cresswell & Sheikh, 2013; Eason, Dent, Waterson, Tutt, & Thornett, 2012; Eason & Waterson, 2013; Greenhalgh, Russell, Ashcroft, & Parsons, 2011; Greenhalgh et al., 2010) and Coiera, (2009). The aim was to explore the extent to which the e-health strategy adopted by the government was an appropriate way of stimulating e-health adoption, or could an alternative strategy be better, and if so why did interviewees think that? The results are set out in Section 4.3, Overall Strategy.

The interviews also explored "Stakeholder Engagement", within both the macro-environmental dimension and human and social dimension, especially in relation to what approaches the interviewees think the government are using to engage with various stakeholders, and to what extent these are effective facilitators. Again a recurring theme in the literature review is the extent to which an e-health strategy is affected by cultural issues at a human, social (especially among clinicians), and organisational level (Boonstra, 2010), (Cresswell, 2012), (Zimlichman, 2012), (Rozenblum, 2011), (Robertson, 2010), (Sheikh, 2011), (Cresswell, 2013), (Deutsch, 2010), (McGinn, 2011), (Greenhalgh, 2013). Discussions looked at how the

government were encouraging engagement in the change process and how they were promoting consensus building to overcome mainly cultural barriers (and what those barriers were). As with the first topic interviewees were also asked if there was anything the government should do differently moving forward and if so why did they think that. Section 4.5, Stakeholder Engagement - The Importance of Culture, sets out the results.

The literature review highlights that difficulties in setting up and investing in a suitable national decision and governance structure via a national coordinating body building in a decision making structure across the range of organisations involved in the e-health strategy and providing adequate human resources can impact on a wide range of areas including schedules, stakeholder engagement and consensus building (Deutsch, 2010) (Morrison et al, 2011) (Rozenblum et al, 2011). So in light of that a further topic explored "Governance" in terms of whether the interviewees thought that the governance structure deployed to progress the e-health strategy was appropriate and effective. It also explored the extent to which national human resources deployed to progress the e-health strategy, mainly from NHS England and NHS Digital, were sufficient, of the right type and calibre, whether they were being deployed effectively and whether there was anything that should be done differently moving forward and if so why. Interviewees were also asked if they thought this could be improved, or could other structures work more effectively going forward and if so, why did they think that. The outcome of that discussion is set out in Section 4.6, National Governance and National Resourcing.

As found during the Literature Review the "Implementation Approach and Targets" adopted by an e-health strategy can have a significant impact of outcomes (Robertson, 2010), (Sheikh, 2011), (Greenhalgh, 2013), (Cresswell, 2009). So the next topic explored the approach being used to progress the e-health strategy and how effectively that was working in practice. That included an exploration of the e-health strategy's overall plan and targets [as described by the government] in terms of how appropriate and realistic the targets were and which factors could be given higher or lower priority to meet them, how they could be improved, or could other approaches be preferable, and if so why they thought that. That is set out in Section 4.7, Implementation Approach and Targets.

Finally, interviewees were asked to explore "Factors that the e-health strategy does not address at all, or inadequately" to try to extract views on any areas, thoughts and ideas that haven't already been covered. As a means of stimulating discussion a list of the socio-technical model dimensions and the factors that have been found elsewhere to affect e-health strategies was included with the interviewee instrument ("Socio-technical model – Factors that may affect e-health strategies"). The outcome of those discussions is set out from Section 4.3, Overall Strategy to Section 4.8, Additional Socio-technical Factors.

3.5.8 Interviewee Selection & Process

The interviewee sample size was governed by a number of considerations within this context, including the saturation point (when new data cease to emerge from subsequent interviews as the data collection process unfolds), budget (none, self funded), and time constraints (limited) (Bryman & Bell, 2015), (Silverman, 2013). In view of this a subjective decision was taken based on numbers in similar studies to aim for an initial sample size around 20-25 and review that as the process progressed. Given the highly specialised nature of the topic it was necessary to adopt a purposive sampling approach and pick interviewees who were knowledgeable and well placed to provide the kind of insights the research required (Rowley, 2012), (Silverman, 2013). So a cohort of purposively selected knowledgeable individuals were chosen, split into two sample groups, to fill the gaps identified in Section 2.6, Gaps in the Literature . The first drawn from the supply side and the second from the demand side:-

- Suppliers - Persons working as employees for suppliers of EHR and EHR related software, hardware, services and infrastructure to the NHS in England;
- IT Consultants - Persons working in consultancy roles who have worked, or are working, on projects to implement EHRs and EHR related software, hardware, services and infrastructure in the NHS in England, supplying their expertise to NHS organisations (provision of guidance, intellect and manpower to support healthcare providers).

Two from each took part in the pilot and the remainder in the main data collection process. A total of 22 interviews took place, which is in a similar range to other e-health strategy studies:-

Table 6, Number of Interviewees in Other Studies

Semi-structured Interviews	Interviewees
Murray (2011)	23
Zimlichman (2012)	29
Zwaanswijk (2013)	17

A number of additional interviewees were available, but ultimately stood down, because thematic saturation was reached with the first cohorts and the researcher reached a conclusion that additional data collected would more than likely provide few, if any, new insights (no significant new themes being highlighted) (Leung, 2015) (Morse, 2008). (Saunders, 2012), (Silverman, 2013), (Alshenqeeti, 2014).   Details are shown in Table 7, Interviewee Selection:-

Table 7, Interviewee Selection

Approach Priority	Number approached	Number interviewed	Pilot interviewees	Data Collection Interviewees
1st	26	13	4	9
2nd	38	8	0	8
3rd	43	1	0	1
TOTAL	107	22	4	18

A total of 18 were interviewed during the data collection stage (7 face to face and 11 telephone interviews). A further 4 were held in reserve, but "stood down" when the sample data was deemed to have reached saturation after the first 22 were interviewed. The volume of data was significant. Key statistics are shown below in Table 8, Data Collection Interview Statistics:-

Table 8, Data Collection Interview Statistics

Type of interview	IT Consultants	Suppliers	Total	Words Transcribed	Pages Transcribed
Face to face	3	4	7	92,754	156
Telephone	6	5	11	116,251	166
Total	9	9	18	209,005	322

The interviews took place between September 2016 and February 2017. There were 7 face to face interviews held at a Chester Business School meeting room and 11 telephone interviews for those unable to travel.

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Interviews were recorded with the interviewee's prior permission, to improve subsequent verbatim transcription quality and accuracy. That produced over 209,000 spoken words. Each interview lasted between circa 1.5 hours and 3 hours, with an average duration of close to 2 hours and produced 2,160 minutes of speech to transcribe. That took 288 hours to transcribe onto 322 A4 pages (average of 18 pages per interview). The task was undertaken personally by the researcher in parallel with the interview process and was completed in May 2017. Draft transcripts were sent by email to all interviewees for proof reading. Seven took the opportunity to review drafts and return with small amendments. All interviewees confirmed in writing or via email that they were content with the transcripts and their responses retained as part of the audit trail. The method used also took into account issues relating to reliability, validity, triangulation and research ethics which are described in the following sections.

3.5.9   Justification for the Selection of Supplier and IT Consultants

The justification for selecting samples of IT suppliers and consultants were several. Both groups were very poorly represented, or not at all, in the sample frames of other national e-health strategy studies, as explained in Section 2.6, Gaps in the Literature. That presented an opportunity to make a contribution to filling that gap, rather than repeat the health sector employee based sample frames typical of many previous studies, like (McGinn et al., 2012).   As well as their seniority of role, a further key differentiating reason related the breadth and depth of their professional

knowledge and experience compared to other possible sample groups based on their career history (Rowley, 2012), (Silverman, 2013), as illustrated below:-

Table 9, Interviewees: Years Worked by Sector

HIT = Health Information Technology, DHA = district Health Authority, SHA Strategic Health authority								
Years Worked / Sample Group	In Health Information technology (HIT) for NHS healthcare provider organisations	HIT for DHA, SHA, Regional, National Govt Health IT Agency	HIT Supplier [Software, Networking, IT Service Supplier]	HIT Consultancy	TOTAL YEARS Works(ed) in HIT	Years worked in IT in other sectors	Years worked in IT	Years worked in none IT roles	Years worked
IT Consultants	74	64	10	66	**215**	41	**255**	51	**306**
Suppliers	18	26	135	11	**191**	59	**250**	36	**286**
TOTAL	92	90	145	77	406	100	506	86	592

Those approached had exposure to multiple stakeholder groups and many had multiple sectors experience, in addition to health, that should bring in a broader range of perspectives than those whose careers are solely based within the health sector. They had exposure to multiple NHS stakeholder groups such as IT staff, management, doctors, nurses and patient; several government NHS agencies current and past e.g. NHS England, NHS Digital and Department of Health; healthcare commissioners and providers e.g. acute, community mental health, primary care; multiple health product and services and suppliers; and multiple national and local e-health strategies and associated implementation programmes. In summary, then a view was taken that there was a greater probability that both sample groups should bring a wide perspective and supply a richer data set than, say, NHS employee based samples. By contrast the latter's role typically places them within their employing organisation for several years, increasing the likelihood that their wider perspectives may be more limited by comparison.

3.5.10 Interview Transcript Analysis

The interview transcripts were analysed via a process informed by several studies of national e-health strategies that used Computer Assisted/Aided Qualitative Data Analysis System (CAQDAS) software packages (NVivo 8 or ATLAS.ti) to support analysis (Robertson, 2010), (Rozenblum, 2011), (Sheikh, 2011) (Zinszer, (2013).

The process itself is illustrated below in Figure 16, Thematic Data Analysis Process, informed by Cresswell (2009):-

Figure 16, Thematic Data Analysis Process

```
                    ┌─────────────────────────────────────┐
                    │  Interpreting the meaning of Themes / │
                    │            Descriptions               │
                    └─────────────────────────────────────┘
                                    ▲
                    ┌─────────────────────────────────────┐
                    │    Identify interrelating Themes /    │
                    │            Description                │
                    └─────────────────────────────────────┘
                         ▲                      ▲
                  ┌────────────┐         ┌────────────────┐
                  │   Themes   │         │  Description   │
                  └────────────┘         └────────────────┘
                         ▲                      ▲
                    ┌─────────────────────────────────────┐
                    │  Code Barriers and Facilitators Data  │
                    │  in NVIVO 11 using the Socio-Technical │
                    │    Data Extraction Grid structure      │
                    └─────────────────────────────────────┘
                                    ▲
 ┌──────────────┐   ┌─────────────────────────────────────┐
 │ Validating the│   │            Input the Data            │
 │ accuracy of the│  │  Input transcriptions into NVIVO 11  │
 │  information  │   └─────────────────────────────────────┘
 └──────────────┘                   ▲
                    ┌─────────────────────────────────────┐
                    │    Reading Through Interview Data     │
                    │      Validate with Interviewees.      │
                    │  Prepare for input into NVIVO 11 by   │
                    │  setting up a coding structure that   │
                    │  mirrors the Socio-Technical Data     │
                    │          Extraction Grid              │
                    └─────────────────────────────────────┘
                                    ▲
                    ┌─────────────────────────────────────┐
                    │   Organising and preparing the data   │
                    │        Type up audio recordings       │
                    │  using MS Speech Recognition and  MS  │
                    │                 Word                  │
                    └─────────────────────────────────────┘
                                    ▲
                    ┌─────────────────────────────────────┐
                    │              Raw data                 │
                    │   Audio Recordings of Interviews      │
                    └─────────────────────────────────────┘
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That process of analysing interview transcripts was assisted by NVivo 11 (University of Surrey, 2013), (Lewins & Silver, 2009). That package was used to support "bottom up" inductive coding to analyse the transcripts and map transcript text to "best match" factors (a subjective process) in the socio-technical model data extraction grid and to combine additional themes that emerged from the data (a subjective process, aka template analysis) (Saunders, et al, 2012), (Savin-Baden & Major, 2013). A data item was deemed to exist and entered into the grid when the text "mentions", in the subjective view of the researcher, factors affecting progress of the strategy under study such as barriers and, or, facilitators. Transcript analysis was complete in July 2017.

3.6 Reliability

As this is interpretative exploratory socio-technical research with an ontological position *(a belief about reality)* that there is no one truth "out there" to be found, positivist definitions of reliability are inappropriate (Gill & Johnson, 2010), (Leung, 2015), (Easterby-Smith et al., 2012), (Silverman, 2007). So unlike with positivist reliability definitions, no claims are being made here that this research process will produce similar, consistent, reliable results if used by others to conduct similar studies in the future (Saunders, et al, 2012), (Easterby-Smith et al., 2012). So rather than look at how reliable this research is in that sense, it proposes that it is "reliable" because it is "dependable", "credible", "trustworthy", "fit for purpose", and "auditable" (Guba & Lincoln, (1981) as seen in (Morse, Barrett, Mayan, Olson, & Spiers, 2008) and (Greene, 2014). This is achieved by testing the process as described in Section 3.5.6, Data Collection Pilot Stage, to check the interview instrument for terminology variation and understanding and by the presence of this thesis as a means of supporting future critical scrutiny and assessment (Lincoln and Guba (1985) as seen in Gill & Johnson (2010). As suggested by Saunders et al (2012), this research also addressed concerns about reliability relating to interviewer and interviewee bias. This can arise where the comments, tone or non-verbal behaviour of the interviewer creates bias in the way that interviewees respond to the questions being asked. This was addressed by consciously seeking to adopt a consistent non-directive persona during all interviews and avoiding the use of leading questions (Easterby-Smith et al., 2012).

3.7 Validity

As with reliability, positivist definitions of validity are inappropriate here (Gill & Johnson (2010) so internal validity is replaced by the concept of "credibility" and external validity by "transferability" and "appropriateness" (in relation to the credibility and appropriateness of the tools, processes, and data), (Guba & Lincoln, (1981) as seen in (Morse et al., 2008) and (Greene, 2014), (Easterby-Smith et al., 2012), and (Leung, 2015). Firstly, to improve internal credibility all draft interview transcripts were returned to interviewees for proof reading, and confirmation sought that they were good representations (Guba & Lincoln, (1981) as seen in (Morse et al., 2008). Secondly, in relation to external validity, ("transferability" and "appropriateness"), no claims are made here that the tools and processes used will yield similar results on other occasions, but the researcher was aware that any relevant research context, setting, and cultural context that could impact on the findings should be noted in the transcripts (Guba & Lincoln, (1981) as seen in (Morse et al., 2008) and (Greene, 2014). One item is noted in relation to that in respect to the "Implementation Approach and Targets" topic. The government announced a major reorganisation of the delivery programme structure that coincided with the start of the interview process. Virtually all existing programmes under the umbrella of the strategy were to be replaced by new ones that did not appear to match closely at all. That meant that interviewees were unable to comment on the appropriateness of the new programme structure per se, but it did yield valuable insights and observations from them all on the issues raised by a major restructure during the course of a strategy's lifecycle. Further discussion can be found in Chapter 4, Section 4.6, National Governance and National Resourcing.   Other researchers can then form a judgement on the relevance of findings by considering and comparing contexts.

The researcher is also confident that, firstly, the method is valid for the desired outcome (to identify factors affecting the e-health strategy in the NHS in England), secondly, the choice of methodology set out in this chapter is appropriate for addressing the research questions, thirdly, the design is valid for the methodology and the sampling strategy and data analysis approach is appropriate, and finally the results and conclusions are valid for the sample and context (Leung, 2015).

3.8   Triangulation

To improve the validity of this study, triangulation is used to compare and contrast findings across two data sources.   The first point of triangulation is the secondary analysis of data previously collected during prior peer reviewed studies set out in the literature review, (Cresswell et al., 2013), (Amirhossein. Takian et al., 2012). The second and third is from purposively selected knowledgeable individuals in two groups. Splitting interviewees into two similar sized supply and demand groups supports triangulation through cross comparisons of views and emerging themes. As noted above many studies typically focus on interviewing the demand side (government agency and internal health sector employees) such as Murray, (2011). Studies, by Robertson et al (2010) and Cresswell, (2015) are exceptions and do include a sample group of supplier representatives within their frames, but not independent IT contractors. So this study consciously seeks to add an additional commercial demand side perspective.

3.9   Research Ethics

The ethical principles of autonomy, beneficence and justice were applied to this research (Bryman, 2015), (Morse, 2008), (Pierce, 2008). Interviewees were regarded as autonomous agents rather than simply subjects by seeking their informed consent via completion and signing of a form with supporting documentation that set out the purpose, risks and benefits of the research and that their permission was sought (see Appendix 5, Research Instrument). All interviewees were fully briefed in this regard, both verbally and via an invitation email, to provide an audit trail. Interviewees were also told that they could withdraw at any time and they are assured that their identity will always remain confidential and their anonymity guaranteed.

Under the second principle, beneficence, which seeks to maximise benefits to subjects while minimising harm and risk arising as a result of the research or intelligence gathering, no persons were put at risk, came to any harm, or were subject to any hazards, including emotional and mental distress, no damage was done to their financial and social standing and they were not physically harmed in any way during the course of this research. Telephone interviews were conducted by prior arrangement when the interviewees were able to dedicate their time solely to

that purpose without distraction, either in their normal place of work, or at their home. None were undertaken whilst the interviewees were in transit or driving. All face-to-face interviews were conducted in a meeting room in the Churchill Building at the University of Chester Business School.

Under the third principle, justice, which seeks a fair distribution of costs and benefits associated with the research, no individuals took disproportionate risks or harm while others reaped the rewards. Each participant was asked to donate a proportion of their time to be interviewed, but were not expected to incur any other costs. Those who attended face-to-face interviews did so willingly and did not request any reimbursement for their mileage. All participants were treated equally in that regard. So no financial incentives were offered, or given if requested (none were). Finally the research complied with the Data Protection Act.   As interviewees were drawn from a sample of none NHS employees, so this study did not require local NHS Ethics Committee approval.

3.10 Summary

So having set out the methodology adopted to carry out this research in detail the key elements are summarised in the Table 10, Research Methodology Framework below drawing on a format by Page, (2012):-

Table 10, Research Methodology Framework

Approach to research	Philosophy	Time Horizon	Strategy	Approach	Research Tradition / paradigm	Techniques
Exploratory socio-technical research tradition	Interpretivist	One time data collection / Cross sectional Formative Evaluation – midpoint.	Initial neutral stance. Socio-technical strategy. Draws on some elements and principles of Grounded theory and Change Management Theory	Mix of deductive (Lit Review) and abductive (data collection) builds on available, but incomplete information	Qualitative Socio-technical	Literature Review. . Semi structured interviews. 2 sample groups: 1. Suppliers 2. IT consultants
Ontology - beliefs about reality	Relativist as opposed to realist. Emic constructivist or *verstehen,* methodology adopted [not etic or *erklaren,* research] to obtain knowledge to search for meaning in the experience of those two sample groups, rather than a "truth". Co-constructed (aka socially constructed) using an iterative abductive process.					
Axiology	Bound in values – researcher is part of research – subjective. Research cannot be completely free of personal values. The researcher's own values inevitably introduce bias into the research. These values can be so embedded within the culture the researcher operates within that they can go by without even being noticed					
Epistemology - approach to knowing	Emic - Constructivist methodology based on interactions between and among the researcher and interviewees. A consensus was sought within the findings. Epistemological approach to knowing taken where both are co-authors, or co-creators, of the findings that constructs meaning. Several socially constructed meanings are considered correct. As this is constructivist, the notion was rejected that an objective reality existed and instead this research sought meanings in the experience of participants rather than "the truth". The socio-technical model and associated data extraction grid, evolved as the study progresses as additional factors, concepts and themes emerged. That in turn led to the development of new knowledge and propositions.					

In summary, this formative study took place within the context of an interpretative research philosophy and socio-technical research strategy. This socio-technical systems perspective views technology adoption within the context of a wider social system consisting of not just a technical dimension at the core (the tools and technologies that support and enable work processes), but also interacting human, social, organisational, macro-environmental and wider socio-political dimensions.

Many researchers argue that an e-health strategy's successful outcome, depends on recognition of, and successful navigation through, not just the technical, but barriers and facilitators linked to all those other dimensions as a strategy progresses through its lifecycle.

A research strategy was framed by beginning with a neutral socio-technical model, as opposed to a proposition based one (where one or more dimensions are seen to be more influential that others and evidence is sought to disprove that). This neutral stance sought to induce which socio-technical dimensions may be more or less relevant, and in what way, and why, as they emerge from data analysis (which in turn was used to generate insights that could be transferable to others and propositions). So this research is informed by some elements of Grounded Theory, but not all as this study began a deductive literature review first with top down thematic coding informed by socio-technical principles. It also drew on elements of Diffusion of Innovation and Change Management Theory to illustrate that e-health strategies can typically be bound by time constraints and date related targets to illustrate that they are not static entities, but exist and change through time and that factors affecting their progress can vary in their presence and impact as time passes.

A socio-technical data extraction grid was developed from prior studies and literature was reviewed and analysed supported by that grid. This identified a range of factors and higher level themes that affect the progress of e-health strategies which can be found in Chapter 2, Literature Review. Those themes were carried forward into the development of an interview instrument whose form and language was also influenced by a content analysis of purposively selected e-health strategy government reports. Data was collected from interviews with two sample groups of Suppliers and IT Consultants, analysed using the same socio-technical data extraction grid used for the literature review, to identify factors influencing the adoption of the e-health strategy in an iterative abductive process. These are set out in Chapter 4, Data Presentation and Analysis, which follows. The socio-technical model and associated data extraction grid, evolved as the study progresses as additional factors, concepts and themes emerged. That in turn led to the development of new knowledge and propositions which are set out in Chapter 5, Conclusions and Implications.

4   Data Presentation and Analysis

4.1   Introduction

This chapter presents the data analysis results from the interview process as described in Section 3.5.8, Interviewee Selection & Process, to address Research Question 3: "*What factors affect the adoption of the e-health strategy in the NHS in England?*" This chapter presents and analyses the data collected. The following Chapter 5, Conclusions and Implications, summarises the findings from this chapter within the context of the prior research set out in Chapter 2, Literature Review, and identifies whether this research agrees, or disagrees, with that prior research and why. A number of co-constructed "do differently" suggestions, were also developed with interviewees to provide data for Research Question 4, "*What insights, experiences and lessons could be used to inform future plans for the e-Health strategy, and other national strategies in other countries?*" An analysis of those is set out in Chapter 5, Conclusions and Implications, primarily in Section 5.5, Research Question 4: Informing Future Plans. Appropriate cross references linking issues raised here to the "do differently" suggestions are included in this chapter.

The Interview topics began with a discussion entitled "Checking Understanding" and the remainder mirror the main themes drawn forward from the Literature Review:-

1. "Overall Strategy".
2. "Stakeholder Engagement".
3. "Governance and National Resourcing of the e-health strategy".
4. "Implementation Approach and Targets".

A final ''safety net'' open topic, *"Factors that the e-health strategy does not address at all, or inadequately"*, was designed to give interviewees an opportunity explore any other factors that they felt had not been addressed at all, or inadequately during earlier parts of the interview process (using the Socio-Technical Model as an agenda guide to stimulate discussion). Further details can be found in Appendix 5, Research Instrument. An overview of the results follows.

4.2   Interview Transcript Analysis Results

With the exception of one factor ("Medico-legal issues") all other factors in the socio-technical model informed by the Literature Review were identified by varying numbers of the IT Consultants and, or Suppliers sample group as factors affecting the progress of the e-health strategy to a greater or lesser degree.. Further discussion on the implications of that can also be found in Chapter 5, Conclusions and Implications, in Section 5.3, Research Question 2: Factors affecting e-Health Strategies.

The interview topic order is largely mirrored in this chapter. However, as should become clearer, the findings reflect the themes drawn out from the data analysis process. These reflect the highly inter-related influence of the many factors that make up the Socio-Technical Model and some new ones. So, for example, Section 4.3, Overall Strategy, does retain the same interview instrument topic heading and explores factors affecting that.

However, Section, 4.4, Clinical and Social Care Workflow Improvement, is new to give appropriate emphasis to a major issue that arose from the data analysis process. Interviewees from both groups felt strongly that the government had shifted the emphasis of the delivery programme away from the strategy's original intent. Specifically, to focus on the "electronic glue", aka interoperability, and inappropriately towards single organisation "Centres of Digital Excellence" (CODE) sites. They felt they should be focussing on multi-organisational health and social care economy based ones with a focus on interoperability related programmes as a vehicle for achieving that.   Following that Section 4.5, Stakeholder Engagement - The Importance of Culture, reflects an additional major finding about the vital importance of addressing a key element of engagement relating to "culture", especially aspects relating to clinical engagement. Those included problems reaching out to the "unconverted", "not engaged" and neglected key, stakeholders, the negative credibility effect on intended end users of adhering to unattainable national targets, the need for credible local Champions, the provision of training and support and local engagement issues caused by information overload.

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Section 4.6, National Governance and National Resourcing, remain as themes with a focus on inadequate stakeholder representation on governance bodies and the adverse impact of "midpoint" internal government reorganisations on progress. For similar reasons the anticipated discussions about the topic set out in Section 4.7, Implementation Approach and Targets, did pose a number of unexpected challenges due to a major programme re-structure announcement by NHS Digital that coincided with the start of the interviews (September 2016). This re-structure replaced all the "Aspiration" based programmes set up from the start of strategy in 2015, (National Information Board, 2015b), with ones based on "Delivery Domains". Interviewees felt that that occurred before any of the "Aspiration" based ones had reached a stage where they could meaningfully deliver progress (National Information Board, 2016). All that was available were "Delivery Domains" programme headings with no detail, so interviewees felt unable to judge the new programme structure in the way intended, but did offer many insightful observations and suggestions on the consequences of such changes if they occur so early on in a strategy's lifecycle. Some new factors not evident in previous studies also came to light during discussions. As such these represent new knowledge and further discussion on the rationale for including those factors in the model can be found in Section 4.8, Additional Socio-technical Factors. All of these results provide some valuable insights on the issues faced by the e-health strategy that are drawn forward from this chapter and are explored further in Chapter 5, Conclusions and Implications.

4.3 Overall Strategy

4.3.1 Introduction

Beginning then with "Overall Strategy", interviewees were asked to explore the extent to which the e-Health strategy adopted by the government is an appropriate way of stimulating adoption, or whether interviewees felt that an alternative strategy could be better and, if so, why they felt that.   As explained in Section 3.5.8, Interviewee Selection & Process, interviewees, as knowledgeable individuals, were encouraged to draw on and recall their experiences of the e-Health strategy. Given the length of interviewees' careers, many also drew useful comparisons from previous experience of other national strategies going back many years.

To provide some initial structure as to whether the strategy was "appropriate", Coiera's (2009) classification of national government strategies was used to help frame the discussion following testing of that as described in Section 3.5.6, Data Collection Pilot Stage. To briefly recap, strategies are classified by Coiera as either "top down", "middle out", or "bottom up" along a spectrum with blurred boundaries. Interviewees were all comfortable with Coiera's 'bottom up'' and ''top down' classifications. These had entered their normal vocabulary as terms applied to previous national strategies they recalled during discussions and which are briefly introduced in Section 1.1, Background, such as the "bottom up" HISS and ERDIP and "top down" NPfIT strategies. They associated less so with the term 'middle out'', being unfamiliar with that prior to interview, but through discussion, they recognised it as being a variable mix of elements drawn from both "top down" and "bottom up". It did attract alternative label suggestion of *''hybrid approach''* from James, *"mixed approach"* from Harry and *"consensual approach"* from Glen.

To explore whether the strategy was more or less "appropriate" interviewees were encouraged to consider whether it was actually needed at all, and if so why. In other words whether there was a need to use an e-health strategy to facilitate change. To provide some structure, the discussions drew on elements of the Technology Lifecycle Model put forward by Cresswell (2013) as illustrated in Figure 17, Technology Lifecycle Model:-

Figure 17, Technology Lifecycle Model

Informed by Cresswell (2013)
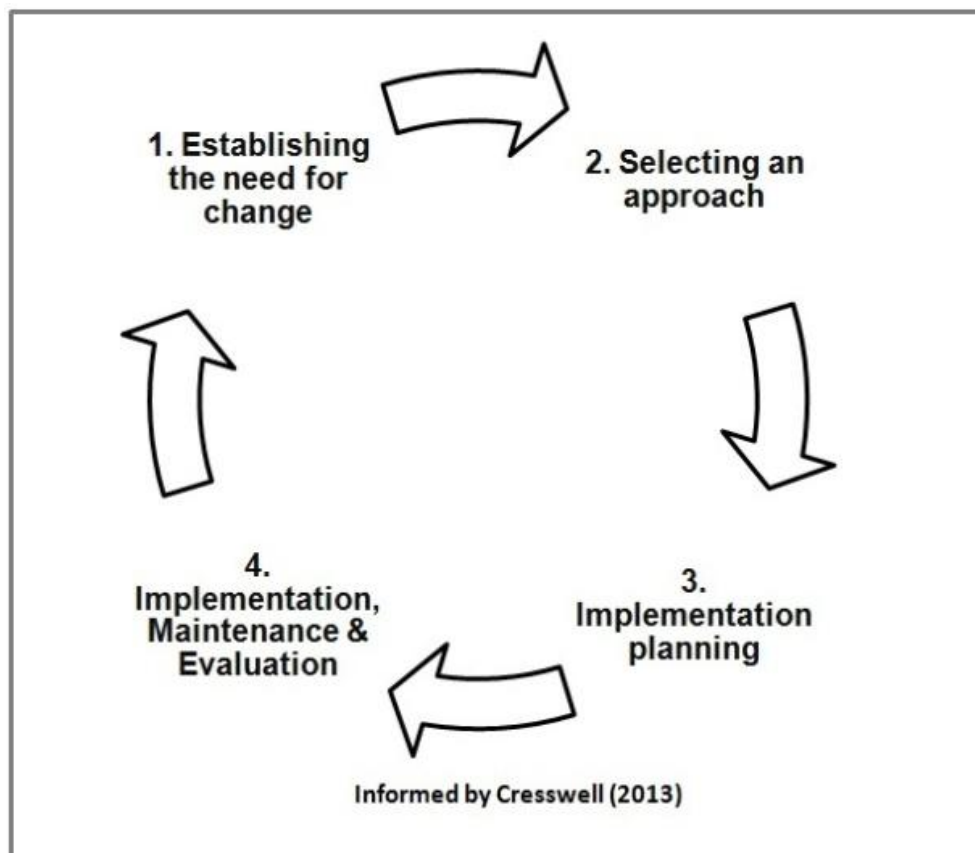
Results are summarised in Section 4.3.2, Establishing the need for change, followed by Section 4.3.3, Selecting an Approach Conclusion

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4.3.2 Establishing the need for change

In terms of stimulants on government that establish the need for change, interviewees expressed these in terms of perceived barriers, problems, issues and pressures faced by government that in turn lead to a strategic response of which the e-health strategy is a component. Interviewees all suggested that NHS e-health adoption continues to lag behind almost all other sectors. Interviewees also unanimously perceived that the majority of clinicians are generally conservative in nature and resistant to change, which translates into slower adoption of e-health technologies at a local organisational level.

So government intervention to stimulate change is required, in their view, to speed up adoption, which they all viewed as a desirable change. They all concurred that the most appropriate adoption stimulation vehicle for that is the e-health strategy itself (as an important element within an overall health sector government policy) and that the strategy's aim should be to increase the pace of change.

In other words, no interviewees felt that the government should withdraw from the field and leave e-health adoption entirely to the NHS to take forward with no form of government intervention. Although several reflected that their income as suppliers and IT consultants did rely on government funding arising from such strategies to some significant degree and acknowledged their vested interest in the strategy's continued existence.

They also felt that its existence also allowed government to be politically seen to be taking action to address a number of pressures they perceive exist which are listed in Table 11, Stimulants on Government, below:-

Table 11, Stimulants on Government

Ref	Stimulants as perceived by interviewees- strategies are needed because:-
1	NHS e-health adoption continues to lag behind almost all other sectors
2	Clinicians as generally conservative in nature and resistant to change
3	Slower adoption of e-health technologies at a local organisational level
4	Healthcare expenditure rising … Ageing population.
5	Consumer expectations are rising
6	Pressure to provide more and better healthcare services to more people.
7	Greater demands on the healthcare system.
8	Financial pressures are increasing
9	Medical technology advances - more interventions possible
10	Tough choices - raise revenue - increase taxes, increase borrowing &/or improve efficiency to slow rate of increase in costs.

These stimulants are most closely associated with the socio-technical macro-environmental factor "*The wider economic environment & pressures*" as derived from the literature review. However, several of these stimulants are not all strictly economic so this factor has been adjusted slightly to reflect that new insight to the following:-

"*Wider economic, political and social environmental pressures*".

4.3.3 Selecting an Approach – "Top Down" v "Middle Out" v "Bottom Up"

Drawing on their current and past experience, interviewees universally recognised that the strategic e-health response by governments to the above stimulants has differed over time. The discussion was framed using the "top down", "middle out" or "bottom up" definition of e-health strategy types (Coiera, 2009). They were the most comfortable with Coiera's proposition that a "middle out" strategy is the most effective response. That is characterised as leaving the choice of EHRs to local healthcare provider organisations, to facilitate local ownership and commitment, with government providing support via national data and messaging standards, national systems to facilitate interoperability, resources, governance, funding, guidance and support to transfer lesson learnt, often via pilot projects. Unlike "top down", interviewees felt that "middle out's" major advantage is that it does not typically dictate to local organisations which EHRs they can choose. Both sample groups unanimously felt that allowing local choice of EHRs significantly reduces the risk of end user rejection. There was wide agreement among interviewees that central control of several elements is appropriate (overall strategy formulation, target setting and monitoring, funding support to local organisations and its allocation, setting national standards and the provision of national systems and networks are appropriate facilitators). They rejected "top down" central selection of EHRs for local deployment, citing NPfIT as a costly example of that. Here are some example quotes:-

> "*NPfIT primarily failed because it was overly centralised and monolithic*": James

> "I*t did not buy systems that were proven to exist, so they bought vapourware essentially*": Phillip.

> "*NPfIT tried to impose a one size fits all onto a very disparate and fragmented set of organisations":* Phillip

4.3.4 Conclusion

In summary, interviewees were all content that the strategy fits within a "middle out" classification and did not see a need to shift that into either "top down" or "bottom up" classifications. Remaining sections within this chapter set out issues about particular aspects of the strategy that interviewees felt should be addressed, but none of those, if addressed and action taken to implement changes, move it into a different classification. Those issues are set out in subsequent sections below and several "do differently" suggestions to address those are set out within Chapter 5, Conclusions and Implications, Section 5.5, Research Question 4: Informing Future Plans. In terms of why they felt "middle out" was better than "top down" or "bottom up" strategic approaches, all interviewees, again whether they were IT Consultants or Suppliers, consistently pointed towards factors in the Human & Social Dimension of the Socio-technical Model, and especially the factor "*Cultural attitudes, expectations and, concerns*", and the ability of "middle out" to balance those with national priorities. As Lewis put it:-

"….*the biggest single factor in success has got to be the people.*"

Finally, interviewees felt that the strategy's focus had, however, recently become too centred on single organisation CODE sites and not sufficiently focussed on its original strategic aim, the "electronic glue", to facilitate clinical & social care workflow improvement. These issues are explored further in the following section.

4.4 Clinical and Social Care Workflow Improvement

4.4.1 Introduction

Whilst the "middle out" strategy was seen by all interviewees as culturally more acceptable at a local level, because local organisations can choose their own EHRs, attempts to improve clinical and social care workflow by sharing structured patient data electronically more widely across multiple care settings, organisations and stakeholders were unanimously seen by interviewees as much less successful. So, whilst this was not a specific interview topic initially in its own right, it has been drawn out into its own section as a way of reflecting that importance. To quote, an interviewee from the supplier group, Glen:-

"*The biggest issue that runs through this, whether you are top down, upside down or inside out it doesn't matter, they work on standards, they work on interoperability standards, and they are not compulsory".*

Interviewees felt that most patients think that their data is already being shared across healthcare providers and are surprised that that is rarely the case. Karen's observation is typical of the kind of comments made:-

"Patients haven't got a clue what's going on. They assume that all the EHR systems are already connected. They assume that when they go into Accident & Emergency Departments that people will know their medical history. They assume that everything is sorted already, because the rest of society has already sorted it, and they are horrified that it is not."

Interviewees also observed that, even when interoperability systems and standards exist, local healthcare providers do not always adopt them fully, with many still using traditional paper based, fax or proprietary NHS email based routes. This observation finds statistical support in subsequent analyses of public domain government data on "Digital interactions between primary and secondary care" collected by survey from 209 CCGs in 2017 (NHS England, 2017). That data indicates that digital message flows between GP practices and other healthcare providers in a CCG area vary from 39% to 82% of all messages, with an average of 64%. That provides an indication that an average of around one third of patient related clinical messages between GPs and hospitals did not flow digitally. That is despite the presence of national data standards, national infrastructure, national systems and various local or regional EHR portals and data exchange systems being in place to facilitate those. Examples of national systems include GP2GP, the Electronic Prescribing System (EPR2), Electronic Referral System (eRS), the Message Exchange for Social Care and Health System (MESH), and Summary Care Record (SCR). An unknown proportion of the two thirds that are digital, such as e-discharge summaries, may not be compliant with national standards for data and structure (NHS England, 2017).

In addition, interviewees were aware that the scale and volume of patient information flows generated within and between healthcare provider organisations is perhaps not fully appreciated. They perceived that there seemed to be a lack of focus on the highest volume information flows that need to be either pushed from one clinicians and organisation to another to initiate an action along a patient's care pathway, e.g. GP referrals, discharge summaries, or pulled on demand to inform clinical decision making. With regard to the latter interviewees noted that it can often be difficult to predict which previous datasets may be relevant in the future. So a strategy that focusses on interoperability projects and systems to facilitate on demand pulling from one EHR to another may be more beneficial than one that just aims to deliver a national pre-defined summary care record EHR (which assumes which subsets are relevant). Subsequent analysis indicated that there could be well over 2.9 billion patient events per year in the NHS in England, which currently generate multiple sets of patient level data. These can be passed internally and externally, between clinicians and organisations and increasingly patients. Some are sent on paper. some electronically using various proprietary systems and messaging standards and some using national standards. That is illustrated in below:-

Table 12, Examples of High Volume Clinical Events

NHS in England	Per Year
GP appointments (NHS Digital, 2018a)	307,000,000
GP Referrals (NHS England, 2017b)	3,523,000
Other Referrals (NHS England, 2017b)	2,173,000
Discharge summaries (NHS Digital, 2017d)	19,700,000
A&E attendances (NHS Confederation, 2017)	23,372,000
Outpatient clinic attendances (NHS Confederation, 2017)	89,430,000
Contacts with specialist mental health services (NHS Confederation, 2017)	1,826,000
Outpatient & community contacts - mental health (NHS Confederation, 2017)	21,034,000
Patients on waiting lists (NHS Confederation, 2017)	3,783,000
Operations ('procedures and interventions') (NHS Digital. 2017d)	11,893,000
Pathology tests (NHS Improvement, 2017)	1,120,000,000
Radiology Diagnostic Imaging (NHS England, 2017a)	42,100,000
Prescriptions Dispensed in the Community (NHS Digital, 2018b)	1,105,800,000
Allied Health Professionals contacts (Royal Society for Public Health, 2018)	208,000,00
Approximate Annual Total	**2,959,634,000**
Note: the above statistics do not always relate to the same time period and are from several sources. This is intended to covey an idea of scale, not a precise measure. All statistics are annual and rounded to nearest 1,000.	

In addition to over 2.9 billion events estimated above there are many others arising other contacts of patients, e.g. with nurses, social services, private sector organisations provided NHS funded and private patient care and diagnostics, as well as palliative care, nursing homes and residential and supported living organisations (such as those supplied by charitable organisations).

A key point being made here is that some of the data generated as a consequence of these events could provide valuable insights if available to other clinicians involved in a patient's diagnosis and care as patient's progress along their current and future health and social care pathways. The general view was that that ability, to look back to see what has been, to inform what action is needed going forward, is key, but severely lacking at present due to difficulties accessing paper based and EHR data, or not being able to access any at all. Also interviewees observed that, in terms of what to share and what not to share with other clinicians, it can be very difficult to predict the future value of data at a point in time. The value and significance of it may not become apparent until the patient presents with a condition where past trends in the data may support better decision making on treatment going forward. That in turn has implications as to whether to push or pull certain data sets.

In the case of EHR data access, interviewees felt that was frequently impeded by clinicians putting too much emphasis on objections and concerns about threats to patient confidentiality. That led to the co-construction of major "do differently" actions which are expanded upon further in Chapter 5, Conclusions and Implications. That includes, in Section 5.5.4, Focus on "Community Wide Interoperability" CODE Projects, to show the art of the possible and Section 5.5.5, Mandate National Standards and Systems, to develop, test and mandate national data push (EDI) and pull (API's) data interchange standards for all major clinical workflows and ensure they are adopted by all over time and to address cultural issues as set out on Section 5.5.6, Encourage More Inclusive Clinical Engagement. Section 5.5.7, Establish One National Interoperability Department, also suggests changes to national organisation structures to maximise the effectiveness of the manpower resources available to take this forward.

4.4.2 The Problem of Strategic Drift

That view on interoperability standards and data sharing is perhaps surprising, because a key theme of the e-Health component of the "*5 year Forward View*" was to promote those (NHS England, 2014) page 32:-

> "*In future we intend to take a different approach. Nationally we will focus on the key systems that provide the '**electronic glue**' which enables different parts of the health service to work together. Other systems will be for the local NHS to decide upon and procure, provided they meet nationally specified interoperability and data standards.*"

This emphasis on developing plans across "*health and care economies*" that span multiple care setting and stakeholders was amplified in "*Personalised Health and Care 2020*" (National Information Board, 2015a) page 5.: -

> "*Clinical Commissioning Groups will be required to submit their plans - local digital roadmaps - for how their local health and care economies will achieve the ambition of being paper-free at the point of care by 2020*".

A number of interviewees commented that the strategy had since acquired an inappropriate nick name, in their view, of "*Paperless 2020*" and many hospitals were investing limited resources in internal, inward facing, document scanning projects. Those were digitising paper medical record libraries using a variety of proprietary software, technical, data, format standards and indexation methods in the absence of any national ones. Interviewees felt that that was at the expense of '*electronic glue*' projects to digitise health and social care workflows, especially across organisational boundaries to eliminate paper and proprietary electronic communication. Several interviewees cited the "Meaningful Use" national strategy in the USA as a good example of mandating the local use of national standards and national infrastructure in the form of Health Information Exchanges (HIEs), with compliance being linked to government conditional funding provision and financial contractual penalties for non-compliance. That led to a co-constructed "do differently" suggestion that the government should put effort into re-dressing that drift publically

and practically, which is expanded upon in Section 5.5, Research Question 4: Informing Future Plans.

4.4.3 The "Wachter Review"

Also all interviewees discussed the "Wachter Review", an evaluation of the strategy the government had initiated in 2015 (Department of Health, 2015). That was published in August 2016 immediately prior to the start of the interview process and so, contextually, it was a major topic of interest and discussion during interviews (Department of Health, 2016). The discussion with interviewees centred on a new policy addition to the e-health strategy arising directly from that review's recommendations known as the "Centres of Digital Excellence" (CODE) Programme (to select and invest in a small number of acute hospital pilot sites with the most mature EHRs according to their national Digital Maturity Index returns), The government planned to half fund those pilot sites to develop their EHRs further and showcase the results to all, as well as promote the replication of the outcomes at selected half funded "Fast Followers".

Whilst interviewees were pleased to see what might be a new source of government funding, which many of them would ultimately hope to benefit financially from, a major finding was that they were perplexed by the strategic drift represented by the new CODE Programme with, at the time, its focus on acute hospitals. They drew comparisons between that and previous less successful e-health strategies, such as HISS and ERDIP (in the sense that they did not result in many other hospitals replicating the lessons learnt by a small number of nationally funded pilots). To them, the CODE programme signalled an inappropriate shift in emphasis away from that of the original "5 Year Forward View" and the subsequent e-health strategy with its focus on "electronic glue". To redress that shift a number of "do differently" suggestions arose that are all aimed at promoting workflow improvement across organisational boundaries. These are set out in Chapter 5, Conclusions and Implications.

4.4.4 Interoperability Standards Development and Enforcement

Just as significantly, interviewees also felt that the government were not putting enough resources into standards development and in making interoperability

standards mandatory for all and that the resources they had were split across different departments. Neither were they adequately enforcing and monitoring compliance using levers such as the NHS Standard Contract Commissioning for Quality and Innovation framework that supports improvements in the quality of services and the creation of new, improved patterns of care (aka CQUINs targets), including standards compliance in Care Quality Commission (CQC) Audits and monitoring deployment via the periodic Digital Maturity Index Returns.

Interviewees also observed that, even where the government are actively promoting electronic interchange, like for discharge summaries, local organisations still have wide leeway to implement local proprietary standards and approaches which gives rise to a plethora of incompatible variations and systems. John for example, recalled that one of their customers [an NHS hospital], like many others they deal with, had paid his company to develop and implement five different e-discharge summary standards required by the five NHS Clinical Commissioning Groups in their geographical catchment zone, because of lack of national enforcement of one standard, commenting:

"*There should be one way and everybody should be following it*".

Interviewees also observed that, even when interoperability systems and standards exist, local healthcare providers do not always adopt them fully with many still using traditional paper or email based routes.

Interviewees did highlight major problems arising from having various separate national departments working on interoperability message standards and deployment, information governance, and data coding standards in both NHS England and NHS Digital rather than having just one "interoperability" department within NHS Digital. "Do differently" suggestions to address these issues are set out especially in Section 5.5.7, Establish One National Interoperability Department, and Section 5.5.5, Mandate National Standards and Systems.

4.4.5 Multiple National Transformation Initiatives

In addition, *a*ll interviewees felt that there were too many government process improvement and transformation initiatives that competed, not just among themselves, but also for scarce local resources, especially from IT. Those identified included the Sustainability & Transformation Programme (STP) being run by NHS England under the banner of their New Care Models Programme, various Lean process improvement initiatives and Accountable Care Organisations (ACOs) pilots. All of these, like the e-health strategy, focus on similar areas, such as clinical and social care workflow improvement within and across organisational boundaries (NHS England, 2018). Co-constructed measures to address this issue can be found mainly in Section 5.5.8, Look for Synergy across Transformation Initiatives.

4.4.6 Conclusion

The original aim of the e-health strategy set out in the original "5 Year Forward View" was to focus on the 'electronic glue' to enable different parts of the health service to work together. Despite that, interviewees perceived that a strategic drift had occurred and pointed to local inward facing "*Paperless 2020*" projects scanning paper medical records using disparate standards [in the absence of any national ones] and a few single organisation "Wachter Review" CODE sites. They questioned whether there was a wide appreciation at national level of the vast quantities of patient data [generated from upwards of 2.9 billion patient events per year] that is generated in the NHS every year that that "electronic glue" should be seeking to link together. However much of that core data is recorded in paper medical record files and, or, remains isolated in local EHRs, and, as long as national interoperability standards do not exist, and if they do, as long as they are not compulsory and not enforced effectively, that situation is unlikely to change as rapidly as it could if more proactive action was taken. Interviewees were aware, however, that there are several national "building block" systems in place with supporting infrastructures and national manpower resources to enable the government to take forward the interoperability agendas to the next "compulsory use" level.

However, they felt that the government resources dedicated to standards development were inadequate and too split across different departments. Neither was the government adequately using levers and feedback loops effectively like

CQUIN targets, CQC Audits and Digital Maturity Returns. They also observed that there are many government process improvement and transformation initiatives, such as STPs, Lean and ACOs, competing, not just among themselves, but also for scarce local resources, especially from IT. These perceptions led to the generation of several "do differently" suggestions, all aimed at improving clinical and social care workflow by sharing structured patient data electronically more widely across multiple health and social care settings, organisations and stakeholders.

It also became clear during the data analysis process that several factors identified by interviewees whilst discussing several topics, and especially the "Stakeholder Engagement" question, have a major cultural theme running through them. That is explored further in the following section.

4.5 Stakeholder Engagement - The Importance of Culture

4.5.1 Introduction

The interview instrument included a list of stakeholders (derived from the Content Analysis of government reports) which includes those shown in Figure 18, e-Health Strategy Stakeholders, below:-

 Figure 18, e-Health Strategy Stakeholders

Interviewees observed that they were seeing government engagement with the above through a range of channels and mechanisms and recognised the role that that played in addressing cultural issues.   Both the IT Consultant and Supplier groups recognised the channels and mechanisms that were being used and appreciated the scale of the task facing the government. All interviewees recognised the scale of the government's engagement task, which George, for example, illustrated well, noting that in addition to over 7,400 GP Practices :-

> *"There are 458 different NHS organisations out there that I know of. So that is 458 individual people at Chief Information Office level that you've got to know".*

4.5.2 Reaching the "Unconverted" and the "Not Engaged".

Interviewees recognised that engaging with CIOs and IT staff is only one aspect. As a major theme interviewees recognised, from their own experience and observations, that many stakeholders, and they especially highlighted clinicians, can lack the motivation, capacity, or interest, to engage with government efforts,

especially in terms of reading media and attending face-to-face, or virtual, project briefings and meetings and knowledge sharing conferences. There was a feeling that most clinical engagement activities had little value, because they tended to only attract a very small minority of "converted" clinicians who are already enthusiastic about IT, typically the CCIO, but not the vast majority that matter. Namely, the "unconverted" and the "not engaged". So whilst there were many and varied opportunities available, interviewees generally felt that "unconverted" stakeholders can feel they are too busy, or perceive they have other higher competing clinical priorities and can choose not to participate. Harry and Lewis for example, both note that one possible explanation for this could be that the "unconverted" can view "EHRs" as an unnecessary disruption. Interviewees consistently highlighted a perception that engagement activities should therefore focus more attention on addressing doctors' concerns over patient data confidentiality and patient consent. A range of "do differently" suggestions are set out in Section 5.5.5, Mandate National Standards and Systems, to make that intent clear to clinicians and Section 5.5.6, Encourage More Inclusive Clinical Engagement, to address the engagement gap.

4.5.3 Negative Effect of Unachievable targets

Interviewees also perceived that engagement effectiveness was being negatively affected by what they unanimously viewed as unachievable "paperless by 2020" targets. The government's continued political adherence to those, when interviewees consistently felt that that they were completely unrealistic and unattainable, was adversely affecting the local credibility of the e-health strategy itself. Interviewees recognised that the "message" can sometimes become diluted to the point of being ignored and, as a result, lessons that are meant to be learnt from pilot sites don't always get translated into action elsewhere. Suggestions to address that can be found in Section 5.5, Research Question 4: Informing Future Plans.
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4.5.4 Presence and Influence of Champions

Cultural considerations were very much to the fore. All interviewees felt strongly that the presence and influence of champions employed within healthcare provider organisations was crucial to counter cultural barriers put up by their clinical colleagues. They felt that effective champions could act as a positive facilitator,

promoter and problem solver to progress the national strategy within specific local healthcare organisations. Interestingly, one interviewee felt that "clinical champions", in their experience, were too often wrongly chosen for their "geek" characteristics as amateur dabblers in computer programming (viewed as a negative attribute), rather than their ability to lead opinion forming to persuade their colleagues and promote the strategy within their local organisations. Suggestions in relation to this are set out in Section 5.5.6, Encourage More Inclusive Clinical Engagement.

4.5.5 Insufficient Investment in Local Training and Support

Again, especially to address cultural issues, the majority of the IT Consultant group especially, who were involved in supporting local NHS organisations, highlighted the lack of major national investment in end user training and support locally. They could see investment in CIO, CCIO and project teams but they felt that insufficient training and support was available to increase general awareness among other stakeholders of opportunities to improve flows of patient data between organisations. Several commented that clinicians typically work in their field for all, or much, of their careers, such as in Pathology, as a GP, or as a surgeon, often in a small number of healthcare providers, and, as a consequence, may not fully appreciate the implications of paper based or proprietary digital information flows after the patients move on to others along their care pathways.   Interviewees felt that a lack of case studies, site visit opportunities and the dearth of evaluation studies could be addressed via the suggestions set out in Section 5.5.4, Focus on "Community Wide Interoperability" CODE Projects.

4.5.6 Problems with Stakeholder Information Overload

There was a perception that stakeholders are receiving mixed inconsistent messages from several government sources, such as the Department of Health, NHS England and NHS Digital. Then within those organisations, from various departments tasked with promoting other national strategies and programmes with digital and EHR implications (such as NHS England's Sustainability & Transformation Programme and Lean process improvement initiatives). Different parts of NHS Digital programme teams also appear to be issuing messages that can conflict with those from others. Collectively these messages can be voluminous when viewed from the perspective of their intended audiences. They can include

official press releases, letters to Chief Executives, reports, programmes updates, web content, guidance, conferences and various other channels initiated via press releases. That volume can lead to information overload as recipients try to sift, digest and prioritise those internally, especially as they have their "day jobs" to do as well. This perception is put well by James, referring to overloading of local staff by the many disparate communications they received from the government about aspects of the strategy:-

> "*Their communications and engagement is incoherent. So you will get NHS Digital communicating in one way, NHS England communicating in another way, and individual projects within that communicating in all different ways. So I think the coherence of their communications and stakeholder engagement is very fragmented. Hence this overload thing I think..*"

Interviewees recognised that this could be a difficult factor to alleviate, but suggestions to address this were considered and can be found in Section 5.5.8, Look for Synergy across Transformation Initiatives, and Section 5.5.10, Replace CCGs Planning Role with Regional e-Health Tiers, to help filter communications and make them more relevant locally.

4.5.7 Upsetting the Moral Order

Finally, interviewees also consistently felt that progress towards sharing data across organisational boundaries was being frustrated by concerns about information governance, especially from doctors' representative bodies about perceived threats to patient data confidentiality and inadequate patient consent. Interviewees felt that a lack of national clarity on a common Opt-out Model for patients (as opposed to opt in) was adding to those. Some interviewees felt that those concerns were a mask, hiding more powerful vested interests to prevent the opening up of access to patient data, which could reduce clinicians' power as traditional gate keepers of that. That perception lends support to the proposition put forward by McLoughlin et al., (2017) that this, and other e-health Strategies, fail to make the progress initially expected, because they upset the moral order, especially among doctors as gatekeepers of patient data, who then seek to delay progress as a consequence, not necessarily via active opposition, but by fighting for patient interests, when it is really their own they

are protecting. Suggestions to address this are set out in Section 5.5.6, Encourage More Inclusive Clinical Engagement.

4.5.8 Conclusion

In summary this section sets out a range of issues relating the way that the government has engaged with stakeholders. That includes problems reaching the "unconverted" and the "not engaged"; the negative effect on engagement effectiveness of sticking with e-health strategy targets that are widely perceived by many other stakeholders to be unachievable; not engaging with some key stakeholders, the need for credible local Champions and in training and support and finally, problems caused by voluminous, disparate, communications, via many channels, that can lead to stakeholder information overload at a local level. However, several interviewees cautioned that many of these behaviours are well engrained within the national government culture and that changing behaviours would be problematic and difficult, especially if all of those government agencies and departments remain separate and intent on pursuing and publicising their own programmes. Despite that lack of optimism a number of "do differently" suggestions to address these issues can be found in Section 5.5.6, Encourage More Inclusive Clinical Engagement, which could perhaps make some difference if implemented.

4.6   National Governance and National Resourcing

4.6.1 Introduction

This interview topic explored the extent to which the governance structures and national resources (staff and funding) arrangements that were in place at the time to promote the e-health strategy were appropriate and effective.

4.6.2 Mixed Reviews on Governance Structures

Like the Literature Review, interviewees consistently felt that having appropriately structured and resourced government bodies in place to make strategic policy and implementation decisions, see that those are cascaded up and across at national level and downwards to local level and implemented, are an essential component of an e-health strategy. The interviews explored the governance roles played by National Information Board (NIB), NHS England, NHS Digital and Clinical Commissioning Groups (CCGs). At the time the interviews took place NHS England

had responsibly for strategy formulation and policy and NHS Digital for implementation of that, with CCGs responsible for Local Delivery Plans (LDPs), although interviewees noted that there appears to be a blurring of boundaries between these.

4.6.3 National Information Board

Discussion about the National Information Board (NIB), with over 60 members highlighted mixed views across sample groups. Half the interviewees saw it as a useful forum to effectively engage with stakeholders and half did not. Those who favoured it thought that it was a useful forum to secure consensus, whilst recognising that the real policy making power belonged to NHS England, feeding down through NHS Digital to various Delivery Boards for each programme that notionally sit beneath the NIB. Those who did not favour the NIB saw it as overly complicated and cumbersome with too many organisations and people represented. They favoured a slimmed down arrangement to facilitate speedier decisions.

Several interviewees felt that, whilst the National Information Board representation included a large range of stakeholders (29) via its 61 members, there was no explicit interoperability standards body representation, such as from the Royal Colleges Professional Records Standards Board, (PRSB)**,** IHE UK, or HL7 UK, or the British Computer Society Health Informatics Group. That did not reflect the suggested shift of emphasis towards clinical and social care workflow improvement and the underpinning interoperability initiatives required to support that.

Similarly, whilst "Industry" was recognised by government as a stakeholder and NHS Digital were seen to be engaging directly with them, interviewees note that NHS Digital do not have an "industry" representative on the NIB either and several point to TechUK as a possible candidate. Others suggested that "industry" should only be engaged with outside of the NIB via other routes given the commercial sensitivity of some of the discussions that take place there.

Other additional stakeholders highlighted by interviewees that were not apparent in government publications included doctors' Local Medical Committees (LMCS), the Medical Defence Union (MUD), and the British Medical Association (BMA).

Interviewees, speaking from past experience, felt that these bodies hold real power and can put up objections and major hurdles in the way of EHR projects in healthcare provider organisations. Whilst interviewees were not advocating that they should be directly represented within the national governance structure they did feel that specific action to engage them as stakeholders should be desirable. In light of the above, a number of "do differently" suggestions can be found in Section 5.5.9, Adjust National Governance.

4.6.4   Clinical Commissioning Groups

All interviewees were critical of the local governance role being played by CCGs who were tasked with leading the preparation and execution of the e-health strategy via "Local Delivery Plans" (LDPs), aka "*local digital roadmaps",* covering all organisations in their geographical area of responsibility (National Information Board, 2016). CCGs were generally perceived as lacking the practical knowledge, IT resources and skills on how to deliver the e-health strategy, and without national funding, interviewees did not see how their plans could be achieved within the 2020 target timescales given other local pressures. Suggestions on how to address that can be found in Section 5.5.10, Replace CCGs Planning Role with Regional e-Health Tiers.

4.6.5   The Adequacy of National Staff Resources

Moving now to examining the adequacy of national resourcing, interviewees were asked whether the level of national resource they see the government deploying to progress the e-health strategy was about right, too much, or inadequate. Two aspects were discussed: [1] The number and skills of staff deployed by government to execute e-health strategy (mainly employed by NHS Digital, but some in NHS England); and [2] The amount of government funding available for local organisations to undertake projects to progress the e-health strategy.

On the first point, staffing, at the time the interviews take place, the Content Analysis revealed that NHS Digital employed 2,100 people and had a budget of over £200 million per year. Due to the limited availability of more precise data on NHS Digital staffing deployments and those other related government organisations that play a

role in progressing the e-health strategy, coupled to a complete absence of any published "Delivery Domain" programme plans, interviewees did not feel able to make any informed comments on whether the level of national staffing was adequate or not. Interviewees did comment on problems caused by the way national staff were deployed to address the various components of interoperability. "Do differently" suggestions to address that concern can be found in Section 5.5.7, Establish One National Interoperability Department.

4.6.6   Unclear, Inadequate and Late National Funding

Interviewees were aware that the government had stated, just prior to the interviews commencing following on from the "Wachter Review", that they were setting aside £4.2 billion to support delivery of the e-health strategy with around £1.3 billion of that (31%) earmarked for "local investment" (National Information Board, 2016). Several interviewees identified the provision of such support as essential to address business case funding gap difficulties faced by local organisations (due to competing local operational demands and from other "transformation" initiatives). They felt that real cash releasing savings rarely covered the cost of EHR investment in full, so national support to fill the gap was viewed as essential. Some drew on previous experience of what they saw as the failure of the previous HISS and ERDIP strategies. They recalled that the government sought to stimulate widespread adoption of more sophisticated EHRs by investing in a small number of pilot sites, but that did not materialise to any meaningful level.   Interviewees observed that under the recent announcement, that the vast majority of healthcare providers were not getting any national funding under the CODE programme. So interviewees were very perplexed as to how the vast majority of unfunded organisations were going to deliver the "2020 targets'' and had a high degree of confidence that they would not do so. There was also a high degree of scepticism that the national funding was real "new money" and not just re-packaged "old money" brought together to make a political statement. Interviewees also observed that the national funding release was delayed beyond the timescales originally expected following its announcement. For example, they were aware that the government announced in February 2016 they were making £4.2 billion available "*for NHS IT*" with £1.8bn of that to "create a paper-free NHS and interoperability for clinicians" (Digital Health News, 2016), ((Digital

Health News, 2016). They were aware that none had been released to any local NHS organisations when the interviews took place between October 2016 to February 2017 and yet the "paperless by 2020" targets were still being promoted by government as achievable.

Contextual Note: It was later, in August 2017, half way through the 2015-20 strategy term and after all interviews were completed, that the government (HM Treasury) approved part of the sum originally promised (£385m) in CODE funding for 23 organisations (£195 million) for 16 acute and 7 mental health "Digital Exemplars" Trusts, and £190 million for "Fast Followers", on condition each organisation added the same again from their own funds. The government also announced than CODE funding (unspecified) was to be allocated at some point in the future to 2 new ambulance pilots (Digital Health, 2017).

To summarise then inadequate funding, allocated late and routed directly to a minority of individual organisations, not via official governance routes, leaves the rest unsupported and significantly reduces to close to zero the possibility that overall e-health strategy targets will be delivered.. In terms of how to do this differently suggestions are set out in Section 5.5.2, Provide Timely Clarity on National Funding.

4.6.7   Conclusion

In conclusion, interviewees had mixed feelings about the NIB, with some in favour and others feeling it was too big and cumbersome. They did feel that there was inadequate interoperability representation on the NIB from appropriate groups like PRSB and that engagement with doctors groups like LMCs, MDU and BMA could be more explicit. They felt that CCGs were lacking in the IT skills needed to develop and deploy LDPs and even if they were, the vast majority were underfunded with only a small minority in receipt of government CODE funding. Interviewees were unable to comment on the adequacy of national staffing resources due to a lack of published data on that and coupled to a complete absence of any published "Delivery Domain" programme plans. However they did note that inefficiencies were evident because several different national departments were working on aspects of interoperability. They noted that national funding, which the government stated was £4.2 billion, was required to fill gaps in local business cases, but none had been released yet when

the interviews took place 2 years into the 5 year lifespan of the strategy. Despite that the official government position was still stating the "paperless by 2020" targets would be met. Various internal government organisation structure and programme reorganisations had also resulted in focus being taken away from the initial programme plans, again significantly impacting on the likelihood that any targets would be met.

4.7 Implementation Approach and Targets

4.7.1 Introduction

Interviewees largely focussed on factors that were adversely affecting the implementation plan, the achievement of the targets within that and the overall progress of the e-health strategy. Some of these are closely linked with governance and resourcing, so could just as easily have been placed under that heading.

4.7.2 Adverse Impact of Internal Government Reorganisations

In addition to the points set out in Section 4.6.6, Unclear, Inadequate and Late National Funding, interviewees observed that the adverse impact of internal NHS England and NHS Digital reorganisations not only affected governance as new faces with fresh ideas on how to implement the strategy replaced the original architects of the strategy, but also led to a redefinition of the implementation plan itself as explained in the following sections. Given that the e-health strategy is due to run from 2015 to 2020 a key finding is that interviewees felt strongly that these frequent changes, reorganisations and programme redefinitions are certain to mean that "paperless by 2020" targets will not be met.

They highlighted several internal reorganisations in NHS England and NHS Digital, concluding that these frequent organisational changes, the replacement of key decision makers and major delivery programme re-definitions, have all acted as barriers to progress in their own right. The majority of interviewees felt that these have distracted NHS England's and NHS Digital's attention away from where it is meant to be in their view: implementing the e-health strategy across the NHS.

Looking first at frequent organisational changes, interviewees recalled that since 2013 there have been several reorganisations so far and another one was looking likely. At the time the interviews took place NHS Digital had just announced that a "Capability Review" would commence in October 2016. They also noted that HSCIC had also just been re-branded as NHS Digital in August 2016 and had been reorganised too (Department of Health, 2016a).

> *Note: A report "Fit for 2020. Report from the NHS Digital Capability Review", was subsequently published in July. 2017 after the interviews were concluded (NHS Digital, 2017b). A working party was then established to take forward the many changes sets out in the report with the aim of completing those during 2018-9.*

Secondly, during the same period, interviewees also observed that key decision makers had been replaced, including the Parliamentary Under-Secretary for Health in the Department of Health (who has specific responsibility for political oversight of the e-health strategy), NHS Digital's Chair, Chief Executive and several other Directors, and the national CIO and CCIO (often with staff transferred into NHS Digital from NHS England). Some interviewees, who were, or are, working with NHS Digital, had witnessed inward looking political infighting and territorial disputes between NHS Digital and NHS England policy makers (as the former adjusted to the loss of policy responsibility). They perceived that staff had become more internally focussed on defining roles for themselves and applying for positions in reorganised structures at the expense of e-health strategy progression. They also noted that these reorganisations often break, or weaken, stakeholder engagement relationships especially at senior level where power resides that have been built up between the centre and local NHS organisations and others over time.

Also interviewees observed that, as well as a "Capability Review", the government also announced a major delivery programme re-definition in September 2016 which also coincided with the start of the interview process. This involved the replacement of all the "Aspiration" based programmes set up from the start of strategy in 2015 (National Information Board, 2015b), to ones based on "Delivery Domains" (National Information Board, 2016), whilst still leaving the original "Personalised Health & Care, 2020" strategy from 2014 in place apparently unaltered in content, or in targets set.

The majority of interviewees were unclear as to why the "Delivery Domain" programme re-definition was necessary. However five interviewees, who had contacts inside NHS England and NHS Digital, and knowledge of the events in question, did offer some insights which they shared. They felt that the resetting of e-health strategy was essentially cultural in origin. Virtually all of the key decision makers who participated in the original forming of the "Personalised Health and Care 2020" e-health strategy in 2014-5 had been replaced by 2016-7. The new post holders had set about re-shaping it into a programme of their own making. This links back into the second dimension of the Socio-technical model and especially "Cultural attitudes, expectations, concerns, and motivations". In relation to governance interviewees suggest several "do differently" recommendations which are set out in Section 5.5, Research Question 4: Informing Future Plans.

4.8 Additional Socio-technical Factors

As well as re-wording factor 4.1 as derived from the literature review to reflect new insights set out in Section 4.3.2, Establishing the need for change, from *"The wider economic environment & pressures"* to: *"Wider economic, political and social environmental pressures", a* number of new factors were also identified that did not feature during the literature review and did not form part of the socio-technical model developed from that. Specifically:-

Organisational Dimension

- *Procurement cycles and issues;*
- *Quality of Supplier;*
- *Other organisational changes – the pace of change;*

Macro-Environmental & Socio-Political Dimension

- *Presence of National Cyber Security Measures*

The first factor, "Procurement cycles and issues", was raised by nearly all the Supplier group and some of the IT Consultant group, and related to a mismatch

between the 2015-20 timescales of the national e-health strategy and the length of EHR and related infrastructure contracts within local organisations. They suggested that a shift of focus towards interoperability and away from EHRs specifically could mitigate that factor to some extent in line with the suggestions in Section 5.5.5, Mandate National Standards and Systems. The second new factor "Quality of Supplier" largely arose as a result of the NPfIT experience of interviewees who saw the consequences of a national EHR supplier being appointed by government who subsequently became unviable financially and whose EHR software failed to meet requirements.   Whilst the government engineered a rescue using another multi-national supplier to take them over, that had major consequences for NPfIT which was subsequently ended by the government prematurely. Again, a shift of focus towards interoperability and away from EHRs specifically should mitigate that.   The third factor, "Other organisational changes – the pace of change", arose because of a perception that there are far too many "transformational" initiatives emanating from various government bodies. These "transformational" initiatives are all broadly aimed at improving the effectiveness and efficiency of the NHS in the light of increasing demand and financial pressures. These were perceived as putting a significant strain on the ability of local organisations to cope with so many incoming pressures and demands from multiple government agencies against a backdrop of finite local resources (time, human and financial). A "do differently" suggestion to mitigate that can be found in Section 5.5.8, Look for Synergy across Transformation Initiatives.

A further additional factor, "Presence of National Cyber Security Measures", was added to reflect their concerns that government and local healthcare providers' willingness to take risks and innovate may be adversely affected if they perceived that their EHR systems could become more vulnerable if they make them more interconnected and interoperable. Contextually interviewees were aware of more recent seriously disruptive cyber security incidents affecting the NHS and other sectors. They felt that the government, IT suppliers and local healthcare providers needed to invest significantly more resources in a range of protective measures including a national cyber security strategy, policies, standards, national protective systems, training, audit and support services. Further consideration can be found in Section 5.5.5, Mandate National Standards and Systems.

4.9   Conclusion

So having set out a range of findings arising from the topics covered during the interview process and themes extracted from those, there are a number of conclusions that can be drawn which are set out below.

The methodology chosen has proved to be appropriate. Its application has provided sufficient data to provide answers Research Question 3. "What factors affect the adoption of the e-health strategy in the NHS in England?"   It has identified many factors that, in the eyes of the interviewees in both sample groups, were affecting the adoption of the e-Health strategy in the NHS in England at the time the interviews took place. It also drew out from those interviews sufficient data to support the co-construction of a range of "do differently" recommendations to address Research Question 4: *"What insights, experiences and lessons does this research highlight that could be used to inform future plans for the e-Health strategy, and other national strategies in other countries?".*

The data analysis of the interview transcripts, supported by NVivo, has demonstrated with some precision, that the range of factors that are frequently found to influence the rate of adoption of e-health strategies in the Literature were also found to be relevant to varying degrees in the current context. There were some exceptions. For example, medico-legal issues were highlighted in the literature, but not by interviewees in either group.

All interviewees believed there was a need for national e-health strategies and that the government should remain engaged in the field, citing a number of stimulating factors on government that support that argument. Interviewees also universally concurred that the e-health strategy was "middle out" in its construction drawing on the classification put forward by Coiera (2009), and that that was the most appropriate form to stimulate adoption, rather than "bottom up" or "top down". They drew extensively on their current and prior exposure to other e-health strategies to support their arguments in favour of adding new factors and insights including "*Procurement cycles and issues"* and *"Quality of Supplier".* Prior experience cited included the failed (in their view) "top down" NPfIT, which tried to impose national

EHRs on local organisations which generated major cultural barriers and "bottom up" HISS and ERDIP strategies, which did not significantly translate their success outside of the pilot projects they promoted.

There was a strong theme emerging that interviewees perceived that, as all healthcare providers now have EHRs in place, albeit with varying degrees of functionality, that the government were focussing the strategy, resources and funding too much on stimulating EHR adoption within individual healthcare providers, and not enough on clinical and social care workflow improvement across multiple health and social organisations and stakeholders including patients. They felt that the government had not put sufficient emphasis on developing and mandating the local use of national interoperability standards and national infrastructure and systems to enable that, or investing in measures to protect systems and data, which in turn led to the addition of a new factor: *"Presence of National Cyber Security Measures".* They also felt that the national CODE pilot site programme were too "single organisation" acute hospital centric. They had not selected health and social care economy based CODE pilot projects to focus on inter-organisational clinical and social care workflow improvement.

The interviewees especially emphasised a need to address cultural issues especially within the clinical professions, especially doctors, who they perceived were generally reluctant to move away from traditional ways of working towards more digital ones. They felt that some clinical champions were acting as a positive facilitator to progress the national strategy within specific local healthcare organisations. In that context they all welcomed the government's initiatives to encourage local healthcare providers to appoint board level Chief Clinical Information Officers (CCIOs) and Chief Nursing Information Officers (CNIOs).

They also identified significant barriers to progress arising from government reorganisations, both in organisational structures and senior appointments in NHS England and NHS Digital and in the e-health strategy programme structure and projects which they had witnessed during 2016. This links to a new factor that was suggested by interviewees as a result: *"Other organisational changes – the pace of change",* where the changes can, themselves, become a barrier. They took the view that those reorganisations were diverting senior management attention, national

resources and focus inwards in NHS England and NHS Digital, away from the e-health strategy, while those changes embedded themselves. They also felt that national CODE programme funding release was severely delayed and it left the vast majority of healthcare providers without access to national resources and funding.

As a consequence, none of the interviewees believed that the "paperless by 2020" targets, that are the cornerstone of the e-health strategy set out in 2014 in "Personalised Health and Care 2020", (National Information Board, 2014), were realistic. None thought they would be met, other than perhaps by a very small minority of some of the CODE pilot site organisations. Many interviewees cited an alternative date ranging between 2025 and 2030 as a more achievable target range. The situation was, in their view, being made even more complex by the conflicting presence of other government programmes led by other departments within NHS England, such as the Sustainability and Transformation Programme and moves to pilot Accountable Care Organisations and other Lean process improvement initiatives. These were often seen as overlapping in scope, with similar aims and objectives to the e-health strategy, and were competing for limited local resources from similar pools to take them forward. The volume of government publications and other materials also made it difficult for local staff to read sift and digest everything, some of which left stakeholders with mixed and inconsistent messages from several government sources.

Finally, interviewees felt that stakeholder representation on national bodies lacked input from those working in the clinical and social care workflow improvement and interoperability fields. That should underpin a shift in focus, as would merging various interoperability national teams into one and by adjusting national resourcing to redeploying some staff into a NHS Digital regional tier.

So having explored the socio-technical factors that are at play during the process of adoption with "knowledgeable individuals" and provided some "do differently" insights, Chapter 5, Conclusions & Implications, includes a comparison of the Literature Review results with the data generated and analysed above to assess the extent of agreement or disagreement between the two and why.

5   Conclusions and Implications

5.1   Introduction

To recap, Chapter 2, Literature Review identifies recent prior research that explores the factors affecting the progress of national e-health strategies across a range of westernised developed countries. Themes identified include the importance of the overall construction of the strategy, the necessity of effective stakeholder engagement, the presence of an effective national governance structure and national resourcing (staffing and funding) and finally realistic implementation approach and targets that deliver the strategy's overall objectives. It also identifies important gaps in knowledge, the most significant of which is that no academic research has been published into factors affecting the e-health strategy in the NHS in England. Also few studies were located that include data collected from distinct sample groups of suppliers and none for IT consultants. Chapter 3, Methodology, sets out the interpretative socio-technical approach taken to make a contribution towards filling both gaps by collecting data on factors affecting progress of the e-health strategy via semi-structured interviews with purposively selected knowledgeable individuals in Supplier and IT Consultant sample groups. Chapter 4, Data Presentation and Analysis, lays out the results of that quest.

Finally this chapter, which draws on a format set out by Perry, (1998), begins with Sections 5.2, to 5.4 which confirm how the developed research questions have been clearly addressed and therefore that the research project has delivered precisely the outcomes as originally intended. They compare the Literature Review results with the data generated for each of the research questions to assess the extent of agreement or disagreement between the two and why. That is followed by Section 5.5, Research Question 4: Informing Future Plans, which is perhaps one of the most important sections. It set out a range of recommendations designed to improve the strategy and act as guidance for others.

Those sections are followed by Section 5.6, Critique of Adopted Approach. That explores the wide variation in approaches highlighted by the Literature Review and that taken here and how that affects the transferability of the findings to other studies. Then, Section 5.7, Limitations of the Study, sets out the researcher's views on a range of those. That is followed by Section 5.8, Opportunities for Further

Research and Section 5.9, Publishing Plans, which highlights a range of planned opportunities in both those regards. That is followed by Section 5.10, Contribution to Knowledge and Practice, which proposes a revised socio-technical model that adds additional factors and dimensions building on this research. So to begin then the following sections confirm how the research questions have been clearly addressed.

5.2   Research Question 1: Suitability of IT Adoption Theories

So this research did not begin with a proposition that the progress of e-health strategies are affected the most or less by certain factors, or by their overall construction. For example, whether they are likely to be more successful if they are "top down", "middle out" or "bottom up", like Coiera (2009), or by the degree of technical coupling, like Eason (2013), but rather sought to determine what proposition, if any, is supported by the data collection and analysis process. That methodology was then deployed during the data collection process and subsequently supported the emergence of themes which are set out in Chapter 4, Data Presentation and Analysis. That process was initially structured using a Socio-technical Model derived from similar published academic studies where factor level details of their conceptual models were included as explained in Section 2.4, Factors Affecting National E-health Strategies. That was revised by the addition of new factors highlighted during the data collection stage as set out in Section 4.8, Additional Socio-technical Factors.

The end result is an enhanced socio-technical conceptual model consisting of four dimensions, similar to those developed by others, but with a more comprehensive range of factors that can affect the progress of e-health strategies. It also draws on elements of Change Management and Technology Lifecycle theories to introduce two further dimensions to reflect the influence of the "passage of time" and "purpose" informed by similar studies by, for example, Cresswell (2013) and Murray, (2011). This revised model represents new knowledge and is explored further in Section 5.10, Contribution to Knowledge & Practice.

The conclusion drawn from the above is that the methodology adopted has been theoretically appropriate and justified. The methodology also provided a firm

foundation to answer Question 2, *What factors affect the adoption of other national government e-Health strategies?*, as set out in Section 5.3., below and Question 3, *What factors affect the adoption of the e-Health strategy in the NHS in England?,* in Section 5.4 which follows.

5.3   Research Question 2: Factors affecting e-Health Strategies

Moving now to the second research question*: What factors affect the adoption of other national government e-Health strategies?"*, whilst the detail varied at factor level in terms of frequency of citation by study and by interviewee and the interplay of those, the overall conclusion is that the proposition of socio-technical theory, that such strategies are affected by a rich interplay of factors across several dimensions through time, is supported. All but one of the factors identified during the review were highlighted by interviewees during data collection ("Medico-legal Issues" was omitted). This strongly suggests that the data supports the finding of the Literature Review, that the outcome of an e-Health strategy is dependent on the recognition of, and successful navigation through a wide range of factors spanning, not just the technical, but also human, social, organisational, macro-environmental and wider socio-political dimensions.

A further point of agreement between the data and the review is that the specific socio-technical model informed by the literature review and subsequently developed into a data extraction grid in NVivo to analyse interview transcripts, did support the identification of factors affecting previous and current e-health strategies, and in the latter case, supported the identification of additional factors as set out in Section 4.8, Additional Socio-technical Factors. The implication of that is that the end result, a further enhanced socio-technical conceptual model, should provide a useful and robust foundation for further studies of national e-health strategies in the future. It should also act as a useful aide memoire to those involved in e-health strategy design and implementation.

5.4   Research Question 3: Factors Affecting the e-Health Strategy

Turning now to R*esearch Q*uestion 3, "*What factors affect the adoption of the e-Health strategy in the NHS in England?",* a number of factors stood out in terms of

their importance and others, because they were exceptions. Setting the exceptions aside for a moment, there is a broad agreement between the Literature Review and findings arising from the data collection process, that all of the factors identified during the Literature Review, and included in the socio-technical model used here, were highlighted as affecting the progress of the national e-health strategy in the NHS in England to a greater or lesser degree by interviewees, except medico-legal issues (as stated in Chapter 4, Data Presentation & Analysis), Some were viewed as more influential than others. So for example, the factor "Overall EHR Strategy", in terms of its overall construction, was identified by all interviewees from both sample groups as the most influential of all the factors in the model. That is in agreement with the Literature Review where the majority of studies emphasised the fundamental importance of this including Cresswell (2012), Deutsch (2010), and Takian (2012). Resting beneath the strategy level there was also almost universal recognition among interviewees in both sample groups that key next level components, "Implementation Approach and Targets", and "Stakeholder Engagement", with the latter focussing on the need to address cultural issues, were also significant determinants of progress. This again is in line with the findings of a number of studies, including Sheikh, (2011), Deutsch (2010) and Robertson (2010).

Moving from conclusions about areas of common agreement to major exceptions, or disagreements, between the Literature Review and the collected data, the first exception is a macro-environmental factor *"International developments",* which was not identified by the IT Consultant group. The second exception was "Medico-legal issues". That was not identified by either sample group as previously stated. In this context, that can be defined as the perceived risk of clinicians being sued for clinical incidents arising from their decisions based on inaccurate patient data provided by other clinicians in other organisations. That, in turn, could reduce their willingness to actively promote and participate in the adoption of the national strategy. This factor did feature significantly in a study of the Dutch n-EPR strategy (Zwaanswijk et al., 2013), but less so in a Canadian study where it featured, but only in a minor capacity in an appendix (McGinn, 2011). Other studies did not identify it, focussing mainly on patient data "privacy and security concerns" among clinicians, so medico-legal issues were not a frequently occurring factor in the literature. Earlier discussion of that can be found in Chapter 2, Literature Review. The key point is that medico-legal

issues were not highlighted and, as such, this represents a disagreement between the Literature Review and the findings of this study. However that is not intended to infer that "medico-legal issues" should be deleted from the model going forward. There is a possibility, like with the Dutch n-EPR strategy, that such issues may feature as a factor affecting national e-health strategies in the future and its inclusion may support practitioners in their efforts to recognise, or discount, its relevance. New factors identified in Section 4.8, Additional Socio-technical Factors, have been added to an enhanced version of the model set out in Section 5.10, Contribution to Knowledge & Practice.

5.5   Research Question 4: Informing Future Plans

5.5.1   Introduction

As this is a professional doctorate, this section makes a contribution to professional practice derived from discussions with interviewees and co-constructed with them, whilst exploring Research Question 4:-

"*What insights, experiences and lessons could be used to inform future plans for the e-Health strategy, and other national strategies in other countries?*"

These insights, experiences and lessons*,* are set out as a series of recommendations, intended to be of benefit to stakeholders, such as senior NHS and government policy makers and other tasked with the formation, deployment and evaluation of the current and other national e-health strategies. Following that Section 5.10, Contribution to Knowledge and Practice, builds on Chapter 2, Literature Review, the issues raised in Chapter 4, Data Presentation and Analysis, and these recommendations to propose an enhanced socio-technical model.

To place what follows into context, both the Literature Review and data collected from both sample groups set out in Section 4.3 Overall Strategy, support Coiera's (2009) proposition, that a "middle out" strategy is a more appropriate way to successfully stimulate the adoption of e-health strategies. Several other studies

identified in the Literature Review also support that including Eason, (2012), Morrison, (2011), Takian, (2012) and Greenhalgh,(2013) as well as by a number of studies into the perceived failure of NPfIT (Robertson et al., 2010), (Sheikh, 2011), (Currie, 2012) (Waterson, 2014) and (McLoughlin et al., 2017).

So, the broad positioning of the e-health strategy in the middle ground is viewed as an appropriate way of balancing cultural tensions and power distribution between the need for the government to direct and the need of local organisations and end users to feel that they have the power to control and "own" the local elements of the strategy. In other words the research concludes that it is in broadly in the correct position along a mandatory-voluntary compliance spectrum. Its major cultural advantage is that a "middle out" strategy does not dictate to local organisations which EHRs they can choose. Both sample groups unanimously felt that allowing local choice of EHRs significantly reduces the risk of end user rejection drawing heavily on their experience of NPfIT to support that argument.

As such this is not strictly a "do differently" recommendation, but more of a "do not do differently" one. In other words, if government policy makers are considering taking a "bottom up" or "top down" approach they would be well advised to take note of the findings of this and other studies and consider adopting a "middle out" strategy instead. That is not to say that improvements cannot be made to the "middle out" strategy. Section 4.4, Clinical and Social Care Workflow Improvement, concluded by suggesting that the government should signal a shift in strategic purpose back towards the original "Electronic Glue" aspiration of the "5 Years Forward View" (NHS England, 2014). To be seen to be doing that, interviewees felt that, the government should consider re-issuing and communicating an update to the strategy as set out in "Personalised Health and Care 2020" (National Information Board, 2014). Or, they could replace it with a new publication setting out a new strategy and by doing so, signal a cleaner break with a widely held perception that the strategy is more about becoming "paperless". This could also be used as an opportunity to address concerns raised in Section 4.5.3, Negative Effect of Unachievable targets, by re-base lining the strategy to revise and reset targets and ensure they are more realistic.

In summary, a number of recommendations were suggested to improve the "middle out" strategy, or to be included in its replacement. These are as follows:-

- Provide timely clarity on national funding;
- Avoid government organizational restructuring during the course of the strategy;
- Focus on "Community Wide Interoperability" CODE projects;
- Mandate national interoperability & cyber security standards and systems;
- Encourage more inclusive clinical engagement;
- Establish one national interoperability department;
- Look for synergy across transformation initiatives;
- Adjust national governance; and
- Replace CCGs planning role with regional e-health tiers.

Each is explored in more detail below.

5.5.2 Provide Timely Clarity on National Funding

Section 4.6.6, Unclear, Inadequate and Late National Funding, explained that major delays to the programme occurred because government failed to act quickly enough to clarify and release funding they had announced in time to meet the targets they had set. Section 4.5.3, Negative Effect of Unachievable targets, set out some of the consequences on local commitment of that. This "do differently" recommendation has been added to simply state that government should be clear on funding and to release that within the required timescale to facilitate the delivery of the targets they have set.

5.5.3 Avoid Government Reorganizations

Similarly, interviewees felt that a further major cause of delay was due to government reorganisations, especially at NHS Digital, during the first two years of the strategy. These are explored in Section 4.7.2, Adverse Impact of Internal Government Reorganisations. Again, this "do differently" recommendation has been added to simply state that government should build an organisation structure around the needs of the e-health strategy at the beginning as an integral part of its formation

and then avoid changes, unless absolutely essential in response to evaluation findings, during the delivery phase, e.g. to team sizes in one part of the delivery programme needed more or less as the plan unfolds.

5.5.4 Focus on "Community Wide Interoperability" CODE Projects

To recap briefly, interviewees in both sample groups felt that the strategy had shifted focus away from the its original "electronic glue" aim, and strongly recommended that it should re-focus back towards that. They perceived that a major cause of that shift were the government reorganisations highlighted above which saw a large scale replacement of senior level staff, who in turn, perhaps had a desire to make their own mark on the shape of the strategy.

Specifically, the focus should be on interoperability: to have a purpose of promoting inter-organisational clinical and social care workflow improvement across multiple organisations in health and social care economies. Practically, given that funding was limited, they felt that that could be facilitated to some degree by selecting "Community Wide Interoperability" CODE projects, [and not appointing any more single organisation ones]. The risk of such an approach is the probability that those pilots failed to replicate more widely. Several interviews witnessed a lack of replication during the previous HISS and ERDIP strategies as explained in Section 4.3, Overall Strategy.

Those Interoperability CODE projects should be made up of multiple organisations spanning primary, secondary, tertiary, mental, community and social care within a natural health economy where patients receive the majority of their treatment, e.g. Greater London, Greater Manchester, Merseyside or Cumbria. They felt that there would need to be a corresponding community wide IT function in place to support and lead that. The primary aim would be to promote the development and mandatory adoption of nationally specified interoperability standards and national systems and infrastructure. That should help to facilitate standards development and further roll out elsewhere (rather than encourage regional proprietary variations that potentially could produce just bigger silos of enclosed information).

5.5.5 Mandate National Standards and Systems

Most importantly, from a government policy perspective, this would involve mandating and enforcing the use by local health and social care providers of national systems and standards for clinical data interchange messaging and data definitions and cyber security standards. That is not to suggest that the act of mandating would not be met with challenges and clinical resistance similar to that explored in Section 4.5, Stakeholder Engagement - The Importance of Culture, and especially in Section 4.5.2, Reaching the "Unconverted" and the "Not Engaged"., and Section 4.5.7, Upsetting the Moral Order. However, the majority of other studies also emphasised the importance of national interoperability initiatives to address the need to convert paper to electronic data interchanges including Salzberg, (2012), Eason, (2012), Eason, (2013), Zimlichman (2012) and Zwaanswijk, (2013). So the evidence base suggests that, despite that potential resistance, it would be a beneficial purpose.

This initiative would mandate the linkage of local EHRs to national infrastructure systems for all high volume inter-organisational clinical and social care information flows (mirroring the patient journey), but still leaving the choice of EHRs at local level (as long as they had the capability to become interoperable cost effectively). This builds on the problems highlighted in Section 4.4, Clinical and Social Care Workflow Improvement which, to recap briefly, indicated that there are over 2.9 billion clinical events per year in the NHS in England that currently generate multiple patient datasets. Much of that data is pulled or pushed through the broader system now on paper, and / or as none standardised electronic data. Shifting that bulk to comply with national standards should make that more efficient. It is suggested that the scope of such national initiatives should cover the elements below:-

Table 13, Scope of Interoperability Initiatives

Type	Description
"Push" method	National EDI Standards to enable health care providers to electronically push patient data from one EHR to another to follow the patient journey.
"Pull method"	National standards for pulling data (Application Programme Interfaces or API's) to enable clinicians on other organisations to extract patient data entered by their clinical colleagues in other organisations' EHRs and display it on demand either in their own organisations EHR or national and regional EHR portals.
Legal frameworks	relating to patient data protection, consent, and confidentially requirements, e.g. a national opt-out model for patients to record their opt out on the national Summary Care Record and for that to be available to all EHRs;
Data standards	E.g. for example mandate and enforce use of NHS number as primary patient ID.

In addition to potentially better coordination of communications several other linked measures are shown below that also should be in scope:-

Table 14, National Interoperability Facilitation Measures

"Do differently" suggestions	Facilitators
Strategic emphasis	The government should shift their overall strategic objective from becoming "paperless" by 2020, to inter-organisational "clinical workflow improvement".
National resource priorities	Shift national resources in NHS England and NHS Digital more towards interoperability programmes and systems.
CODE programme participants	Select future CODE programme participants based on communities of health and social care providers within a health and social care economy and also with patients.
	Promote electronic data sharing between those to demonstrate the art of the possible to others.
Interoperability standards Mandatory compliance	Making local use of national systems and standards mandatory over time, rather than advisory.
	Develop and mandate data push (EDI) and pull (API's) data interchange standards for all major clinical workflows such as GP referrals, outpatient attendance letters, discharge letters and A&E attendance letters.
	Use regulatory, contractual and audit levers and facilitators to enforce compulsory use by all NHS organisations

On the last point in the table above, "enforce compulsory use", interviewees felt that the government should make better use of several available levers and feedback loops they have at their disposal. For example, the NHS Standard Contract Commissioning for Quality and Innovation framework was highlighted. That supports improvements in the quality of services and the creation of new, improved patterns of care (aka CQUINs targets). New interoperability targets could be added to that. They could also add similar targets to the Care Quality Commission (CQC) Audits, which healthcare providers are subjected to periodically. NHS Digital could do the same with the annual Digital Maturity Index Returns.

A further "do differently" recommendation in this context should involve mandating and enforcing the use by local health and social care providers of national cyber security systems and national standards. In a rapidly evolving environment, where new cyber security threats can impact at any time, protective measures should include a frequently updated national cyber security strategy, policies and standards. It should include national protective systems, training, audit and support services. The aim should be to provide technical assurance against threats, but also to raise

confidence and address cultural issues (fear of change) especially at a local level. Specifically, the aim would be to give a higher degree of confidence to local organisations and stakeholders, especially clinicians, that the risk of interconnecting EHRs to share patient level data is managed effectively. Further discussion on cultural issues can be found in Section 5.5.6, Encourage More Inclusive Clinical Engagement. It should also include a national department, perhaps as part of the combined interoperability department suggested in Section 5.5.7, Establish One National Interoperability Department below.

5.5.6 Encourage More Inclusive Clinical Engagement

Interviewees recognised that that shift could raise cultural barriers from powerful clinicians, probably expressed as threats to patient privacy and data security at the thought of increased volumes of patient data leaving the confines of their organisational control. They also recognised that much of the proposed changes may be perceived as threatening to many clinicians who wish to retain their traditional roles as gatekeepers of access to patient data, as set out in Section 4.5.7, Upsetting the Moral Order. Interviewees suggest that the government could consider a phased introduction over time with proof of concept evidence provide by the "Community Wide Interoperability" CODE sites. That could involve prioritising the highest volume workflows first and include key stakeholders within the process and provide them with additional training and support. That could be in a similar inclusive way to the successful clinical engagement approaches that Greenhalgh (2013) highlights in a study of the strategies behind Scotland's Emergency Care Summary (ECS); Northern Ireland Emergency Care Summary (ESR) and the Welsh Individual Health Record (IHR). Greenhalgh (2013) suggests that that approach should avoid the pitfalls of the less successful "top down" strategies that failed to engage with clinical stakeholders, citing England's Summary Care Record (SCR) programme during NPfIT as an example.

Such a move should also support Eason's, (2013) EHR Technical Coupling Model proposition that the success of an e-Health strategy is driven primarily by the degree of "technical coupling" required between the technical dimension (the EHR and associated infrastructures) that the strategy is seeking to promote, and the human, social and organisational dimensions (within the implementing organisations and

intended end users). Eason's postulates that NPfIT style "tight coupling" strategies (replacing local EHRs with nationally procured ones equivalent to Coiera's "top down") are the least likely to succeed as they fail due to cultural barriers caused by lack of local ownership of those EHRs. Eason argues that "loose coupling" strategies, such as one based on interoperability facilitators to link data held in local EHRs across organisational boundaries, are the most likely to succeed as they cause the least cultural disruption within local organisations. The evidence supports that proposition. Several "do differently" improvements were suggested by interviewees, especially relating to focussing more attention on addressing doctors' concerns. These are summarised below in the table below;-

Table 15, Stakeholder Engagement Improvements

"Do differently" suggestions	Facilitators
Communications	Improve coordination of NHS England and NHS Digital communications channels to put out consistent messages. Set up in-house stakeholder engagement forums. Make better use of virtual channels.
Clinical Champions	Invest more time to ensure appropriately qualified and competent people are in role and they are provided with sufficient training and development.
Best practice	Identify, promote and rewards best practice among health and social care providers.
Closer local contact	Shift more NHS Digital resources into a NHS England regional tier to improve ability to match national e-Health strategy requirements to local priorities and vice versa.
Representation	Add representation from the interoperability stakeholder community to the National Information Board to reflect the suggested shift in emphasis.

5.5.7 Establish One National Interoperability Department

A significant "do differently" suggestion within that interoperability context involves improving leadership and making better use of limited resources, by merging various national teams tasked with facilitating interoperability progress. Interviewees observed that the messaging team and information governance teams sit within NHS

England and coding standards teams in NHS Digital. A more coordinated interoperability facilitation service could be provided by merging them into one department under NHS Digital.

5.5.8 Look for Synergy across Transformation Initiatives

Section 4.5.2 sets out problems relating to reaching the "Unconverted" and the "Not Engaged". Linking with the point in the previous section above about the "strategic alignment" point, there was a general agreement that the shift could present an opportunity to seek synergy by bringing the e-health strategy more closely into line with other process improvement and transformation initiatives that draw on limited national and local staff resources. At that time these included the Sustainability & Transformation Programme (STP) being run by NHS England under the banner of their New Care Models Programme, various nationally led Lean process improvement initiatives and Accountable Care Organisations (ACOs) pilots (NHS England, 2018).

5.5.9 Adjust National Governance

Section 4.6.3, National Information Board, highlighted a number of issues that came to light when discussing NIB membership. These were primarily related to a perceived lack of representation from bodies promoting interoperability. That should support the shift towards community wide CODE projects as set out in Section 5.5.4, Focus on "Community Wide Interoperability" CODE Projects and an increased focus on interoperability itself. So to address those concerns and give appropriate emphasis to interoperability during meetings, it is suggested that there should be explicit interoperability standards body representation on the NIB or on an equivalent body, or bodies, if that is replaced. Interviewees suggested that representatives could be drawn from the Royal Colleges Professional Records Standards Board, (PRSB), IHE UK, HL7 UK, or perhaps the British Computer Society Health Informatics Group.

5.5.10 Replace CCGs Planning Role with Regional e-Health Tiers

Interviewees expressed serious concerns about the capability of CCGs to prepare and lead Local Delivery Plans which are set out in Section 4.6.4, Clinical

Commissioning Groups. All interviewees were familiar with the previously abolished regional teams within Strategic Health Authorities that sat between NHS Digital's previous namesake, Connecting for Health (CfH), and local organisations. They had also seen the evolution in some areas of community wide IT teams, such as NHS Informatics Merseyside and NHS Greater Manchester Shared Services. NHS England had put regional structures into place since for other functions, but not for facilitating the e-health strategy. So interviewees suggested that NHS England and NHS Digital should consider shifting some of their staff [and any regional IT, process improvement and transformation staff] into regional offices to act like the old SHAs, as intermediary, or "interpreter", to sift voluminous information flows and to help lead and make e-health strategy more locally relevant. They should also encourage the development of   community wide IT teams and determine appropriate governance arrangements. Ideally, their footprint could match "Community Wide Interoperability" CODE Projects described in Section 5.5.4, Focus on "Community Wide Interoperability" CODE Projects, above.

5.5.11 Conclusion

This section sets out a range of co-constructed practical recommendations in response to issues highlighted in Chapter 4. Those address Research Question 4, "*What insights, experiences and lessons could be used to inform future plans for the e-Health strategy, and other national strategies in other countries*?" Building on strong support from interviewees for an e-health strategy broadly with "middle out" characteristics, a number of suggestions were co-constructed with interviewees to improve that, and potentially others too.

These primarily involved a shift in purpose away from "paperless by 2020" targets which were perceived to be unachievable, and a move away from single organisation national demonstrator (CODE) sites, with the latter recommended in the Wachter Review (Department of Health, 2015). The new purpose should be:-

> *"Health and social care clinical workflow improvement across organisational boundaries, with interoperability as the vehicles for that".*

The emphasis would be on improving clinical information flows along patient care pathways without seeking to replace local EHRs, but by interconnecting them. Culturally that will require improved engagement with clinicians, many of whom may perceive these changes as threatening the moral order with respect to their role as traditional gatekeepers of patient data. Signalling that shift in emphasis could be via a strategy update, or a replacement strategy announcement. Underpinning all of that, it is suggested that the government should provide more timely clarity on national funding amounts and provision. Delays in that area have severally delayed progress of the strategy.

A number of other supporting measures are proposed that include developing and mandating the local use of national interoperability standards and systems, supported by "Community Wide Interoperability" CODE projects to demonstrate the art of the possible. Fear of threats arising from cyber security attacks could hinder progress so towards opening systems to support interoperability. So mandating national cyber security standards and systems is suggested as a way of mitigating that. Changes to national governance representation are also suggested to include greater interoperability body representation and reorganising the disparate interoperability resources at NHS England and NHS Digital into one national interoperability department. To facilitate that, responsibility for community wide Local delivery Plans are also suggested, to move that responsibility away from CCGs, to regional e-health teams. Those could be made up of more NHS Digital staff at a regional office level, looking for synergy with other transformation initiatives (STPs, ACOs and Lean process improvement projects) and giving a greater planning role to regional IT teams that have been established in several areas (such as Merseyside and Greater Manchester).

So having set out the above this chapter now moves onto the methodology itself which has proved to be appropriate, but not entirely without areas of criticism or limitations. These are explored further in Section 5.6, Critique of Adopted Approach and Section 5.7, Limitations of the Study.

5.6   Critique of Adopted Approach

There are two main critique areas: immaturity of the research area and the technical approach taken here.   As explained in Chapter 2, Literature Review, the field of study appears to have not reached a point of maturity where it has a common nomenclature, classification approach and methodology. **Error! Reference source not found.**It lacks coherence both in the terms used to describe key items such as e-health strategy, EHRs, socio-technical dimensions and factors affecting progress.

Turning now to variation in classification approach, the following Figure 19, Differences in Socio-Technical Data Extraction Grids, illustrates the wide variation in grids used by various researchers during their studies:-

Figure 19, Differences in Socio-Technical Data Extraction Grids
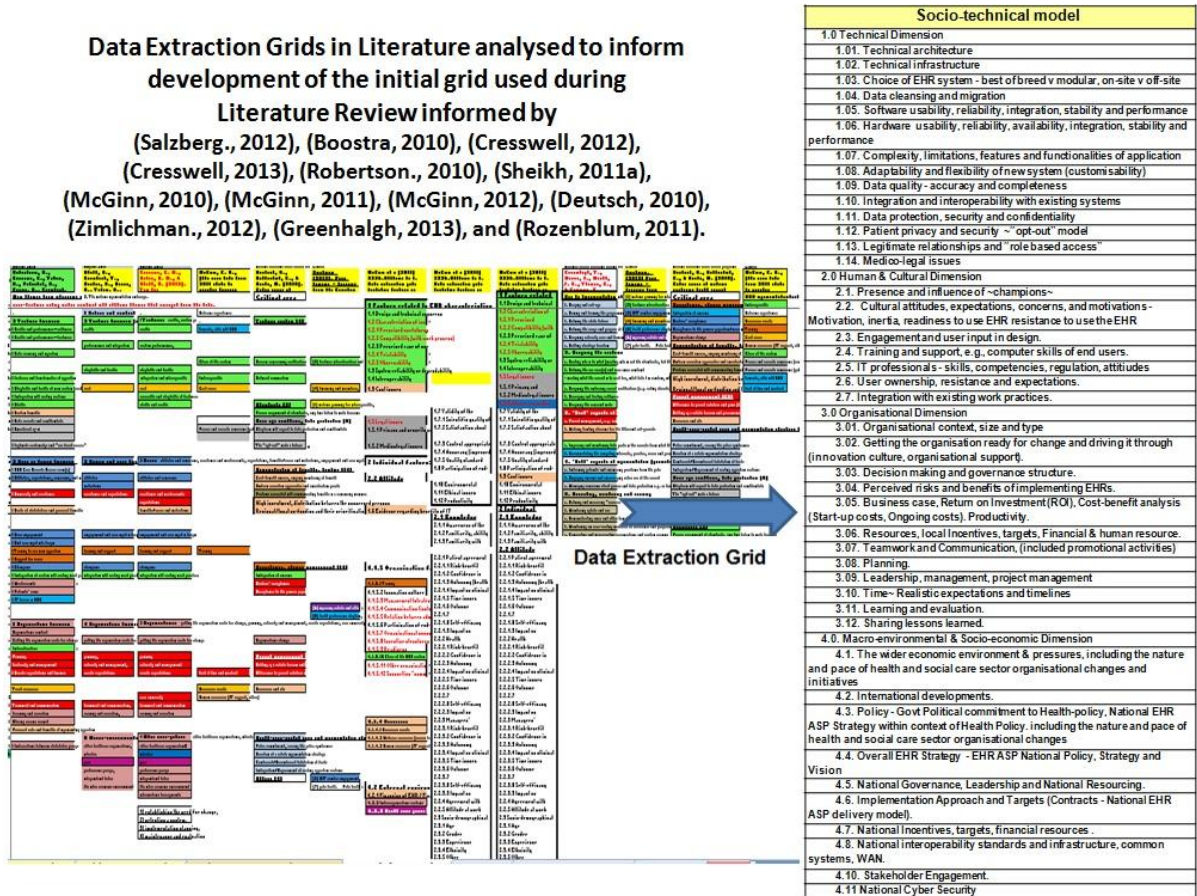
The colour coded columns illustrate the list of dimensions and factors found within each study that provided a basis for and influenced the progress of the e-health strategies they studied. These were then subjectively mapped across (based on the

judgement of the researcher) and used to form the socio-technical model used here, as illustrated on the right above. That suggests strongly that there is scope for wide interpretation which could lead to less than accurate cross comparisons due to implicit assumptions being made about labels or names given by this and other researchers and their meanings.

Moving now to another critique area, with hindsight, technically the NVivo software package could also have been used to analyse the factors affecting various strategies in the literature text too in the same way that it was used for the interview transcripts. A Microsoft Excel based Data Extraction Grid was used instead where the "factors affecting progress" text (data) in each study (one study per column) was copied and pasted into the appropriate socio-technical factor cell. Cross comparison between the literature review data and the interview data could have been done more efficiently in the opinion of the researcher if they were both in the same NVivo database. They could be analysed and reported on together. That database should also be relatively easy to update going forward as new literature appears, as well as have the potential to provide a firm data foundation for further studies.

5.7   Limitations of the Study

Given the interpretative philosophy adopted to undertake this formative research, it claims only to represent the views of a small group of participants at a point in time and cannot be used to necessarily extrapolate findings to other strategies, or to the strategy at some future point in time. Further studies could be undertaken at different points in time and compared. .

Secondly, looking now at the scope of the data collection process, whilst saturation was reached from the 18 interviewees that took part, in the sense that no new themes were emerging, budget and time constraints dictated that additional data collection methods were not included such as surveys and workshops.   Sheik (2011), for example, included 431 participants from various stakeholders. This study could have been expanded to include other sample groups such as:-

- Profession based sample groups such as   NHS IT staff, management, doctors, nurses and social care staff;

- Sector based sample groups such as government sector and their agencies, employees from NHS England and NHS Digital;

- Programme based transformation groups, such as those from the Sustainability & Transformation programme and Lean process improvement teams;

- Members of governance bodies tasked with overseeing the strategy such as the National Information Board; and

- Public and patients.

However budget and time constraints overrode such considerations in this case.

5.8   Opportunities for Further Research

As noted in Chapter 2, Literature Review, no peer reviewed papers have been published to date into the current e-health strategy. This one off cross sectional formative study is the first. Due to timescale constraints for this research repeated longitudinal analysis over time is not feasible e.g. further rounds of interviews at points in time as the e-health strategy progresses through its lifecycle, or as a summative evaluation as part of a longitudinal study after its planned end, say, after 2020 (National Information Board, 2015c). For example, the previous EHR e-health strategy in England, NPfIT, was studied midpoint and then again near its end (Robertson et al., 2010), (Sheikh et al., 2011).

Secondly a further *opportunity for future research* is to improve triangulation and validity by collecting data to compare and contrast the varying perspectives of more sample groups to address that limitation highlighted in Section 5.7, above.

5.9   Publishing Plans

The plan is to firstly, publish the thesis and offer an electronic copy to interviewees that requested that. Secondly, given the professional nature of the topic, the sections that set out the "Do Differently Suggestions" in this chapter will form the core of a publication in a business report format. The plan is to circulate that to senior staff tasked with leading the strategy in government and their agencies including NHS England, NHS Digital and those who sit on governing bodies, especially the National Information Board. It is hoped that they will reflect on the contents and consider the

points made which may influence the evolution of the strategy, or its successors, in the future.

Shorter papers, summarising the study, will also be prepared and submitted to peer reviewed journals for publication, including the International Journal of Medical Informatics, Journal of the American Medical Informatics Association and BMC Medical Informatics and Decision Making. In addition, offers will be made to present key findings at a number of annual national conferences in the UK including:-

- EHI Live;
- Digital Health World Congress;
- The Digital Healthcare Show;
- Future Healthcare 2018; and
- The UK e-Health Week Conference.

Finally, shorter articles will be prepared and offered for publication to none academic health sector publications to reach professional stakeholder groups at a more local as well as national level, including the:-

- British Computer Society's Health Group;
- HiMSS British Journal of Healthcare Computing;
- Health Services Journal; and
- Digital Health, including Digital Health News and their CIO, CCIO and NCIO Forums.

5.10 Contribution to Knowledge & Practice

5.10.1 Introduction

This section sets out two significant contributions to knowledge and practice. The first is an enhanced understanding of the factors affecting the progress of e-health strategies set out in Section 5.10.2.   The second is set out in Section 5.10.3, The Addition of "Passage of Time" & "Purpose" Dimensions.

5.10.2 Factors Affecting Progress

As explained in Chapter 2, Literature Review, the literature supports a view that the success or otherwise of e-health strategies   are dependent upon a successful navigation through an interacting mix of factors, which can act as both barriers and facilitators within, and across, not just technical, but also human, social; organisational; macro-environmental and wider socio-political dimensions (Bowden & Coiera, 2013), (Takian et al (2012), (Hillestad et al, 2005). This is supported by the findings of this study as set out in Chapter 4, Data Presentation and Analysis and in this chapter. Chapter 3, Methodology, also explains that this research chose to commence with a neutral socio-technical environmental dimensions based model informed by several studies, including Cresswell (2009), rather than a proposition based model, such as those put forward by Coiera (2009) and Eason (2013). The chosen approach was informed by elements of Grounded Theory with the intention of seeing whether the data itself led to the development of a proposition based model, which it has.

The four dimensional socio-technical model also proved itself to be an effective tool to identify and analyse factors affecting progress at a point in time.   As explained in Section 4.8, Additional Socio-technical Factors, the following figure shows the factors affecting progress brought together from various models found in several studies during the Literature Review in black, and those added as a consequence of the data collection process in red, with a presentation style informed by Cresswell (2013), Murray, (2011) and Takian (2012):-

Figure 20, Socio-technical Environmental Dimensions Based Model

New Factors affecting progress found during data collection – from interviewees

3 Organisational dimension
3.1. Organisational context, size and type
3.2. Getting the organisation ready for change (innovation
3.3. Decision making and governance structure
3.4. Perceived risks and benefits of implementing EHR
3.5. Financial - Business case, Return on Investment (ROI).
3.6. Resources, local Incentives, targets, financial & human
3.7. Teamwork and Communication, (included promotional
3.8. Planning
3.9. Leadership, management, project management
3.10. Time: Realistic expectations and timelines
3.11. Learning and evaluation
3.12. Sharing lessons learned

3.13 Procurement cycles and issues
3.14 Quality of Supplier
3.15 Other organisational changes – the pace of change

4 Macro-environmental & Wider socio-political dimension
4.1. The wider economic environment & pressures
4.2. International developments
4.3. Policy - Govt Political commitment to Health-policy, National EHR ASP Strategy within context of Health Policy
4.4. EHR National Policy (Strategy and Vision / National EHR ASP implementation strategy / Choice of Strategy
4.5. National decision and governance structure
4.6. Contracts - National v local EHR delivery model
4.7. National Incentives, targets, financial resources
4.8. National interoperability standards and infrastructure,
4.9. Stakeholder Engagement

4.10 Presence of National Cyber Security Measures

4. Macro-environmental & Wider socio-political dimension
3. Organisational dimension
2. Human and social dimension
1. Technical Dimension
Socio-technical conceptual model

1 Technical Dimension
1.1. Technical architecture and provision of adequate end
1.2. Technical infrastructure and information standards,
1.3. Choice of EHR system
1.4. Data cleansing and migration
1.5. Software usability, reliability, integration, stability and
1.6. Hardware usability, reliability, integration, stability and
1.7. Complexity, limitations, features and functionalities of
1.8. Adaptability and flexibility of new system
1.9. Data quality - accuracy and completeness
1.10. Integration and interoperability with existing systems
1.11. Data protection, security and confidentiality
1.12. Patient privacy and security / "opt-out" model
1.13. Legitimate relationships and "role based access"
1.14. Medico-legal issues

2 Human and social dimension
2.1. Presence and influence of "champions"
2.2. Culture - Attitudes, expectations, concerns, and motivations - Motivation/inertia to use EHR
2.3. Engagement and user input in design
2.4. Training and support, computer skills of end users
2.5. User ownership, resistance and expectations
2.6. Integration with existing work practices

A key conclusion drawn here, and as such, this represents a major difference, is that the model that exists now at the end of this research process is an enhanced version of the one derived from the Literature Review drawing together factors identified in several previous models and the inclusion of new factors that came to light during the interview process (with the latter n red in the figure above). As such this model in itself represents new knowledge and has been included in this analysis.

However, the problem with the above model is that it fails to reflect the passage of time, as an e-health strategy processes through its lifecycle. It also fails to reflect the "purpose" of the strategy itself, which, as the Literature Review and data collected from interviewees demonstrated, can vary. Additions to the model to address those deficiencies are set out in the following section.

5.10.3 The Addition of "Passage of Time" & "Purpose" Dimensions

The shift in "purpose" towards "*inter-organisational clinical and social care workflow improvement*" also suggests that a revised e-health strategy Socio-technical Model may be helpful for future studies if it is adjusted in two ways. Firstly, to recognise "the passage of time", especially the varying impact of factors depending on where the strategy is within its life cycle, (or the same factors may vary in their impact, as barriers or facilitators, as time progresses from factors affecting the strategy at its beginning and through its lifecycle, to its end) and secondly, to recognise the concept of "purpose". Several researchers have sought to overlap an additional cross cutting dimension to typically illustrate the time related nature of the process, but not "purpose" per se. Examples found in the literature include Murray's, (2011) application of Normalisation Process Theory and Takian's (2012) application of Cornford's (1994), "In Progress: Structure, Process and Outcome" Model. Other examples of process models are Cresswell's (2013), which draws on elements of the Technology Lifecycle Model and Greenhalgh's (2013), which draws on elements of the Diffusion of Innovation Theory. Interviewees also recognised this theme, citing several examples from their own experiences over many years, including the need to engage effectively with stakeholders at early stages in the evolution of the strategy to secure cultural acceptance; the adverse impact of mid-term programme and organisational restructuring on timescales and the inadequacy of human resources and national funding to support local initiatives. Drawing on these studies and the evidence gathered, the concepts of "purpose" and "time" dimensions are drawn on to propose a revised model.

To represent this navigational "passage of time" dimension this study proposes to draw on a revised representation of a strategy's life cycle informed by Cresswell (2013) as shown in Figure 21, E-Health Strategy Lifecycle Model below:-

Figure 21, E-Health Strategy Lifecycle Model
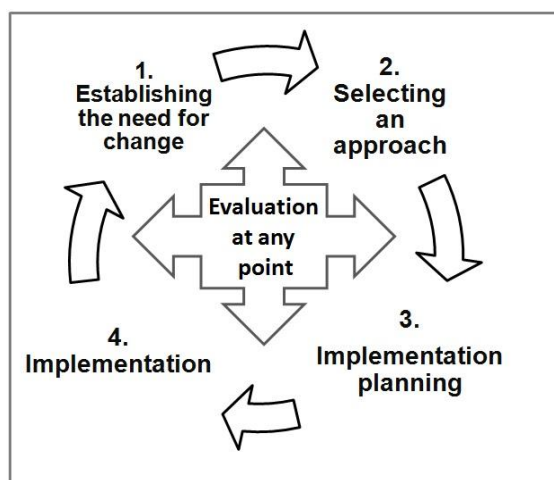
Unlike Cresswell, the above model separates the "Implementation" stage from the "Evaluation" stage to suggest that evaluation can take place at any point, whereas Cresswell (2013) includes both in a "Maintenances & Evaluation Stage".

The addition of the "purpose" dimension to the model builds on a key area of difference between the Literature Review, where studies typically focus on EHR adoption per se, and the findings of this study as set out in Section 4, Data Presentation and Analysis. That is especially in respect to the recommended focus of this strategy on clinical workflow improvement and national Mandate National Standards and Systems. As further argued above, a significant proposition is that current and future e-health strategies are more likely to be successful if they have "middle out" characteristics, but also that their "purpose" shifts away from promoting the adoption of EHRs, now that healthcare providers have EHRs in place, albeit with varying levels of functional sophistication, more towards inter-organisational clinical and social care workflow improvement. This lifecycle process is illustrated in Figure 22, A Model to represent the Lifecycle & Purpose of an e-Health Strategy:-

Figure 22, A Model to represent the Lifecycle & Purpose of an e-Health Strategy
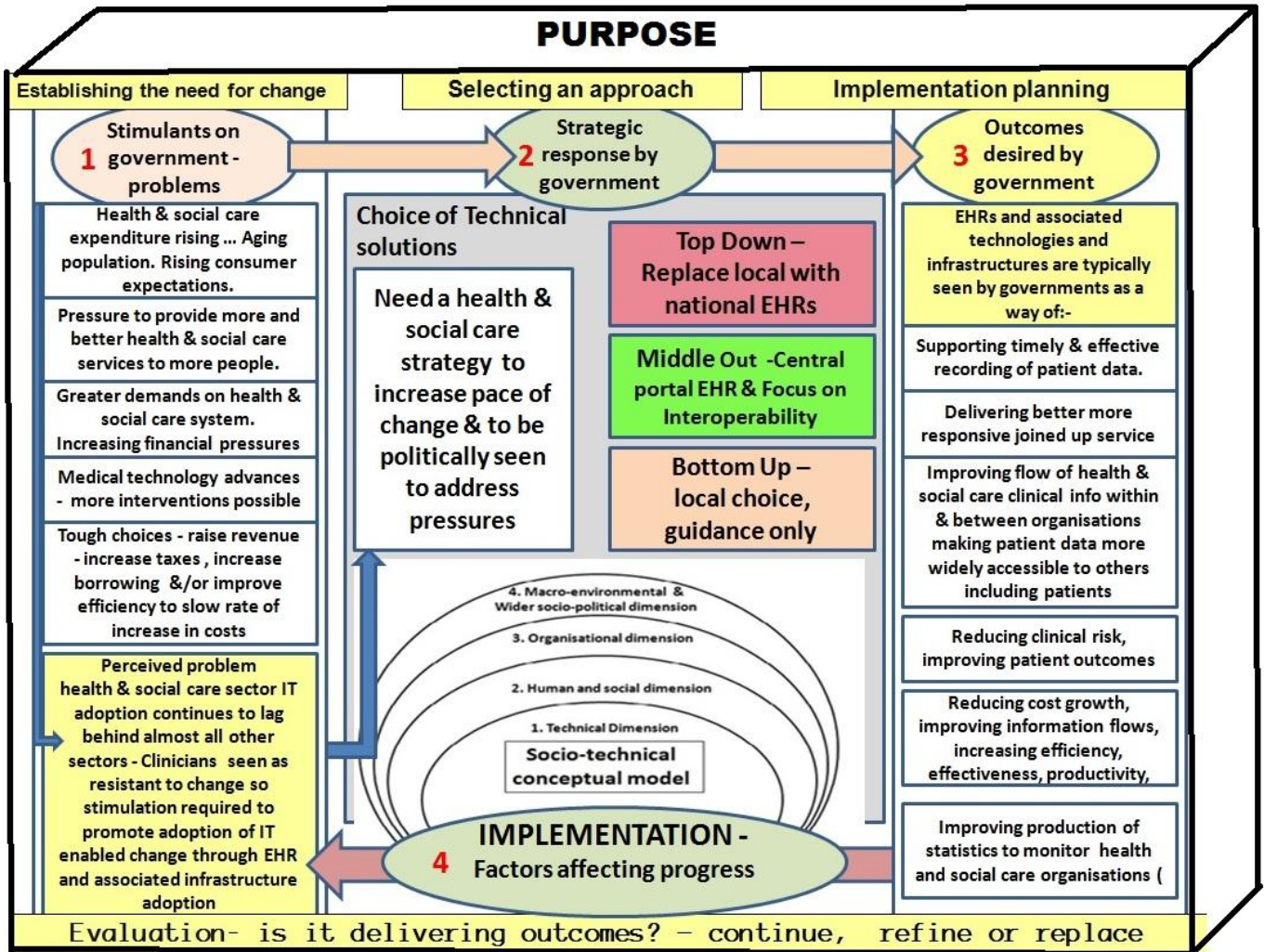
The major stages of the model are described in more detail below:-

Expanding on **"Stage [1]: Establishing the need for change",** of the model, it is proposed that this is affected by a number of factors that stimulate government to act. Those shown in the model above are derived from stimulants highlighted in Chapter 2, Literature Review, Section 2.8.1, Stimulants on Governments, and Chapter 4, Data Presentation and Analysis, Section 4.3.2, Establishing the need for change. Both the literature and interviewees suggest that these stimulants are typically expressed as problems and political imperatives that establish the need for change. There appears to be a high degree of commonality of those stimulants across strategies in many westernised developed countries and those affecting the NHS in England. These could also be called "factors affecting its conception" and can include: responding to pressures from rising health & social care expenditure due to an ageing population with more complex and costly health needs; rising consumer expectations; responding to pressure to provide more and better health & social care services to more people leading to greater demands on health & social care system; increasing financial pressures due to those; and also medical technology advances making more interventions possible.

This can lead to tough choices, such as whether to raise revenue by increasing taxes, or borrowing and measures, such as an e-health strategy, setting out how to improve efficiency and productivity to try to slow the rate of increase in costs. The common perceived problem is that IT adoption continues to lag behind almost all other sectors. Governments often see clinicians especially as resistant to change, so stimulation is required to promote IT enabled change through EHR and associated national infrastructure adoption via a health & social care strategy that is intended to increase the pace of change and to be politically seen to address pressures.

In relation to **Stage [2] Selecting an Approach**, it is proposed that the strategic response by government to those stimulants is typically the development of a healthcare policy [and potentially integrated with a social care policy] of which an e-health strategy and its technical solution set is a component, Earlier discussion on that can be found in Chapter 2, Literature Review, Section 2.5.2, Selecting an Approach and Chapter 4, Data Presentation and Analysis. These stimulants are most closely associated with the factor *"The wider economic environment & pressures",* as derived from the literature review (see Appendix 4, Factors Affecting

e-Health Strategies). However, these are not all strictly economic, so that has been adjusted slightly to reflect that new insight to "*Wider economic, **political and social environment & pressures***".

Drawing on Coiera (2009), that approach could be "top down", "middle out" or "bottom up", with a proposition supported by the literature, and this study in Section 5.3, Research Question 2: Factors affecting e-Health Strategies, that a technical solution with "middle out" characteristics is the most appropriate means to deliver the desired outcomes.

It is proposed that **Stage [3] Implementation Planning**, involves the development of an implementation plan to deliver a range of desired outcomes. Building especially on the conclusions drawn in Section 5.5.5, Mandate National Standards and Systems, this research proposes that plans should focus more on mandating and enforcing the use of national interoperability and cyber security systems, national standards and national infrastructure for all higher volume clinical and social care information flows.

Various cross cutting components of that plan should also include measures to address cultural issues via various stakeholder engagement activities building on the findings in Section 2.9, Stakeholder Engagement, Section 4.6, National Governance and National Resourcing and Section 5.5.6, Encourage More Inclusive Clinical Engagement. Also, it is proposed that the plan should include the set up of a national governance structure together with resources (funding and staffing support), based on the findings set out in Section 2.10, Governance and National Resources, Section 4.6, National Governance and National Resourcing, Section 5.5.7, Establish One National Interoperability Department, Section 5.5.8, Look for Synergy across Transformation Initiatives, Section 5.5.9, Adjust National Governance, and Section 5.5.10, Replace CCGs Planning Role with Regional e-Health Tiers.

Finally the plan should include a range of programmes designed to deliver the desired outcomes, examples of which can be found in Section 2.8.1, Stimulants on Governments Section 4.3.2, Establishing the need for change, Section 5.5.4, Focus on "Community Wide Interoperability" CODE Projects, and Section 5.5.5, Mandate

National Standards and Systems. Also the plan should build on the suggestions contained in Section 4.7, Implementation Approach and Targets, and Section 5.5.10, Replace CCGs Planning Role with Regional e-Health Tiers, Desired outcomes could typically include, for example: supporting the timely & effective recording of patient data; delivering better more responsive joined up services; improving flow of health & social care clinical info within & between organisations; making patient data more widely accessible to others, including patients; reducing clinical risk, improving patient outcomes; reducing cost growth, improving information flows, increasing efficiency, effectiveness, productivity; and improving production of statistics to monitor health and social care organisations.

Stage [4] Implementation commences once the programme structure plan and key ingredients are put in place including funding; a governance structure to oversee it; a national delivery organisation; and national teams to run the programmes and to take those forward. The task is then to implement the strategy. Hopefully that should avoid the pitfalls identified by interviews in Section 4.7, Implementation Approach and Targets, include the Section 4.7.2, Adverse Impact of Internal Government Reorganisations. Of particular importance will be a need to recognise the need to be clear on the provision of national funding support as set out in Section 5.5.2, Provide Timely Clarity on National Funding.

The Evaluation Stage is deliberately shown as cross cutting, in the sense that it could happen at any point and be repeated, during the lifecycle of a strategy to assess progress. An example of one is described in Section 4.4.3, The "Wachter Review". It is proposed that the aim should be to determine factors affecting its adoption, and to set out recommendations relating to its revision or termination. For example, whether the e-health strategy is delivering the desired outcomes in appropriate timescales, which may alter significantly following major reorganisations, delivery failures, the election of a new government. That may lead to a decision to either continue, refine or replace the strategy totally with another different strategy and the cycle continues. The evaluation could also take the form of an academic evaluation, such as those that took place during the previous EHR e-health strategy in England, NPfIT, which was studied midpoint and then again near its end (Robertson et al., 2010), (Sheikh, (2011).

5.11 Conclusion

5.11.1 Background

This is a study of the national e-health strategy of the NHS in England. The strategy was first announced, as a component of the government's overall health policy, in 2014 in their publication, the "*5 year Forward View*". The e-health strategy component of that was expanded upon in "*Personalised Health and Care 2020*" in 2015, with a focus on providing the "electronic glue" to promote inter-organisational interoperability to achieve an overall strategic objective that the strategy would result in the NHS becoming "paperless at the point of care by 2020".

In this context the national e-health strategy and those that proceeded that, as well as other e-health strategies in other westernised developed countries, are conceptualised here as politically-initiated, highly complex, challenging, and large-scale programmes which operate at a macro level in highly complex healthcare environments. As they are initiated by governments which change over time, they tend to have a lifecycle closely aligned to those changes, so their time is typically limited. History illustrates that those can have a lifespan of around 5.5 years in the NHS and that choosing any one particular type of strategy construct and purpose is not a guarantee of success. They are subject to highly complex interactions of factors in a continually changing environment where they are dependent upon the successful navigation through an interacting mix of factors (variables), both known and unknown. Some act as barriers and others as facilitators within, and across, not just technical, but also human, social, organisational; macro-environmental and wider socio-political dimensions. As a result they can have unpredictable outcomes with unintended consequences. Their complexity and lack of a physical form suggests that e-health strategies can be defined by various stakeholders in different ways. Those stakeholders may have differing vested interests, varying levels of power to support or hinder progress, varying cultural beliefs and attitudes and, as a consequence, may have multiple mental constructions, perceptions, manifestations, meanings and interpretations of reality attributed by them to the strategy. Given that complexity and unpredictability, this formative study, like the vast majority of studies of e-Health strategies, concludes that an interpretative research philosophy is the

most appropriate one to adopt, rather than a positivist one, to explore factors affecting their progression.

5.11.2 Methodology

In terms of research strategy, epistemologically, this study adopts a relativist, exploratory co-constructivist methodology in the qualitative, socio-technical research tradition. This study did not begin with propositions that progress of the e-health strategy is being affected more or less by certain factors, or by its overall form and construction, and then seeing if those propositions were supported or not by the data. Instead it was informed by some elements of Grounded Theory and chose to develop a neutral four dimensional socio-technical model informed by similar models in previous studies (technical dimension at the core, then human and social, organisational and finally, a macro-environmental and socio-political dimension, with factors affecting progress within each).

That was used to deductively and systematically identify factors, in academic peer reviewed literature published from 2009 onwards, which have been frequently found to affect the progression of other e-health strategies in a number of westernised developed countries, and to subjectively group those into main themes (based on the judgement of the researcher). Those themes include [1] the importance of the overall construction of the strategy, [2] the necessity of effective stakeholder engagement to address cultural issues, especially among clinicians who can be resistant to change, [3] the presence of an effective national governance structure and national resourcing (staffing and funding) and finally [4] the setting of a realistic implementation approach, properly resourced and funded plans and realistic targets that deliver the strategy's overall objectives.

The Literature Review also identified important gaps in knowledge that justify the need for this research, the most significant of which was that no academic research had been published into factors affecting this e-health strategy. It also highlighted that studies rarely collect data from distinct sample groups of suppliers or IT consultants, with most typically drawing on the experience of staff employed by healthcare provider organisations, governments and their agencies. The outcome of the Literature Review can be found in Chapter 2.

As explained more fully in Chapter 3, Methodology, an abductive data collection method was adopted that built on the main themes of the Literature Review as topic entry points to frame the stylistically open interview questions. It also drew on available, but incomplete information from a content (textual) analysis of purposively selected government e-health strategy reports to provide some briefing information as a proxy of the government's viewpoint of what the strategy "is" as part of the co-construction process. These both informed the development and structure of a semi-structured interview instrument. An initial Pilot Phase tested the reliability and validity of the method, the instrument structure and content with four interviewees (drawn from both sample groups). The interviews proper took the form of one to one semi-structured interviews, with 18 purposively selected knowledgeable individuals in two sample groups of nine who were involved in the implementation of the strategy (seven face to face and 11 telephone interviews selected from a larger cohort of 155). Samples were differentiated based on whether interviewees were working either for suppliers of EHRs and associated services and infrastructures, or as IT Consultants providing implementation support to NHS organisations. Interviews took place between September 2016 and February 2017. A number of additional interviewees were available, but ultimately stood down, because thematic saturation was reached with the first cohort. That produced over 209,000 spoken words that took 288 hours to transcribe onto 322 A4 pages, which was completed in May 2017.

The Socio-Technical Model informed by the Literature Review, the interviewees and the interview transcripts were imported into the NVivo 11 system and linked to the most appropriate factor in the Socio-Technical Model. Some data items were found to not have a corresponding factor in the Model as derived from the Literature Review so new factors were added as the data analysis process proceeded. The data sets were then analysed iteratively by re-reading segments several times to distil themes arising for inclusion in Chapter 4, Data Presentation and Analysis, which was completed in November 2017. From an ontological perspective, that data collection and analysis process successfully obtained knowledge of the factors affecting progress of the strategy and the meanings behind those based on the many current and historical e-health strategy experience of interviewees (it did not seek a single "truth"). Axiologically, this research is therefore bound in values where those

meanings are subjectively socially co-constructed with the researcher. Therefore the researcher accepts that they are inevitably an "insider" and part of the research. So no claims are made here that it is free of the researcher's personal values and that, inevitably, bias is introduced into the findings and conclusions. So epistemologically, several socially constructed meanings can be considered correct and, as this research is co-constructed, it does not claim to put forward one objective reality merely some propositions. So any notion that there is a single "right way" to construct and deploy e-health strategies is not intended.

The methodology chosen proved to be appropriate and its application has provided sufficient data to provide answers to the Research Questions. It has identified the factors that, in the eyes of many of the interviewees in both sample groups, were affecting the adoption of the e-Health strategy in the NHS in England at the time the interviews took place. It also drew out, from those interviews, a number of insights, experiences and "do differently" suggestions that they felt could be used to inform future plans for the e-Health strategy and potentially those of other national strategies of this and other countries in the future. Those insights were then used, in conjunction with the literature review findings, to determine what propositions, if any, are suggested by the data collected.

5.11.3 Key Differences

The process of analysing the data collected from interviewees highlighted some key differences between this research and that carried out by others. These are introduced here and then expanded further. These are:

[1] All of the factors affecting progress identified during the literature review were highlighted by interviews except for medico-legal issues. Some additional factors were also highlighted.

[2] Interviewees also emphasised the most influential factors that in they perceived were impeding progress the most to such an extent that the government's target, that the NHS would become "paperless at the point of care by 2020", is unattainable in their view.

3] They did conclude that a "middle out" strategy is the most appropriate type to deploy and co-constructed practical recommendations to improve the current strategy, or to be included in a replacement.

[4] A further proposition is that the understanding of factors affecting progress of e-health strategies can be enhanced by drawing on elements of Change Management Theory and Technology Lifecycle Theory by increasing the socio-technical model from four to six dimensions by adding "passage of time" and "purpose" dimensions to the technical, human and social, organisational; macro-environmental and wider socio-political dimensions.

[5] Finally in relation to the sixth "purpose" dimension, this study puts forward a significant proposition, co-constructed with a number of interviewees. That is that current and future "middle out" e-health strategies are more likely to be successful if they not only have "middle out" characteristics, but also that their "purpose" shifts away from promoting the adoption of EHRs and more towards inter-organisational clinical and social care workflow improvement.

So to begin with the first key difference, the research process highlighted some key differences between previous studies and this. For example, medico-legal issues were highlighted as a barrier to progress in the some of the prior literature, but not by interviewees in either sample group. There were also similarities. Like previous studies, which accepted implicitly that national e-health strategies are needed (none argued for their demise), all interviewees believed that too. Interviewees also universally concurred that the e-health strategy was "middle out" in its construction, drawing on the classification put forward by Coiera (2009), and that that was the most appropriate form to stimulate adoption, rather than "bottom up" like previous "bottom up" NHS HISS and ERDIP programmes, or the "top down" NPfIT. Again, that is a view echoed in the literature where no reviewed studies proposed that "top down" or "bottom up" were the more likely to be successful strategic constructs.

Interviewees also highlighted a number of additional factors that led to the first proposition of this study, and contribution to knowledge set out here. That

proposition is that the socio-technical conceptual model should be expanded to include additional factors that have been found to affect progress of the e-health strategy. These were highlighted mainly by the supplier sample group, but not exclusively. Four were identified: [1] the threats to progress posed by possible national cyber security incidents, (located in the macro-environmental dimension) and three new factors in the organisation dimension: [2] recognising the potential mismatch between e-health strategy timescales and the procurement cycles of local organisation (impacting potentially on their ability to react quickly enough to national stimuli); [3] The quality of IT suppliers to deliver added functionality in quality products and services in sufficient time to meet national targets at affordable prices; and finally [4] The threat to the provision of adequate resources to progress the e-health strategy locally caused by the competing demands of other change management programmes with significant information technology requirements and implications initiated locally and by other government agencies. Interviewees especially cited the competing demands for local resources of the Sustainability & Transformation Programme and Accountable Care Organisation pilots.

The second key difference is that interviewees also highlighted the adverse impact on progress of several of the most influential factors including: [1] Inadequate and late funding: with a focus on providing only partial and much delayed funding to a small minority of organisations as "Centres of Digital Excellence" (CODE) and "Fast Followers" to promote the implementation of EHR functionality within their organisations and lack of funding for the majority, [2] Distracting "Mid-Term" reorganisations and senior management changes at the government agencies tasked with e-health strategy policy and implementation (NHS England and NHS Digital) and a major mid-term implementation programme re-structuring announced in September 2016 before the initial programmes had had sufficient time to deliver. All leading to a unanimous conclusion among interviewees and the researcher that the primary target set out in "*Personalised Health and Care 2020*" in 2015, that the NHS would become "paperless at the point of care by 2020", is unattainable.

Thirdly, so whilst interviewees concluded that a "middle out" strategy is the most appropriate way to proceed, that in turn led to a number of co-constructed practical

recommendations to improve the "middle out" strategy, or to be included in its replacement. These are summarised in below:-

Table 16, Co-constructed Practical Recommendations

Ref	Recommendation
1.	**Provide timely clarity on national funding**
2.	**Avoid government organizational restructuring during the course of the strategy**
3.	**Focus on "Community Wide Interoperability" CODE projects;**
4.	**Mandate national standards and systems for interoperability & cyber security;**
5.	**Encourage more inclusive clinical engagement;**
6.	**Establish one national interoperability department;**
7.	**Look for synergy across transformation initiatives;**
8.	**Adjust national governance;**
9.	**Replace CCGs planning role with regional e-health tiers**

Fourthly, a further key difference is that the proposition that the understanding of factors affecting progress of e-health strategies can be enhanced by drawing on elements of Change Management Theory and Technology Lifecycle Theory. That can be achieved by enhancing the socio-technical model from four to six dimensions by adding cross cutting "passage of time" and "purpose" dimensions to the technical, human and social, organisational; macro-environmental and wider socio-political dimensions.   To reflect the "passage of time", or the lifecycle nature of those strategies, interviewees felt that different factors may impact on progress depending on where the strategy is within that life cycle, or the same factors may differ in their impact, adverse or beneficial, as time progresses (from factors affecting the strategy at its beginning and through its lifecycle, to its end), e.g. the provision of resources and funding near the beginning.   So it is proposed that the "passage of time" dimension should have five lifecycle stages within that, that reflect the change management aims of an e-health strategy: [1] Establishing the need for change, based on a number of "factors that stimulate the government into action", typically problems, such as an ageing population with more complex and costly health needs

and a perception that healthcare providers and their staff, especially doctors, are reluctant to change working practices locally to take fuller advantage of the opportunities offered by new technology, thus requiring the application of national stimulus and interventions. [2] Selecting an approach, the strategic response by government such as a "top down", "middle out" or "bottom up" approach. That includes a proposition, in agreement with several recent prior studies and the interviewees, that a "middle out" approach is the most appropriate, because it strikes the right cultural balance between "top down" government direction in relation to mandating national standards, systems and infrastructure use and local freedoms to choose their own EHRs as long as they can connect up with others via that national infrastructure. [3] Implementation Planning to deliver the outcomes desired by government, such as delivering a better more responsive joined up service; [4] Implementation to include the key factors (ingredients) needed to progress plans, including funding, a governance structure to oversee it, a nationally resourced delivery organisation, national teams to run the programmes and to take those forward, linked with corresponding teams locally linked into that structure. [5] Evaluation, which can occur at any point in the process more than once, to determine factors affecting its progress and leading to decisions to either continue, refine or replace the e-health strategy.

Finally the fifth and final and most significant key difference relates to the sixth "purpose" dimension. This study puts forward a significant proposition, co-constructed with a number of interviewees that current and future "middle out" e-health strategies are more likely to be successful if they not only have "middle out" characteristics, but also that their "purpose" shifts away from promoting the adoption of EHRs and more towards inter-organisational clinical and social care workflow improvement. That is based on the premise that all healthcare providers now have EHRs in place, albeit with varying levels of functional sophistication. Of special importance here are the findings set out in Section 4.5, Stakeholder Engagement - The Importance of Culture. Seeking to change local EHRs, like with NPfIT, can upset the moral order and generate significant resistance to change from clinicians who, as traditional gatekeepers of that data, have the power to significantly impede progress via active resistance and passive non-cooperation. So in evolutionary terms it is proposed that it is now time to enter a new phase and focus more on the joining up

of those (by promoting and mandating interoperability programmes and by selecting health economy wide CODE sites for example). So it proposes an additional dimension is added to the model relating to "purpose" to allow for the future recognition and differentiation of that. This builds on a key area of difference between the Literature Review, where many studies typically focus on factors affecting EHR adoption per se. These changes are embodied in a new e-Health Strategy Combined Socio-technical and Lifecycle Model as a contribution to knowledge and practice illustrated in Figure 22, A Model to represent the Lifecycle & Purpose of an e-Health Strategy in**Error! Reference source not found.** Section 5.10.3, The Addition of "Passage of Time" & "Purpose" Dimensions,

End

Appendices

Appendix 1, Methodologies Used to Study e-Health Strategies

The following table identifies the methodologies used by a number of similar studies of e-health strategies:-

Table 17, Methodologies Adopted to Study e-Health Strategies

Study	Research Philosophy	Change Management (Interpretative)	Technology Adoption Theory (Positivist)	Socio-Technical Theory	Grounded Theory	Theoretical / Conceptual framework / model
Boonstra (2010)	Interpretative	yes				Adopted a **change management** perspective, to develop some "barrier-related interventions" that could overcome the identified barriers
Bowden (2013)	Interpretative			yes		Adopted a socio-technical approach. Concluded that the technical aspects are the least challenging with the real barriers within the social, cultural, legal, institutional, economic, and political challenges
Coiera (2009)	Interpretative			yes		Adopted a socio-technical approach
Cresswell (2009)	Interpretative			yes		Adopted a socio-technical approach
Cresswell (2013)	Interpretative	yes	Draws on elements of a **technology lifecycle approach**			Draws on elements of a **technology lifecycle approach** to highlight key considerations at four stages: establishing the need for change, selecting a system, implementation planning, and maintenance and evaluation
Deutsch (2010)	Interpretative			yes		Adopted a socio-technical approach
Murray (2011)	Interpretative	yes Normalization Process Theory (				Adopted a Normalization Process Theory (NPT) approach
Greenhalgh (2013)	Interpretative		**Draws on elements of Diffusion of Innovation Theory**	yes		Adopted an Interpretivist social practice perspective that explicitly considered the personal, social and political context as well as the material properties and functionality of the technologies under scrutiny using a framework derived from Diffusion of Innovations Theory.
Greenhalgh (2009)	Interpretative			yes		Adopted a socio-technical approach
McGinn (2012)	Interpretative			yes		Adopted a socio-technical approach
McGinn (2011)	Interpretative			yes		Adopted a socio-technical approach
Morrison (2011)	Interpretative			Yes 'top-down', 'bottom-up' and 'middle-out'		Adopted a socio-technical approach -Informed by Coiera's 'top-down', 'bottom-up' and 'middle-out' conceptualisation of national e-health strategies
Otto	Positivist		Diffusion of Innovation			Adopted a System Dynamics Model simulation model.

Study	Research Philosophy	Change Management (Interpretative)	Technology Adoption Theory (Positivist)	Socio-Technical Theory	Grounded Theory	Theoretical / Conceptual framework / model
(2013)			Theory			informed by the Diffusion of Innovation Theory
Robertson (2010)	Interpretative			yes	yes	Adopted a socio-technical approach informed by modified elements of Grounded Theory
Rozenblum (2011)	Interpretative			yes	yes	Adopted a socio-technical approach informed by modified elements of Grounded Theory
Salzberg (2012)	Interpretative			yes	yes	Adopted a socio-technical approach informed by modified elements of Grounded Theory
Sheikh (2011)	Interpretative			yes		Adopted a socio-technical approach.
Takian (2012)	Interpretative			yes		Adopted a socio-technical approach.
Waterson (2013)	Interpretative			yes		Adopted a socio-technical approach
Zimlichman (2012)	Interpretative			yes	yes	Adopted a socio-technical approach informed by modified elements of Grounded Theory principles of coding and theme abstraction
Zinszer (2013)	Interpretative			yes	yes	Adopted a socio-technical approach informed by modified elements of Grounded Theory principles of coding and theme abstraction
Zwaanswijk (2013)	Interpretative			yes	yes	Not stated, but deduced that study adopted a socio-technical approach informed by modified elements of Grounded Theory principles of coding and theme abstraction
		3	1	18	6	

Appendix 2, Countries in Scope of Previous Studies

Table 18, Countries in Scope of Previous Studies

End Note Ref	Study	YEAR	England	Scotland	Wales	N Ireland	Denmark	Holland	Switzerland,	Germany	USA	Canada	Australia	New Zealand
			EUROPE								AMERICA		AUS NZ	
			UK				EUROPE							
1448	Boonstra (2010)	2010									1			
365	Bowden (2013)	2012	1											1
2128	Coiera (2009)	2009	1								1		1	
2237	Cresswell (2009)	2009	1											
362	Cresswell (2013)	2013	1								1			
198	Deutsch (2010)	2010	1				1			1		1	1	
2241	Murray (2011)	2011	1	1										
1615	Greenhalgh (2013)	2013	1	1	1	1								
1599	Greenhalgh (2009)	2009												
422	McGinn (2012)	2012										1		
787	McGinn (2011)	2011												
225	Morrison (2011)	2011	1								1		1	
1696	Otto (2013)	2013									1			
439	Robertson (2010)	2010	1											
391	Rozenblum (2011)	2011										1		
1649	Salzberg (2012)	2012									1	1		
416	Sheikh (2011)	2011	1											
172	Takian (2012)	2012	1											
364	Waterson (2013)	2013	1	1	1	1			1		1	1	1	1
383	Zimlichman (2012)	2012									1	1		
363	Zinszer (2013)	2013										1		
316	Zwaanswijk (2013)	2013						1						

EUROPE			23								AMERICA		AUSTRALIA, NEW ZEALAND	
UK		19	other EUROPE			4					15			6
England	Scotland	Wales	N Ireland	Denmark	Holland	Switzerland,	Germany	USA	Canada	Australia	New Zealand
12	3	2	2	1	1	1	1	8	7	4	2

Appendix 3, Terminology Variations

The following table illustrates the wide variation of terminology:-

Table 19, Variations in Terminology

Study	EHR described as:	Strategy described as	Factors affecting the strategy described as:
Boonstra (2010)	EMR	Programme/project	Barriers & beneficial intervention options.
Bowden (2013)	EHR HIT	Strategy	Major issues
Coiera (2009)	NHIS. SSEHR	Programme	Difficulties, problems, undesirable consequences.
Cresswell (2009)	NHS CRS	National electronic health record strategy, mega-programme	Factors that have been repeatedly found to be important for the successful implementation of EHRs
Cresswell (2013)	HIT	large-scale health information technology	Key pointers that can help streamline implementation efforts. Factors associated with effective implementation
Deutsch (2010))	EHR eGK HIT	Programme e-Health project	Frequently involved critical areas, problems, points of criticism, deficiencies, significant factors, risks. Useful measures.
Murray (2011)	ICT	e-health initiatives, e-health implementations Programme	Barriers and facilitators. Factors which promote or inhibit successful normalization. Factors which had promoted or impeded implementation
Greenhalgh (2013)	nEPR. Individual Health Record	Programme, Strategy	Implementation challenges
Greenhalgh (2009)	EPR		
McGinn (2012)	EHR. Interoperable EHR solutions	Programme	Key factors. Adoption factors Implementation factors,
McGinn (2011)	EHR	Programme	barriers and facilitators
Morrison (2011)	EHR	Strategies. National-level implementations.	Barriers, factors
Otto (2013)	EHR.	Policy interventions for improved adoption.	Barriers, a control action, a policy intervention
Robertson (2010)	EHR. NHS Care Record Service	Programme.	Barriers and drivers that shape the implementation process and drive the diffusion
Rozenblum (2011)	HIT EHR	e-health plan Programme	Barriers to adoption. Adoption accelerators Successful aspects
Salzberg (2012)	HIT	Programme National policy initiatives	Major barriers to national adoption of policies, Critical factors, key components, Facilitators. Critical factors necessary to ensure that policies are successfully defined and implemented
Sheikh (2011)	EHR. NHS Care Record Service	NPfIT Programme	Contextual factors, local challenges, range of consequences
Takian (2012)	EHR	Programmes Reform strategies. National EHR endeavours	
Waterson (2013)	HIT	Large-scale HIT Implementation strategies.	Factors which influence and shape the character of successful large-scale HIT implementation initiatives. Key success factors. Approaches and strategies.
Zimlichman (2012)	EHR EMR HIT	Programmes	Aspects that succeeded, the features that were less successful.
Zinszer (2013)	HIT	Programme	challenges and successes
Zwaanswijk (2013)	n-EPR	Programme	Factors that may have contributed to problems. Strategies that can contribute to a successful implementation

Abbreviations in above table:	
Health Information Technology (HIT) Electronic medical record (EMR) Electronic Health Record (EHR) National Health Information System (NHIS) information and communication technology (ICT) Single shared electronic record (SSEHR) NHS care record service (NHS CRS)	Elektronische Gesundheitskarte (eGK) National Electronic Patient Record (nEPR) - Nationally accessible electronic summaries of. • Scotland's Emergency Care Summary (ECS). • Northern Ireland Emergency Care Summary (ESR) • England's Summary Care Record (SCR), • Welsh Individual Health Record (IHR)

Appendix 4, Data Collection Methods Used by Similar Studies

The range of methods is shown below:-

Table 20, Data Collection Methods Used

Study	Data Collection Methods			Purposive sampling							
	7 (334)	**9**	**10**	**500**	**6**	**1**	**1**	**1**	**1**	**2**	**1**
	systematic literature review (+ papers in review)	Secondary analysis of data collected previously.	Purposive sampling of knowledge able individuals	Number of participants if stated	Semi-structured Interviews	Structured Interviews	scheduled telephone interview	Delphi study	user group meetings	Online questionnaire	Mailed in survey
Boonstra (2010)	1 (22)										
Bowden (2013)	1 (32)										
Coiera (2009)	1 (8)										
Cresswell (2009)	1 (40)										
Cresswell (2013)		1									
Deutsch (2010)		1									
Murray (2011)			1	23	1						
Greenhalgh (2013)		1									
Greenhalgh (2009)	1 (118)										
McGinn (2012)			1					1		1	
McGinn (2011)	1 (52)		1						1		
Morrison (2011)	1 (62)										
Otto (2013)		1									
Robertson (2010)		1	1	?	1						
Rozenblum (2011)		1	1			1					
Salzberg (2012)			1	?	1						
Sheikh (2011)		1	1	431	1						
Takian (2012)		1									
Waterson (2013)											
Zimlichman (2012)			1	29	1					1	1
Zimlichman (2012)											
Zinszer (2013)			1				1				
Zwaanswijk (2013)		1	1	17	1						

Appendix 5, Research Instrument

This research has been conducted in full agreement with the University of Chester Ethical Policies, the Committee on Publication Ethics, and the British Academy of Management Ethical Guidelines. As a consequence the Research Instrument consisted of three components:-

- Participant Consent Briefing;
- Consent Form; and
- Semi-structured Interview Questionnaire.

The "Participant Consent Briefing" set out the information participants needed to ensure that their consent to take part was well informed. It explained why they were chosen, that they were free to withdraw and what would happen if they took part. It confirmed that they would have the opportunity to review and amend the transcript of the interview and that they would not be identified in the thesis. The disadvantages and advantages of taking part were covered. In addition a senior staff member's contact details were also included in case something went wrong and they wished to contact the university directly. It also explained that the information they gave would remain confidential, what will happen to the study and that they will be offered a copy. It explained that the researcher was organising and funding the study and it included the researcher's contact details. A copy of the Participant Consent Briefing can be provided on request.

The "Consent Form" was included for completion, signing and subsequent retention by the interviewer as part of the audit trail. It included a series of questions confirming that they were giving their informed consent to participate and that they agreed that they were knowledgeable individuals in relation to the e-health strategy. Completed copies are retained on file. In a number of cases consent was given on the paper form in writing and in other cases by email. The form can be provided on request.

A copy of the questions contained in the Semi-structured Interview Questionnaire as issued post pilot, during the main data collection phase, is provided below.

"PHC 2020" stands for Personalised Health & Care 2020" and is the brand name given by the Government to the e-health strategy at the time the interviews took place.

1   Exploration of the "PHC 2020" Approach

1.1   Overall Strategy

Let's explore the extent to which the "PHC 2020" strategy adopted by the government is an appropriate way of stimulating adoption, or would an alternative strategy be better and if so why is that?

1.2   Stakeholder Engagement

Let's explore approaches the government are using to engage with various stakeholders and the extent to which are these effective facilitators?

Moving on let's explore if there any barriers getting in the way of effective stakeholder engagement?

Is there anything the government should do differently moving forward and if so why?

1.3   Governance, Leadership and National Resourcing

Let's explore the extent to which the governance structures and leadership arrangements that oversee the "PHC 2020" are strategy appropriate and effective?

Let's explore if there are any barriers getting in the way?

Could these governance structures and leadership arrangements be improved, or replaced, going forward, and if so why?

Are national manpower resources deployed to progress the "PHC 2020" strategy, mainly from NHS Digital, sufficient/too much/about right, of the right type and calibre, and they are being deployed effectively?

What barriers, if any, are getting in the way of deploying these resources?

Is there anything that should be done differently moving forward and if so why?

1.4   Implementation Approach and Targets

How appropriate is the implementation approach being used to progress the "PHC 2020" strategy and how effectively is it working in practice? Could this be improved or could other approaches be preferable, and if so why?

What barriers if any are getting in the way?

How realistic and appropriate are the targets set by the government?

Which facilitators and barriers should be given higher or lower priority to meet them?

2   Exploration of the "PHC 2020" Delivery Programme

This topic explores at how the government are seeking to implement the strategy using a structure based on 10 Delivery Domain and 32 projects as announced in the NIB Annual Report (published September, 2016).

Let's explore the extent to which the domain based delivery structure and projects (facilitators) the government say they are deploying to progress this strategy are effective and appropriate ways of stimulating adoption.

What barriers if any are getting in the way of progressing these?

Could any of these be adapted, improved, added to or replaced by alternatives?

3.   Other factors that are not addressed at all, or inadequately

Finally let's explore the Research Objective*: "To describe insights, experiences and offer lessons that could be used to inform future plans of the strategy, and other national strategies"*.

Are there any areas, thoughts and ideas that can be explored that haven't already been covered? *As a means of stimulating discussion the list of factors in socio-technical model derived from the Literature Review process was used as an aide memoire.*

Are there any factors listed that the strategy does not address at all, or does so inadequately?

If so, how should the government adjust the strategy to address those?

Bibliography

Ajami, S., & Bagheri-Tadi, T. (2013). Barriers for Adopting Electronic Health Records (EHRs) by Physicians. *Acta Inform Med, 21*(2), 129-134. doi:10.5455/aim.2013.21.129-134

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211.

Almoaber, B., & Amyot, D. (2017). Barriers to Successful Health Information Exchange Systems in Canada and the USA: A Systematic Review.

Alshenqeeti, H. (2014). Interviewing as a Data Collection Method: A Critical Review. *English Linguistics Research, 3*(1). doi:10.5430/elr.v3n1p39

Barnard, M., & Stoll, N. (2010). *Organisational Change Management. A rapid literature review*. Retrieved from www.cubec.org.uk

Berger, E. (2013). Electronic health records, promises promises: experts advise patience for return on investment. *Ann Emerg Med, 62*(1), A19-21. doi:10.1016/j.annemergmed.2013.05.011

Blaikie, N. (2007). *Approaches to social enquiry: advancing knowledge*. Cambridge: Polity.

Boonstra, A., & Broekhuis, M. (2010). Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *Bmc Health Services Research, 10*(1), 231.

Bourret, C. (2010). Electronic Health Record (Dossier Medical Personnel) as a Major Tool to Improve Healthcare in France: An Approach through the Situational Semiotic. In F. Zavoral, J. Yaghob, P. Pichappan, & E. ElQawasmeh (Eds.), *Networked Digital Technologies, Pt 2* (Vol. 88, pp. 7-14).

Bowden, T. (2011). EHR strategy: top down, bottom up or middle out? *Stud Health Technol Inform, 164*, 138-142.

Bowden, T., & Coiera, E. (2013). Comparing New Zealand's 'Middle Out' health information technology strategy with other OECD nations. *International Journal of Medical Informatics, 82*(5), E87-E95. doi:10.1016/j.ijmedinf.2012.12.002

Bowen, G. A. (2009). Document Analysis as a Qualitative Research Method. *Qualitative Research Journal, 9*(2), 27-40. doi:doi:10.3316/QRJ0902027

Brender, J., Ammenwerth, E., Nykanen, P., & Talmon, J. (2006). Factors influencing success and failure of health informatics systems--a pilot Delphi study. *Methods Inf Med, 45*(1), 125-136.

Brennan, S. (2007). The biggest computer programme in the world ever! How's it going? *Journal of Information Technology, 22*, 202–211.

Bryman, A., & Bell, E. (2015). *Business research methods* (Vol. 4th). Oxford: Oxford University Press.

Buntin, M. B., Burke, M. F., Hoaglin, M. C., & Blumenthal, D. (2011). The benefits of health information technology: a review of the recent literature shows predominantly positive results. *Health Affairs, 30*(3), 464-471.

Burnard, P. (1994). Searching for meaning: a method of analysing interview transcripts with a personal computer *Nurse Educ Today, 14*, 6.

By, R. T. (2005). Organizational change management: A critical review. *Journal of Change Management, 5*(4), 369–380.

Chuttur, M. (2009). Overview of the Technology Acceptance Model: Origins, Developments and Future Directions. *Sprouts Working Papers on Information Systems, 9*(37), 23.

Clegg, C., Ellis, B., Wyatt, J. C., Elliott, B., Sinclair, M., & Wastell, D. (2011). *A Manifesto for a Socio-Technical Approach to NHS and Social Care IT-enabled business change – To deliver effective high quality health and social care for all.* Retrieved from University of Leeds: www.bcs.org/upload/pdf/st-manifesto-260810.pdf

Coiera, E. (2007). Lessons from the NHS National Programme for IT. *Med J Aust, 186*(1), 3-4.

Coiera, E. (2009). Building a national health IT system from the Middle Out. *Journal of the American Medical Informatics Association, 16*(May–June (3)), 271-273,.

Coiera, E. (2011). Do we need a national electronic summary care record. *Med J Aust, 194*(2), 90-92.

Corbin, J., & Strauss, A. (1990). Grounded Theory Research: Procedures, Canons, and Evaluative Criteria. *Qualitative Sociology, 13*.

Cresswell, J. W. (2009). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (3rd ed.). USA: Sage.

Cresswell, K., & Sheikh, A. (2013). Organizational issues in the implementation and adoption of health information technology innovations: An interpretative review. *International Journal of Medical Informatics, 82*(5), E73-E86. doi:10.1016/j.ijmedinf.2012.10.007

Cresswell, K. M., Bates, D. W., & Sheikh, A. (2013). Ten key considerations for the successful implementation and adoption of large-scale health information technology. *Journal of the American Medical Informatics Association, 20*(E1), E9-E13. doi:10.1136/amiajnl-2013-001684

Cresswell, K. M., Lee, L., Slee, A., Coleman, J., Bates, D. W., & Sheikh, A. (2015). Qualitative analysis of vendor discussions on the procurement of Computerised Physician Order Entry and Clinical Decision Support systems in hospitals. *BMJ open, 5*(10), e008313. doi:10.1136/bmjopen-2015-008313

Cresswell, K. M., & Sheikh, A. (2009). The NHS care record service (NHS CRS): recommendations from the literature on successful implementation and adoption. *Informatics in primary care, 17*, 153-160.

Cresswell, K. M., Worth, A., & Sheikh, A. (2012). Integration of a nationally procured electronic health record system into user work practices. *Bmc Medical Informatics and Decision Making, 12*. doi:10.1186/1472-6947-12-15

Cucciniello, M., Lapsley, I., & Nasi, G. (2015). Understanding key factors affecting electronic medical record implementation: a sociotechnical approach. *Bmc Health Services Research, 15*(1), 19.

Currie, W. (2012). Institutional isomorphism and change: the national programme for IT – 10 years on. *Journal of Information Technology, 27*, 236-248.

D'Andreamatteo, A., Ianni, L., Lega, F., & Sargiacomo, M. (2015). Lean in healthcare: A comprehensive review. *Health Policy, 119*(9), 1197-1209. doi:https://doi.org/10.1016/j.healthpol.2015.02.002

Davies, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science, 35*(8), 22.

Davis Jr, F. D. (1986). *A technology acceptance model for empirically testing new end-user information systems: Theory and results.* Massachusetts Institute of Technology.

Denzin, N. K., & Lincoln, Y. S. (2011). *The Sage Handbook of Qualitative Research* (5th ed.). USA: Sage Publications Inc.

Department of Health. (2010). The future of the National Programme for IT [Press release]. Retrieved from http://webarchive.nationalarchives.gov.uk/20130107105354/http:/www.dh.gov.uk/en/MediaCentre/Pressreleases/DH_119293

Department of Health. (2011). Dismantling the NHS National Programme for IT.

Department of Health. (2012). *The power of information. Putting all of us in control of the health and care information we need.* London: Department of Health Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/213689/dh_134205.pdf.

Department of Health. (2016a). HSCIC changing its name to NHS Digital [Press release]. Retrieved from https://www.gov.uk/government/news/hscic-changing-its-name-to-nhs-digital

Department of Health. (2016b). *Making IT Work: Harnessing the Power of HealthInformation Technology to Improve Care in England.* London: Department of Health Retrieved from https://www.gov.uk/government/publications/using-information-technology-to-improve-the-nhs.

Deutsch, E., Duftschmid, G., & Dorda, W. (2010). Critical areas of national electronic health record programs-Is our focus correct? *International Journal of Medical Informatics, 79*(3), 211-222. doi:10.1016/j.ijmedinf.2009.12.002

Digital Health News. (2016). Details of £1.8b tech funding revealed: 11 February 2016. Retrieved from http://www.digitalhealth.net/clinical_software/47174/details-of-%C2%A31.8b-tech-funding-revealed

Digital Health News. (2017). £385 million GDE funding approved by Treasury. Retrieved from https://www.digitalhealth.net/2017/08/385-million-gde-funding-approved-by-treasury/

Dyb, K., & Warth, L. L. (2018). The Norwegian National Summary Care Record: a qualitative analysis of doctors' use of and trust in shared patient information. *Bmc Health Services Research, 18*(1), 252.

Eason, K., Dent, M., Waterson, P., Tutt, D., & Thornett, A. (2012). Bottom-up and middle-out approaches to electronic patient information systems: a focus on healthcare pathways. *Inform Prim Care, 20*(1), 51-56.

Eason, K., & Waterson, P. (2013). The implications of e-health system delivery strategies for integrated healthcare: Lessons from England. *International Journal of Medical Informatics, Volume 82,*(Issue 5,), e96-e106.

Easterby-Smith, M., Thorpe, R., & Jackson, P. (2012). *Management Research* (4th ed.). London: Sage Publications.

Edmondson, A. C., & Mcmanus, S. E. (2007). Methodological fit in management field research. *Academy of Management Review, 32*(4), 1246-1264. doi:10.5465/amr.2007.26586086

Emery, F. E., & Trist, E. L. (1960). Sociotechnical Systems. *Management Sciences Models and Techniques, 2*.

Essén, A., Scandurra, I., Gerrits, R., Humphrey, G., Johansen, M. A., Kiergegaard, P., . . . Ancker, J. S. (2017). Patient access to electronic health records: Differences across ten countries. *Health Policy and Technology*. doi:https://doi.org/10.1016/j.hlpt.2017.11.003

Fichman, R. G., & Kemerer, J. O. (1999). The Illusory Diffusion of Innovation: An Examination of Assimilation gaps *Information Systems Research, 10*(3), 255-275.

Filipova, A. A. (2013). Electronic health records use and barriers and benefits to use in skilled nursing facilities. *Comput Inform Nurs, 31*(7), 305-318. doi:10.1097/NXN.0b013e318295e40e

Frosch, D. L., Suepattra, S. G., Rendle, K. A. S., Tietbohl, C., & Elwyn, G. (2012). Authoritarian Physicians And Patients' Fear Of Being Labeled 'Difficult' Among Key Obstacles To Shared Decision Making. *Health Affairs, 31*(5), 1030-1038. doi:10.1377/hlthaff.2011.0576

Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology, 13*(1), 117. doi:10.1186/1471-2288-13-117

Gill, J., & Johnson, P. (2010). *Research Methods for Managers* (4th ed.). London: SAGE Publications Ltd.

Gimba, S., Aylott, J., & Kilner, K. (2016). *The UK National Health Service's Paperless Vision and the Challenges of Clinician Engagement and Leadership: Evaluative Case Study of An Acute Secondary Care Hospital*. Paper presented at the Global Healthcare Conference, Singapore. https://www.researchgate.net/publication/313180279_The_UK_National_Health_Service's_Paperless_Vision_and_the_Challenges_of_Clinician_Engagement_and_Leadership_Evaluative_Case_Study_of_An_Acute_Secondary_Care_Hospital

Glaser, B. G., & Strauss, A. L. (2017). *Discovery of grounded theory: Strategies for qualitative research*. Oxon: Routledge.

Greene, M. J. (2014). On the Inside Looking In: Methodological Insights and Challenges in Conducting Qualitative Insider Research. *The Qualitative Report, 19*(39).

Greenhalgh, T., Morris, L., Wyatt, J. C., Thomas, G., & Gunning, K. (2013). Introducing a nationally shared electronic patient record: Case study comparison of Scotland, England, Wales and Northern Ireland. *International Journal of Medical Informatics, 82*(5), E125-E138. doi:10.1016/j.ijmedinf.2013.01.002

Greenhalgh, T., Potts, H. W., Wong, G., Bark, P., & Swinglehurst, D. (2009). Tensions and paradoxes in electronic patient record research: a systematic literature review using the meta-narrative method. *The Millbank Quarterly, 87*(4), 729-788. doi:10.1111/j.1468-0009.2009.00578.x

Greenhalgh, T., Russell, J., Ashcroft, R. E., & Parsons, W. (2011). Why National eHealth Programs Need Dead Philosophers: Wittgensteinian Reflections on Policymakers' Reluctance to Learn from History. *The Millbank Quarterly, 89*(4), 533-563.

Greenhalgh, T., Stramer, K., Bratan, T., Byrne, E., Russell, J., Hinder, S., & Potts, H. (2010). *The Devil's in the Detail: Final report of the independent evaluation of the Summary Care Record and HealthSpace programmes.* Retrieved from London: https://www.ucl.ac.uk/news/scriesummary.pdf

Harrison, M. I., Koppel, R., & Bar-Lev, S. (2007). Unintended consequences of information technologies in health care--an interactive sociotechnical analysis. *J Am Med Inform Assoc, 14*(5), 542-549. doi:10.1197/jamia.M2384

Hattona, J. D., Schmidtb, T. M., & Jelenc, J. (2012). A revised UTAUT model to investigate E-health acceptance of health professionals in Africa. *Procedia Technology 5 (2012) 706 – 715.*

Hayes, G. B., D. (2008). *UK Health Computing Recollections and Reflections.* Swindon: British Computer Society.

Heath, M., Appan, R., & Gudigantala, N. (2017). Exploring Health Information Exchange (HIE) Through Collaboration Framework: Normative Guidelines for IT Leadership of Healthcare Organizations. *Information Systems Management, 34*(2), 137-156.

Heeks, R. (2006). Health information systems: Failure, success and improvisation. *International Journal of Medical Informatics, 75*, 125—137.

Heimly, V., Grimsmo, A., & Faxvaag, A. (2011). Diffusion of Electronic Health Records and electronic communication in Norway. *Applied Clinical Informatics, 2*(3), 355-364. doi:10.4338/aci-2011-01-ie-0008

Hillestad, R., & Bigelow, J. (2005). *Health Information Technology – Can HIT Lower Costs and Improve Quality?   RB-9136-HLTH, 2005* Retrieved from http://www.rand.org/pubs/research_briefs/RB9136/index1.html

http://www.rand.org/content/dam/rand/pubs/research_briefs/2005/RAND_RB9136.pdf

Holden, R. J. (2011). What stands in the way of technology-mediated patient safety improvements?: a study of facilitators and barriers to physicians' use of electronic health records. *J Patient Saf, 7*(4), 193-203. doi:10.1097/PTS.0b013e3182388cfa

House of Commons Committee of Public Accounts. (2013). *The dismantled National Programme for IT in the NHS. Nineteenth Report of Session 2013-14.* London: The Stationery Office Limited Retrieved from http://www.publications.parliament.uk/pa/cm201314/cmselect/cmpubacc/294/294.pdf.

HSCIC. (2015). *Information and technology for better care. Health and Social Care Information Centre Strategy 2015–2020.* Health and Social Care Information Centre Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/443353/HSCIC-Strategy-2015-2020-FINAL-310315.pdf.

Jeongeun, K., & Hyeoun-Ae, P. (2012). Development of a Health Information Technology Acceptance Model Using Consumers' Health Behavior Intention. *Journal of Medical Internet Research, 14*(5). doi:10.2196/jmir.2143

King, G., O'Donnell, C., Boddy, D., Smith, F., Heaney, D., & Mair, F. S. (2012). Boundaries and e-health implementation in health and social care. *Bmc Medical Informatics and Decision Making, 12*(200).

Lawal, A. K., Rotter, T., Kinsman, L., Sari, N., Harrison, L., Jeffery, C., . . . Flynn, R. (2014). Lean management in health care: definition, concepts, methodology and effects reported (systematic review protocol). *Systematic Reviews, 3*, 103-103. doi:10.1186/2046-4053-3-103

Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *Journal of Family Medicine and Primary Care, 4*(3), 324-327. doi:10.4103/2249-4863.161306

Lewins, A., & Silver, C. (2009). Choosing a CAQDAS Package

Liberati, E. G., Ruggiero, F., Galuppo, L., Gorli, M., González-Lorenzo, M., Maraldi, M., . . . Kwag, K. H. (2017). What hinders the uptake of computerized decision

support systems in hospitals? A qualitative study and framework for implementation. *Implementation Science, 12*(1), 113.

Lovelock, K., Martin, G., Gauld, R., & MacRae, J. (2017). Better, Sooner, More Convenient? The reality of pursuing greater integration between primary and secondary healthcare providers in New Zealand. *SAGE open medicine, 5*, 2050312117701052.

Lowe, A. (2001). After ANT - An illustrative discussion of the implications for qualitative accounting case research. *Accounting, Auditing & Accountability Journal, 14*(3), 327-351. doi: 10.1108/EUM0000000005519

Mair, F. S., May, C., O'Donnell, C., Finch, T., Sullivan, F., & Murray, E. (2012). Factors that promote or inhibit the implementation of e-health systems: an explanatory systematic review. *Bulletin of the World Health Organization, 90*, 357-364.

McGinn, C. A. (2011). Additional file 3 table S1. Factors perceived as barriers (B) or facilitators (F).

McGinn, C. A., Gagnon, M. P., Shaw, N., Sicotte, C., Mathieu, L., Leduc, Y., . . . Legare, F. (2012). Users' perspectives of key factors to implementing electronic health records in Canada: a Delphi study. *Bmc Medical Informatics and Decision Making, 12*, 105. doi:10.1186/1472-6947-12-105

McGinn, C. A., Grenier, S., Duplantie, J., Shaw, N., Sicotte, C., Mathieu, L., . . . Gagnon, M. P. (2011). Comparison of user groups' perspectives of barriers and facilitators to implementing electronic health records: a systematic review. *Bmc Medicine, 9*, 46. doi:10.1186/1741-7015-9-46

McKinsey. (2014). *Modelling the potential of digitally enabled processes, transparency and participation in the NHS.* Retrieved from http://www.digitalhealth.net/includes/images/news0254/PDF/overview-evidence-review-of-data-and-information.pdf

McLoughlin, I. P., Garrety, K., & Wilson, R. (2017). *The Digitisation of Healthcare. Electronic Records and the Disruption of Moral Orders* Great Bitain: Oxford University Press.

Menachemi, N., & Collum, T. (2011). Benefits and drawbacks of electronic health record systems. *Risk Management and Healthcare Policy, 4*, 47-55.

Metzger, M. H., Durand, T., Lallich, S., Salamon, R., & Castets, P. (2012). The use of regional platforms for managing electronic health records for the production of regional public health indicators in France. *BMC Med Inform Decis Mak, 12*, 28. doi:10.1186/1472-6947-12-28

Moghaddasi, H., Rabiei, R., Asadi, F., & Mohammadpour, A. (2017). National Health Information Network: Lessons Learned From the USA and the UK. *Journal of Paramedical Sciences, 8*(2), 57-70.

Moore, G. A. (2014). *Crossing the Chasm* (3rd ed.): HarperBusiness.

Morrison, Z., Robertson, A., Cresswell, K., Crowe, S., & Sheikh, A. (2011). Understanding Contrasting Approaches to Nationwide Implementations of Electronic Health Record Systems: England, the USA and Australia. *Journal of Healthcare Engineering, 2*(1), 25-41. doi:10.1260/2040-2295.2.1.25

Morse, J. M., Barrett, M., Mayan, M., Olson, K., & Spiers, J. (2008). Verification strategies for establishing reliability and validity in qualitative research. *International journal of qualitative methods, 1*(2), 13-22.

Muhammad, I., & Wickramasinghe, N. (2018). *Critical Issues in Implementing and Adopting National e-Health Solutions: Lessons from Australia's MyHealth*

Record. Paper presented at the Proceedings of the 51st Hawaii International Conference on System Sciences.

Mumford, E. (1995a). *Designing Human Systems. The ETHICS Method* Retrieved from http://www.enid.u-net.com/C1book1.htm

Mumford, E. (1995b). *Effective Systems Design and Requirements Analysis: The ETHICS Approach*. London: Macmillan.

Murray, E., Burns, J., May, C., Finch, T., O'Donnell, C., Wallace, P., & Mair, F. (2011). Why is it difficult to implement e-health initiatives? A qualitative study. *Implementation Science, 6*, 6. doi:10.1186/1748-5908-6-6

National Audit Office. (2008a). The National Programme for IT in the NHS Progress since 2006 VOL 1.

National Audit Office. (2008b). The National Programme for IT in the NHS Progress since 2006 VOL 2.

National Audit Office. (2008c). The National Programme for IT in the NHS Progress since 2006: EXEC SUMMARY.

National Audit Office. (2008d). The National Programme for IT in the NHS. Progress since 2006 Press Release.

National Audit Office. (2011). *The National Programme for IT in the NHS: an update on the delivery of detailed care records systems*. Retrieved from http://www.nao.org.uk/wp-content/uploads/2011/05/1012888.pdf.

National Audit Office. (2013). *Review of the final benefits statement for programmes previously managed under the National Programme for IT in the NHS*. Retrieved from http://www.nao.org.uk/report/review-of-the-final-benefits-statement-for-programmes-previously-managed-under-the-national-programme-for-it-in-the-nhs/.

National Information Board. (2014). *Personalised Health and Care 2020. Using Data and Technology to Transform Outcomes for Patients and Citizens. A Framework for Action*. London: HM Government

National Information Board. (2015a). The Forward View into Action: Paper-free at the Point of Care - Preparing to Develop Local Digital Roadmaps. Retrieved from   https://www.england.nhs.uk/digitaltechnology/wp-content/uploads/sites/31/2015/09/digi-roadmaps-guid.pdf

National Information Board. (2015b). National Information Board's workstreams.

National Information Board. (2015c). *Personalised Health and Care 2020. Workstream 2.1 Roadmap. Give care professionals and carers access to all the data they need. Setting the commissioning and regulatory roadmap for implementing of digital data standards 2018/2020*. London Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/442832/Work_Stream_2_1.pdf.

National Information Board. (2016). *Annual Report*. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/553403/NIB_annual_report_A.pdf.

NHS Confederation. (2017). NHS statistics, facts and figures. Retrieved from http://www.nhsconfed.org/resources/key-statistics-on-the-nhs

NHS Digital. (2017a). e-Referral Service (e-RS) Regional dashboards. Retrieved from https://digital.nhs.uk/e-Referral-Service/reports-and-statistics/Regional-dashboards

NHS Digital. (2017b). *Fit for 2020. Report from the NHS Digital Capability Review*.

NHS Digital. (2017c). Message Exchange for Social Care and Health (MESH). Retrieved from https://digital.nhs.uk/message-exchange-social-care-health

NHS Digital. (2017d). Hospital Admitted Patient Care Activity, 2016-17.   Retrieved from https://digital.nhs.uk/catalogue/PUB30098

NHS Digital. (2018a). Appointments in General Practice.   Retrieved from https://digital.nhs.uk/data-and-information/publications/statistical/appointments-in-general-practice/oct-2018

NHS Digital. (2018b). Prescriptions Dispensed in the Community - Statistics for England, 2007-2017.   Retrieved from https://digital.nhs.uk/data-and-information/publications/statistical/prescriptions-dispensed-in-the-community/prescriptions-dispensed-in-the-community-england---2007---2017

NHS England. (2013). *Safer Hospitals, Safer Wards. Achieving an integrated digial care record.* Published to NHS England website, in electronic PDF format only: NHS England Retrieved from http://www.england.nhs.uk/wp-content/uploads/2013/07/safer-hosp-safer-wards.pdf.

NHS England. (2014). *5 Year Forward View*. London: NHS England Retrieved from http://www.england.nhs.uk/wp-content/uploads/2014/10/5yfv-web.pdf.

NHS England. (2017a). *Diagnostic Imaging Dataset. Annual Statistical Release, 2016/17*. NHS England Retrieved from https://www.england.nhs.uk/statistics/wp-content/uploads/sites/2/2017/11/Annual-Statistical-Release-2016-17-DID-PDF-1.5MB.pdf.

NHS England. (2017b). Digital interactions between primary and secondary care. Retrieved from https://www.nhs.uk/Scorecard/Pages/IndicatorFacts.aspx?MetricId=625

NHS England. (2018). New care models.   Retrieved from https://www.england.nhs.uk/new-care-models/

NHS Improvement. (2017). Pathology networks.   Retrieved from https://improvement.nhs.uk/resources/pathology-networks/

Otto, P., & Nevo, D. (2013). Electronic health records: A simulation model to measure the adoption rate from policy interventions. *Journal of Enterprise Information Management, 26*(1/2), 17.

Owen, B. (2011). Practical tips on interviewing the great and the good. *Library and Information Research, 35*(111).

Papadopoulos, T., Radnor, Z., & Merali, Y. (2011). The role of actor associations in understanding the implementation of Lean thinking in healthcare. *International Journal of Operations & Production Management, 31*(2), 167-191.

Perry, C. (1998). A Structured Approach for Presenting Theses. *Australasian Marketing Journal (AMJ), 6*(1), 63-85. doi:http://dx.doi.org/10.1016/S1441-3582(98)70240-X

Pierce, R. (2008). *Research methods in politics: a practical guide*: SAGE.

PricewaterhouseCoopers. (2013). A review of the potential benefits from the better use of information and technology in Health and Social Care. Final report.

Protti, D., Johansen, I., & Perez-Torres, F. (2009). Comparing the application of Health Information Technology in primary care in Denmark and Andalucia, Spain. *Int J Med Inform, 78*(4), 270-283. doi:10.1016/j.ijmedinf.2008.08.002

Protti, D. J. (2002). *Implementing Information For Health: Even More Challenging Than Expected?* London: Department of Health.

Richards, B. (2001). *The Early Days of Health Computing in the UK*. https://doi.org/10.3233/978-1-60750-928-8-754

Robertson, A., Cresswell, K., Takian, A., Petrakaki, D., Crowe, S., Cornford, T., . . . Sheikh, A. (2010). Implementation and adoption of nationwide electronic

health records in secondary care in England: qualitative analysis of interim results from a prospective national evaluation. *British Medical Journal, 341*, c4564. doi:10.1136/bmj.c4564

Rogers, E. M. (2004). *Diffusion of Innovations* (4th ed.). New York: The Free Press.

Ropohl, G. (1999). Philosophy of Socio-Technical Systems. *Society for Philosophy and Technology, 4*(3).

Rowley, J. (2012). Conducting research interviews. *Management Research Review, 35*(3/4), 260-271. doi:doi:10.1108/01409171211210154

Royal Society for Public Health. (2018). Allied Health Professionals (AHPs): an integral part of the health and care workforce.   Retrieved from https://www.rsph.org.uk/our-work/policy/wider-public-health-workforce/allied-health-professionals.html

Rozenblum, R., Jang, Y., Zimlichman, E., Salzberg, C., Tamblyn, M., Buckeridge, D., . . . Tamblyn, R. (2011). A qualitative study of Canada's experience with the implementation of electronic health information technology. *Canadian Medical Association Journal, 183*(5), E281-E288. doi:10.1503/cmaj.100856

Salzberg, C. A., Jang, Y., Rozenblum, R., Zimlichman, E., Tamblyn, R., & Bates, D. W. (2012). Policy initiatives for Health Information Technology: A qualitative study of U.S. expectations and Canada's experience. *International Journal of Medical Informatics,, 81*(10), 713.

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students* (Vol. 6th). Harlow: Pearson Education.

Savin-Baden, M., & Major, C. H. (2013). Chapter 27, "Data handling and coding" from Qualitative Research: the essential guide to theory and practice. (pp. 419-433). Abingdon, Oxon: Routledge.

Scott, P. (2015). Exploiting the information revolution: call for independent evaluation of the latest English national experiment. *Journal of Innovation in Health Informatics, 22*(1), 5.

Seto, B., & Friedman, C. (2012). Moving toward multimedia electronic health records: how do we get there? *J Am Med Inform Assoc, 19*(4), 503-505. doi:10.1136/amiajnl-2011-000660

Sheikh, A., Cornford, T., Barber, N., Avery, A., Takian, A., Lichtner, V., . . . Cresswell, K. (2011). Implementation and adoption of nationwide electronic health records in secondary care in England: final qualitative results from prospective national evaluation in "early adopter" hospitals. *British Medical Journal, 343*, d6054. doi:10.1136/bmj.d6054

Silow-Carroll, S., Edwards, J. N., & Rodin, D. (2012). Using electronic health records to improve quality and efficiency: the experiences of leading hospitals. *Issue Brief (Commonw Fund), 17*, 1-40.

Silverman, D. (2013). *Doing qualitative research* (Vol. 4th). London: SAGE.

Sittig, D. F., & Singh, H. (2010). A new sociotechnical model for studying health information technology in complex adaptive healthcare systems. *Quality and Safety in Health Care, 19*(Suppl 3), i68-i74. doi:10.1136/qshc.2010.042085

Stokes, P. (2011). *Critical Concepts in Management and Organisation Studies*. China: Palgrave MacMillan.

Strauss, A., & Corbin, J. M. (2015). *Basics of Qualitative Research. Techniques and Procedures for Developing Grounded Theory* (4th ed.). Thousand Oaks, CA, US: Sage Publications, Inc.

Stroetmann, K., Artmann, J., & Stroetmann, V. (2011). *European countries on their journey towards national eHealth infrastructures*. Office for Official

Publications of the European Communities Retrieved from http://www.ehealth-strategies.eu/report/eHealth_Strategies_Final_Report_Web.pdf.

Takian, A. (2012). Envisioning electronic health record systems as change management: the experience of an English hospital joining the National Programme for Information Technology. *Studies in health technology and informatics, 180*, 901-905.

Takian, A., Petrakaki, D., Cornford, T., Sheikh, A., & Barber, N. (2012). Building a house on shifting sand: methodological considerations when evaluating the implementation and adoption of national electronic health record systems. *Bmc Health Services Research, 12*. doi:10.1186/1472-6963-12-105

Takian, A., Sheikh, A., & Barber, N. (2012). We are bitter, but we are better off: case study of the implementation of an electronic health record system into a mental health hospital in England. *Bmc Health Services Research, 12*. doi:10.1186/1472-6963-12-484

Tange, H. (2008). Electronic patient records in the Netherlands. *Health Policy Monitor*.

Teijlingen, E., & Hundley, V. (2002). The importance of pilot studies. *Nursing Standard, 16*(40), 33-36. doi:10.7748/ns2002.06.16.40.33.c3214

Tornatzky, L. G., Fleischer, M., Tornatzky, L. G., & Fleischer, M. (1990). *The processes of technological innovation.* . Lexington, MA: Lexington.

University of Surrey. (2013). Computer Assisted Qualitative Data AnalysiS (CAQDAS) Networking Project. Retrieved from http://www.surrey.ac.uk/sociology/research/researchcentres/caqdas/resources/links/index.htm

University of Surrey. (2014). Choosing an appropriate CAQDAS package. Retrieved from http://www.surrey.ac.uk/sociology/research/researchcentres/caqdas/support/choosing/

Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3
and a Research Agenda on Interventions. *Decision Sciences, 39*(2), 43.

Venkatesh, V., & Davis, F. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. . *Management Science, 46*(2), 18.

Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences, 27*(3), 31.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly, 27*(3), 53.

Wang, T. D., Wongsuphasawat, K., Plaisant, C., & Shneiderman, B. (2011). Extracting insights from electronic health records: case studies, a visual analytics process model, and design recommendations. *J Med Syst, 35*(5), 1135-1152. doi:10.1007/s10916-011-9718-x

Waterson, P. (2014). Health information technology and sociotechnical systems: A progress report on recent developments within the UK National Health Service (NHS). *Applied Ergonomics, 45*(2, Part A), 150-161. doi:http://dx.doi.org/10.1016/j.apergo.2013.07.004

Waterson, P., Hoonakker, P. L. T., & Carayon, P. (2013). Special issue on human factors and the implementation of health information technology (HIT): Comparing approaches across nations. *International Journal of Medical Informatics, 82*(5), 277-280. doi:10.1016/j.ijmedinf.2013.01.001

Wiljer, D., Urowitz, S., Apatu, E., DeLenardo, C., Eysenbach, G., Harth, T., . . . Canadian Committee for Patient Accessible Health, R. (2008). Patient accessible electronic health records: exploring recommendations for successful implementation strategies. *J Med Internet Res, 10*(4), e34. doi:10.2196/jmir.1061

Wilkins, M. A. (2009). Factors influencing acceptance of electronic health records in hospitals. *Perspect Health Inf Manag, 6*, 1f.

World Bank. (2018). Health Expenditure as a % of GDP. *World Bank Open Data.* Retrieved from https://data.worldbank.org

World Health Organization. (2013). *Research for universal health coverage: World health report 2013*.

World Health Organization. (2014). *World Health Statistics 2014.* Retrieved from http://apps.who.int/iris/bitstream/10665/112738/1/9789240692671_eng.pdf?ua=1

Xu, J. G., X. Sorwar, G. Croll, P. (2013). Implementation of E-health Record Systems in Australia. *The International Technology Management Review, 3*(2), 13.

Yen, P. Y., McAlearney, A. S., Sieck, C. J., Hefner, J. L., & Huerta, T. R. (2017). Health Information Technology (HIT) Adaptation: Refocusing on the Journey to Successful HIT Implementation. *JMIR Med Inform, 5*(3), e28. doi:10.2196/medinform.7476

Zhang, H., Han, B. T., & Tang, Z. (2017). Constructing a nationwide interoperable health information system in China: The case study of Sichuan Province. *Health Policy and Technology, 6*(2), 142-151.

Zimlichman, E., Rozenblum, R., Salzberg, C. A., Jang, Y., Tamblyn, M., Tamblyn, R., & Bates, D. W. (2012). Lessons from the Canadian national health information technology plan for the United States: opinions of key Canadian experts. *Journal of the American Medical Informatics Association, 19*(3), 453-459. doi:10.1136/amiajnl-2011-000127

Zinszer, K., Tamblyn, R., Bates, D. W., & Buckeridge, D. L. (2013). A qualitative study of health information technology in the Canadian public health system. *Bmc Public Health, 13.* doi:10.1186/1471-2458-13-509

Zwaanswijk, M., Ploem, M. C., Wiesman, F. J., Verheij, R. A., Friele, R. D., & Gevers, J. K. M. (2013). Understanding health care providers' reluctance to adopt a national electronic patient record: an empirical and legal analysis. *Medicine and law, 32*(1), 13-31.