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**Implementation and adoption of the first national
electronic health record: a qualitative exploration of
the perspectives of key stakeholders in selected
English care settings drawing on sociotechnical
principles**

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Abstract

Introduction: Internationally, there is increasing interest in the potential of information technology to enhance the quality and efficiency of healthcare. Many countries are currently actively pursuing electronic health record implementations. However, the introduction of such systems often has significant consequences for users' work practices and organisational functioning due to the complex processes involved in implementing and adopting new technology. Problems may be exacerbated in a national implementation context if users feel that systems are imposed and offer insufficient customisability due to a focus on achieving widespread interoperability. England has embarked on a large-scale national implementation of electronic health records. One of the procured systems was Lorenzo, which was to be built while it was being implemented. Investigating the implementation and adoption of Lorenzo is of particular interest as, in theory, the approach of "co-creating" a system in collaboration with the National Health Service (NHS) should help to increase software usability and thereby facilitate integration with work practices. I sought to understand the views and experiences of users as well as organisational consequences of introducing Lorenzo, and how these evolved over time in the complex environment of a national electronic health record implementation.

Methodology and methods: I conducted a qualitative longitudinal investigation in purposefully selected secondary and community care settings which were implementing early Lorenzo functionality. I conceptualised the settings as case studies. Data collection was theory-driven in that it utilised a methodological framework, which was developed specifically for the purposes of my study and based on the existing theoretical and empirical literature. Using this framework with multi-sited ethnography helped me to examine the immediate environment in which Lorenzo was implemented without neglecting the organisational and political context in which local developments were situated. Data collection consisted of interviews with Lorenzo users and managers in case study sites; interviews with external stakeholders (including policy makers, system developers, and independent sector representatives) from outside NHS Trusts; non-participant observation of staff meetings and use of the technology; as well as a combination of field notes, documents pertaining to Trusts and wider political developments, and press statements. Data collection and thematic analysis were informed by a sociotechnical Actor-Network Theory-based approach highlighting the interrelated nature of technical and social dimensions. The study also drew on other related theoretical frameworks that helped to address some of Actor-Network Theory's theoretical and practical shortcomings. Most helpful in this respect were Strong Structuration Theory, the Social Shaping of Technology, and the Theory of the Diffusion of Innovations (theoretically); and multi-sited ethnography and case studies (practically). I employed inductive and deductive analytical techniques utilising thematic tables for organising and interpreting the data. Individual case studies were analysed first in order to examine local dynamics, before cross-case comparisons were made and findings were integrated with data obtained from outside case study sites.

Results: I collected data between 2009 and 2011 in three case study sites. The complete dataset comprised interview data from a total of 66 different participants within Trusts, 14 interviews with stakeholders from outside case study sites, 38.5 hours of non-participant observation, 149 pages of press statements, 31 pages of field notes, and a range of national and local Trust documents. The three sites differed in demographics and local implementation strategies, and hence presented diverse stories of sociotechnical change unfolding over time within their complex individual contexts. However, there were also similarities, not least the fact that all were implementing the same system and that they were operating within constantly evolving political and economic contexts. Users found it difficult to integrate Lorenzo with their everyday work practices as the software was perceived to be not fit-for-purpose. Over time, these difficulties attenuated to some extent, particularly in the smaller-scale deployments in sites that had invested significant time and resources to adapt the software to fit with their everyday practices. Lorenzo implementation also had significant consequences for organisational functioning, which was often hampered by local restrictions in software customisability associated with national arrangements.

Conclusion: I have developed a theoretically informed methodological framework and applied this to explore sociotechnical processes involved in the implementation and adoption of Lorenzo. In doing so, I identified potentially transferable theoretical insights into local and national developments over time and based on these proposed mechanisms involved in the implementation and adoption process. Overall, my findings help to explain why the adoption of Lorenzo was much slower and on a smaller scale than originally anticipated. The interplay between social (political, individual and organisational) and technical factors was central to implementation progress. At the root of many problems encountered were difficulties with integrating systems with work practices of users and more general organisational functioning. In relation to Lorenzo, co-creating national software with strong user involvement was hampered due to different requirements in individual settings and wider, political and economic constraints. Based on the English experience, there may be some important transferable lessons for similar ventures in other countries. Most importantly, national implementations need to build on a solid basis of local technology adoption by allocating sufficient time for individual users and organisations to adjust to the complex changes that often accompany such service re-design initiatives.

Declaration

I hereby declare that this thesis was composed by me and is entirely my own work.
It has not been submitted for any other degree or professional qualification.

A handwritten signature in black ink that reads "K. Cresswell". The signature is written in a cursive style with a large, stylized 'K' and a long horizontal stroke.

Kathrin Cresswell
September 2011

Dedication

This thesis is dedicated to my parents, who gave me so many opportunities in life and to whom I will be forever grateful.

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I wish to thank the funders, the Medical Research Council, for the opportunity to undertake this work.

This PhD would not have been possible without the help my supervisors Prof Aziz Sheikh and Dr Allison Worth. I wish to express my sincerest gratitude to them not only for their excellent academic guidance but also for their emotional support and understanding. I truly could not have imagined better supervisors and feel extremely grateful for this.

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Abbreviations

A&E	Accident and Emergency
ANT	Actor-Network Theory
BT	British Telecom
CAMHS	Children and Adult Mental Health Services
CDC	Clinical Documentation
CDSS	Computerised (electronic) decision support systems
CPOE	Computerised Physician Order Entry
CSC	Computer Sciences Corporation
DCR	Detailed Care Record
DH	Department of Health
DIF	Deployment Incentive Fund
EA	Early Adopter
EHR	Electronic Health Record
EPS	Electronic Prescription Service
GP	General Practitioner
iPM	iSOFT Patient Manager (interim PAS solution developed by iSOFT)
IT	Information technology
LSP	Local Service Provider
NHS	National Health Service
NHS CFH	NHS Connecting for Health
NHS CFHEP	NHS Connecting for Health Evaluation Programme
NHS CRS	NHS Care Records Service
NME	North, Midlands and East (Programme for IT)
NPfIT	National Programme for Information Technology
PACS	Picture archiving and communication system
PAS	Patient Administration System
PCT	Primary Care Trust
PDA	Personal Digital Assistant
PDS	Personal Demographics Service
PID	Project Initiation Document
R1	Release 1
R1.9	Release 1.9
R2	Release 2
R3	Release 3
R4	Release 4
RCT	Randomised Controlled Trial
RiO	CSE Servalec RiO
R&R	Requests and Results
SCR	Summary Care Record
SHA	Strategic Health Authority
SUS	Secondary Uses Service
T1	Time 1 interviews
T2	Time 2 interviews
UK	United Kingdom
US	United States

Chapter 1: Introduction and background - the implementation of electronic health records (EHRs)

1.1 Challenges facing healthcare and the potential of information technology

Health systems globally face common challenges, including increasing population size; budgetary constraints; major demographic transitions with growing numbers of older, frailer people many of whom live with more than one long-term condition; the ever-increasing amount of knowledge and array of new and expensive treatment options; and increasing public expectations.(1) As a result, healthcare systems are becoming increasingly complex with larger groups of diverse healthcare professionals working together, often over great geographical distances, to deliver patient care. These developments have led to growing international interest in the potential of information technology (IT, see Glossary) in facilitating efficiency and reducing the risk of error.(2) The underlying assumption of introducing IT in healthcare is that more efficient information flow will ultimately result in improved quality of care.(3)

IT interventions in healthcare can take a variety of forms, ranging from basic patient administration systems (PAS, see Glossary), to sophisticated systems aiding clinical decision making at the point of care. By far the most complex systems are electronic health records (EHRs), which are the subject of this thesis. EHRs have great potential to improve the quality and efficiency of healthcare delivery. Amongst anticipated benefits are: higher quality of care due to increased efficiency, better data quality (see Glossary), and improved availability of data for secondary uses (see Glossary).(4)

The definitions of EHRs are many and varied (see Table 1.1. for some examples),(5) ranging from relatively simple patient management functionality in one setting to the more complex interoperable management and clinical systems that allow data sharing across care settings (see Table 1.2).(5) In the context of my study, I defined an EHR as a

compilation of patient information in digital format that can be shared between care settings and has associated management and clinical functionality (such as integrated decision support, see Glossary for definition).

Table 1.1: Examples of definitions of EHRs and associated terms

<p>Electronic medical record, electronic patient record, computerised medical record, computer-based medical record, digital medical record</p>	<p>Broadly equivalent terms used to describe digitally stored patient records, including those created on computer or transcribed or scanned from paper records. Usually refers to information from single providers (e.g. a diabetes clinic, a hospital), but often used interchangeably with EHR.</p>
<p>Integrated care record</p>	<p>A record that contains information from multiple providers of the patient's care. Varies in how the information is integrated (e.g. centralised data storage versus linkage to federated data stores), how much information is integrated (detailed or summary), and the scope and providers of the information (e.g. an integrated diabetes care record versus a more generic shared care record).</p>
<p>Continuity of care record</p>	<p>An evolving standard for a core (summary) electronic record that can be accessed by and added to by multiple health professionals caring for a patient, so as to support integrated and current care.</p>
<p>Interoperable electronic health record</p>	<p>One term for complex EHR that can interface (see Glossary) with a range of records systems, databases and tools for</p>

	decision-making and communication.
Personal health record	Sometimes referred to as electronic patient carried medical records. These refer to records that are accessible by the patient themselves.

Adopted from Car et al (5)

Table 1.2: Levels of complexity of EHR systems

Overall	Health information in digital format			
Levels of complexity	1	2	3	4
	Databases of demographic and/or clinical information that can be queried	Integration of demographic and/or clinical information over time	Sharing of demographic and/or clinical information between care settings (either summary or detailed)	Supporting clinical decision making

Sharing of computerised information between different healthcare settings is often not possible. The more complex EHRs are likely to significantly transform the way patient information in hospitals is stored, holding and managing information such as test results, notes from consultations and hospital stays, x-rays and the medications that patients take. Currently, much of this information is held either on local computer systems or on paper records, which further complicates sharing between different settings.

EHR initiatives are increasingly driven by broader political visions of achieving large-scale interoperability (see Glossary). However, EHRs are often difficult to implement, as long-established ways of individual and organisational working have to be changed with

the introduction of such complex technologies; and customisation allowing tailoring to local needs is often limited.(6-8) This appears to be due to scale but also to perceptions by those on the ground that such IT systems are “imposed” by implementers. Small-scale bespoke systems developed “in-house” and customised (see Glossary) to the specific needs of the organisation are often implemented with less difficulty, although such systems can also have problems integrating within the multifaceted healthcare environment where many different groups use various technologies in complex ways.(9) It is the interplay between these social (individual, organisational, macro¹) and technical factors in large-scale EHR implementation (see Glossary), which is the focus of this thesis.

1.2 International approaches to large-scale EHR implementation

With the significant potential benefits of large-scale EHR systems in mind (particularly with regard to secondary uses and increased availability of information across care settings), several countries around the world have made plans to implement EHRs. However, strategies of introducing these systems vary significantly.(10) High-profile national EHR implementations are currently being pursued by England, the United States (US) and Australia. Coiera distinguishes between “top-down”, “bottom-up” and “middle-out” implementation approaches, respectively (see Glossary).(9) Although somewhat stereotypical and simple, this division of approaches can be a helpful way to conceptualise different national strategies. I will therefore discuss them in more detail in the following sections.

England was the first country to announce plans to centrally implement a national EHR, and has therefore progressed furthest in terms of implementation efforts, followed by the US and Australia. The “top-down” approach pursued here is characterised by its politically-driven nature with the aim to store records centrally (see Section 1.3 for further discussion on the politically-driven approach). According to Coiera, with this approach existing healthcare IT systems may become redundant even if they work well

¹ Please note: macro-environment refers to wider social factors such as political and economic climate

because they are likely to be replaced by national systems. It is argued that the focus on long-term benefits may be at the expense of short-term benefits, as it may be difficult for national systems to respond to emerging local needs.

The US “bottom-up” strategy, on the other hand, emerged from a de-centralised health system, with a strategy to develop local systems in line with national standards and plans to integrate these on a national scale. The aim here is not a centrally stored record but access to local records by different organisations, with existing systems being kept and then integrated. Although this approach may be able to better deal with emergent local needs, difficulties may be encountered when trying to connect local systems and share data. Also, as the government is not as strongly involved, Coiera argues that this may result in a lack of leadership and coherent strategic direction.

The “middle-out” strategy pursued by Australia is characterised by a mixture of the two approaches outlined above,(9) with technical standards deliberated by all key stakeholders (led by the government) before systems are procured. Here, the government is viewed as bringing together interests of different groupings, as a facilitator developing standards, and as helping local organisations to comply with these. Allowing organisations to keep local systems or helping them to choose new compliant systems, means more freedom and choice. According to Coiera, it is possible for the other two approaches to evolve to the “middle-out” strategy during implementation.

1.3 EHRs in England and the National Programme for IT

England was the first country in the world to announce a national “top-down” implementation of IT systems throughout its National Health Service (NHS): the National Programme for IT (NPfIT). As this Programme is nationally driven and taking place in a highly politicised environment, it is important to consider how it evolved over time before outlining details relating to the EHR strategy. Therefore, the English historical and policy context will be described in the paragraphs below, outlining how the Programme was conceived and how it has evolved to where it is today.

1.3.1 A brief overview of the NHS

A detailed discussion of the history and nature of the NHS is beyond the scope of this thesis. I therefore confine myself to a summary of the most pertinent characteristics of the NHS, including its structures and most recent developments that are most relevant to my work, in the paragraphs below. The NHS in England was established in 1948 with the aim to provide “free” national healthcare for all. It is the third largest employer in the world, funded by the taxpayer and managed by the Department of Health (DH). At a local level it is managed through 10 Strategic Health Authorities (SHAs) and approximately 400 Trusts (see Glossary), whose responsibility it is to ensure that national plans are implemented locally and that local needs are reflected in policy developments. Trusts can take a variety of forms including acute Trusts, ambulance Trusts, mental health Trusts and Primary Care Trusts (PCTs) (see Glossary for more details). The scale, complexity and often relative autonomy of these structures make it a uniquely complex organisational setting.

This is exacerbated by frequent changes in the way these structures are organised. For example, there is an increasing move towards Trusts obtaining Foundation Status (see Glossary). Foundation Trusts have increased responsibility and are accountable directly to the DH. This increased focus on autonomy is somewhat at odds with the national “top-down” implementation approach as these Trusts can make decisions (e.g. relating to local IT developments) independently. This will be discussed in more detail in Chapter 7. These governance structures and different levels of independence mean that the NHS is highly fragmented, consisting of a combination of diverse organisations that are sometimes in competition with one another.

Services are provided in primary, secondary and tertiary care settings. Whilst United Kingdom (UK) primary care tends to have relatively high levels of computerisation with over 95% of practices now computerised, secondary care is lagging behind (in many instances not having implemented basic administration systems).

1.3.2 IT in the NHS and the history of the National Programme

The introduction of IT within the NHS was relatively fragmented until 1998 with different organisations commissioning or developing their own IT services. This naturally depended on locally identified needs, priorities and resources, which meant that in some instances investments in IT were not made at all. Although EHRs had begun to be implemented to differing degrees, efforts were confined to local implementations in single organisations and no national guidance and coherent strategy on systems implementation and interoperability existed. This resulted in a range of different levels of maturity of computerisation in different organisations, and associated concerns that local strategies and different systems implementations would later mean a difficulty in integrating local systems.

In 1998, the NHS Information Authority, then part of the DH, published a report setting out a long-term and more integrated IT strategy for England.(11) This was driven by the vision to create joined-up national IT systems across different care settings. The essence of the central vision is most commonly related to a speech by the then Prime Minister Tony Blair. This speech represents for many the starting point of the National Programme:

“If I live in Bradford and fall ill in Birmingham then I want the doctor treating me to have access to the information he needs to treat me.” (Speech by the Prime Minister the Rt Hon Tony Blair MP, NHS 50th Anniversary Conference, London Thursday 2nd July 1998)

The NHS Plan, published by the DH in July 2000, outlined the strategy for implementing IT systems throughout the NHS in more detail.(12) It was followed by an announcement by Sir John Pattison (the then Director of Research, Analysis and Information at the DH) in 2002 outlining the new national strategy for healthcare IT at a conference in Harrogate, and a seminar at 10 Downing Street chaired by Tony Blair to plan the project. The result was the development of a very ambitious 10 year strategy to

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introduce national EHR systems throughout England.² This is now commonly known as the NPfIT. The aim here was to replace local IT systems with national ones and link these together in an integrated way (see Box 1.1 for a more detailed timeline).

Box 1.1: Key developments in England

Timeline

Before 1998: Patchy implementation of IT systems, particularly in hospitals.

1998: The vision for the NPfIT was conceived to introduce national interoperable EHR systems throughout England

2002: Detailed plans of the 10-year implementation strategy were released

2005: NHS Connecting for Health (NHS CFH) was established as a designated governmental agency to oversee the implementation

Key policy documents

- NHS Information Authority. Information for Health. 1998. London, DH.
- DH. The NHS Plan: a plan for investment, a plan for reform. 2000. London, The Stationery Office.
- DH. Delivering 21st century IT support for the NHS: national strategic programme. 2002. London, DH.
- The House of Commons Health Committee. The Electronic Patient Record. 2007. London, The Stationery Office.

Details of the NPfIT are available in several reports published by the DH over the following years.(13;14) In essence, plans in relation to EHRs included the following key components (please also refer to the Glossary):

- National Spine, a database and messaging service holding basic system capabilities

² Some have argued that it was developed in a rushed way hurried by “political impatience to see results” and philosophically radically different from the Information for Health Plan, which is viewed as more realistic (source: confidential communication).

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- National Network for the NHS (N3), a very large virtual private network (see Glossary) allowing electronic data exchanges between the applications across organisations
- Personal Demographics Service (PDS), containing demographic patient details
- Images in Picture Archiving and Communication Systems (PACS)
- Summary Care Record (SCR), held on the National Spine and containing a record of essential clinical information
- Detailed Care Record (DCR), containing comprehensive clinical information on individual patients (this was the focus of my study)
- Secondary Uses Service (SUS) for integration of data from different sources and availability of data for audit and research purposes
- Choose and Book, an electronic booking service giving patients the possibility to choose both location and time of appointments
- An Electronic Prescription Service (EPS), an electronic service allowing sending of prescriptions from primary care to pharmacies.

The National Health Service Care Records Service (NHS CRS), containing both SCRs and DCRs (see Section 1.3.2), was central to the National Programme. It was planned to consist of a range of IT applications interacting with each other, eventually fulfilling the vision of national data sharing across different care settings with the help of EHRs.

1.3.3 Governance and leadership structures

In 2005, to ensure stronger leadership, the DH established NHS CFH as a designated body charged with overseeing the implementation of the Programme. NHS CFH was responsible for setting standards concerning the implementation and systems, and for providing a range of implementation resources to individual organisations and SHAs. It also had overall responsibility for liaising with national software suppliers and accrediting software to be implemented as part of the National Programme. Since 2008, it held contracts with two Local Service Providers (LSPs) charged with implementing the national solutions. These LSPs were responsible for subcontracting software

developers and delivering the software solutions into Trusts. They included the Computer Sciences Corporation (CSC) and British Telecom (BT), who in relation to the national EHR in hospitals, implemented software developed by Cerner (Cerner Millennium), iSOFT (Lorenzo Regional Care, henceforth referred to as Lorenzo), and CSE-Servelec (RiO).

Originally, NHS CFH held contracts with a total of five LSPs in five implementation clusters. These included the North West and West Midlands cluster (with CSC as the LSP); the London cluster (with BT as the LSP); the Southern England cluster (with Fujitsu as the LSP); and the North East and the Eastern England clusters (with Accenture as the LSP). However, in 2007/08 two LSPs, Accenture and Fujitsu, pulled out of these arrangements early. Subsequently, BT took responsibility for implementing Cerner Millennium and CSE Servelec RiO (RiO) software in the London area, whilst CSC took responsibility for implementing Lorenzo software in the Northern part of England. The Southern area of England was left without an LSP and planned to implement a mixture of these systems. The LSPs were expected to work in close collaboration with Trusts and SHAs. In order to increase local ownership and involvement in decision making by local organisations, NHS CFH introduced the NPfIT Local Ownership Programme in 2007, devolving more responsibility in relation to the delivery of the IT solutions to the 10 SHAs.

The cost of the NPfIT, of which the NHS CRS was the most fundamental component, has been estimated to be somewhere between £6-£12 billion.⁽⁵⁾ The aim of nationally procured software through a limited number of service providers was part of a plan to keep implementation costs to a minimum through economies of scale and included the payment of large sums of money up-front to LSPs through national contracts managed centrally by NHS CFH.

1.3.4 Systems and implementation strategy

In order to realise the political vision, England was divided into originally five and, with the exit of Accenture and Fujitsu three, so-called “implementation clusters” representing different geographical areas (see Glossary). These included the Southern region, the London region and the North Midlands and Eastern (NME) region of the country, each with their own designated Service Provider and associated software solutions including Lorenzo in NME and Cerner Millennium/RiO in London.

As the Programme was characterised by the introduction of national software through NHS CFH as a centralised implementation agency driven by a political vision with limited capability for individual Trusts to choose or develop their own software solutions, the underlying assumption was that “one size fits all” through rigorous standardisation (see Glossary) of systems nationally. Anticipated benefits of this approach included increased efficiency, speed and interoperability of software systems.

The implementation of EHRs in secondary care was planned as a staged approach with software releases (see Glossary) being implemented incrementally with increasing capability. However, there were some differences between clusters due to variations in software characteristics. Lorenzo, the NME solution, was developed “from scratch” as it was implemented and did not exist in its full form, whilst Cerner Millennium was a finished product that has been routinely used in the US as a healthcare and billing system. Although both solutions were implemented incrementally, there were some differences in scale of implementations. Lorenzo was planned to be deployed as a so-called “soft-landing” on a small scale with a limited number of users and capabilities (see Glossary). Cerner Millennium, on the other hand, was distinguished by a “big bang” implementation (see Glossary), with whole organisations moving overnight from paper-based to electronic solutions. Please refer to the Glossary for a more detailed description of these approaches.

1.4 The NHS Care Records Service and Lorenzo

As can be seen, the EHRs within the National Programme are complex and consist of a range of systems. Hence, they are difficult to study, both in terms of functionality, but also in terms of geographical areas. For the purposes of my work, I therefore focused on one specific type of software (i.e. Lorenzo) in a specific geographical area (i.e. NME). The reasons for this focus were twofold. Firstly, the focus on NME allowed me to investigate the implementation of EHRs on a truly large scale as this was the biggest implementation cluster; and secondly the unique characteristics of the software allowed me to explore user involvement in design. The following paragraphs will explain these unique system and geographical characteristics in more detail.

Lorenzo was a specific type of web-based EHR software introduced as part of the NHS CRS in the NME region of England. This cluster was previously divided into three geographical areas, namely the East & East Midlands, the North West & West Midlands, and the North East. However, one of the LSPs, which was planned to be responsible for implementing NHS CRS software in the North East and East & East Midlands (Accenture), pulled out of contractual arrangements in January 2007, responsibility for implementing NHS CRS software in these regions was transferred to the LSP of the North West & West Midlands (CSC).

The NME cluster was the largest of the three NPfIT geographical areas and covered approximately 60% of the North of England. It included the following SHAs:

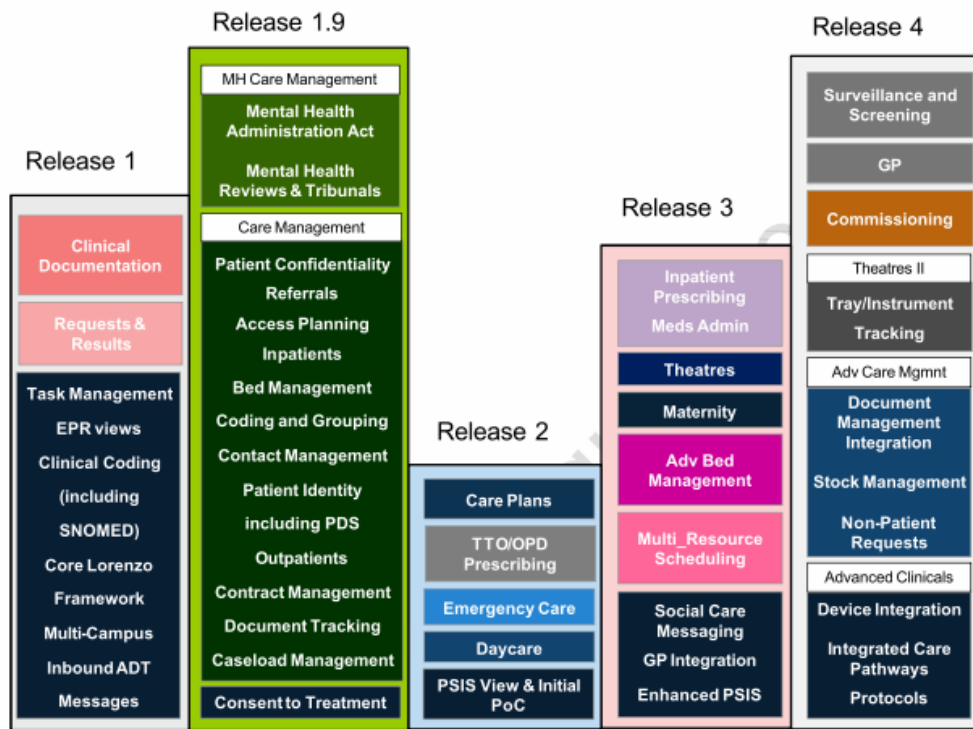
- East Midlands SHA
- East of England SHA
- North East SHA
- North West SHA
- West Midlands SHA
- Yorkshire and Humber SHA.

Altogether, these SHAs covered 89 PCTs, 87 acute Trusts, 28 mental health Trusts, five ambulance Trusts, and 10 specialist Trusts (including social and community care).

Lorenzo software was unique in many ways, but perhaps the most important characteristic was that it did not exist in its full form when it was procured, as the original intention was to develop a system in collaboration with the NHS so that it would address the needs of users. This “co-creational” approach was taken to overcome often-cited problems with lack of user involvement in software design in healthcare IT implementations.(15-32)

Different software releases were available as soon as they were developed in India, where most of iSOFT’s (the developer’s) engineers were based. Although releases had to be implemented consecutively, organisations were to some extent free to choose which parts of releases they wished to implement according to their needs. The generic description of Lorenzo, as stated in the Lorenzo Product Description published by CSC, is displayed in Figure 1.1 below.

Figure 1.1: Generic Lorenzo product description



Note: Generic Lorenzo product description illustrating the four different releases and associated functionality.

An example of the user-interface of the application is provided in Figures 1.2 and 1.3 below, depicting a list of patients and a clinic overview.

Figure 1.2: Example of Lorenzo screenshot with list of patients

Note: Example of a Lorenzo software screenshot displaying a list of fictitious patients as presented to a user.

Figure 1.3: Example of Lorenzo screenshot with a clinic overview

Note: Example of a Lorenzo software screenshot displaying a clinic overview as presented to a user.

In order to deliver early benefits to Trusts, the LSP CSC delivered iSOFT Patient Manager (iPM, also developed by iSOFT) to some English Trusts. iPM was an electronic PAS system with basic functionality and Spine integration, installed as a first step towards the final EHR solution. It was designed to deliver some early benefits to Trusts but was planned to be substituted by the Lorenzo solution eventually with CSC stopping supporting iPM in 2013. iPM was therefore referred to as an “interim solution” (please see Glossary for more details). In Release 1 (R1), iPM and Lorenzo were running in parallel and R1 interfaced to a limited extent with iPM.³

Unlike the implementation of Cerner Millennium in the London cluster, the implementation of Lorenzo in NME was “soft” with paper systems being gradually replaced with electronic systems in selected settings. Incremental releases of Lorenzo

³ In R1 iPM still dealt with all the reporting. Care Management (R2) was planned to take over the reporting functions from iPM replacing the iPM PAS with a Lorenzo PAS.

with increasing capabilities were planned to be slowly rolled out to other settings in the organisation. This set-up offered a unique opportunity to study processes in selected early implementing organisations in detail as they experienced the slow replacement of long-established systems with a nationally procured solution (Lorenzo) in the context of one of the first national EHR implementations worldwide. These in-depth process issues would have been more difficult to study in “big bang” implementations such as Cerner Millennium, as this would have meant “studying chaos” resulting in potential problems of focusing data collection as events would have unfolded more rapidly.

1.5 An evaluation of the implementation and adoption of the NHS CRS in secondary care

At the time I began my PhD, The University of Edinburgh was commissioned to undertake a national mixed methods evaluation of the implementation and adoption of various NHS CRS systems (including Lorenzo) in secondary care funded by the NHS CFH Evaluation Programme (NHS CFHEP).(33)

Whilst doing my PhD, I was also working on this larger evaluation project as the project co-ordinator and my supervisor (Professor Sheikh) was the Principal Investigator. This helped to ensure that my PhD was not an isolating experience as I had frequent contact with colleagues with whom I could discuss emerging findings and methodological issues. I was able to carve out my own niche, collecting a wider range of data that I analysed in more depth than was possible in the large-scale evaluation project (which focused on a wider range of software systems and policy recommendations). My PhD work allowed me to more explicitly draw on theoretical considerations with a focus on theory development.

1.6 Chapter summary

As I outlined in this chapter, increasingly complex large-scale EHR implementations are now at the heart of many international efforts to improve the safety, quality and efficiency of healthcare. However, the introduction of systems often has significant

consequences for work practices and organisational functioning, resulting in difficulty in implementing such systems. This is exacerbated by the focus on interoperability and the “top-down” politically-driven implementation approach in the English context, where customisability to local needs is likely to be limited. There is therefore a real threat that the introduction of the NHS CRS into secondary care will be “unsuccessful” (acknowledging that the notion of “success” itself depends on the viewpoint of the observer).(34) The implementation of Lorenzo as part of the NPfIT presents a unique opportunity to study the views and experiences of users and the consequences of the software for their work practices as well as general organisational functioning in the complex environment of a “top-down” national EHR implementation.

Having outlined the context of the implementation and described the general set-up as well as software characteristics, I will now move on to examining the literature in relation to factors that have been repeatedly identified in helping to explain why many EHR implementations in the healthcare sector “fail” or have been labelled as such. In doing so, the focus of my thesis will not be on the simple dichotomy between “success” and “failure”, which has often characterised quantitative investigations of IT systems, but on the more subtle underlying tensions and related processes.

Chapter 2: Literature review on EHR implementation and adoption

2.1 Introduction

Having outlined the complex national “top-down” implementation landscape of Lorenzo in Chapter 1, I will now examine the existing literature in order to determine which factors have repeatedly been identified as being important for the effective implementation of IT systems in healthcare. In line with the importance of interrelated social and cultural (henceforth referred to as socio-cultural) factors characterising such ventures (Chapter 1), I concentrated on social processes involved in and social consequences of the implementation and adoption of new technology (see Glossary). This not only included exploring technical, individual and organisational dimensions, but also an examination of wider macro-issues (defined as environmental factors such as political and economic climate) as the context in which local developments were situated.(26;35)

My literature review drew on principles of systematic reviews in that the searches were performed systematically and studies were examined thematically. The strict systematic review methodology in the traditional sense (i.e. with a focus on identifying randomised controlled trials (RCTs) based on keyword searches) was not viewed as suitable for my purposes of gaining an insight into the socio-cultural factors surrounding the implementation and adoption of EHRs due to the large volume of qualitative studies, case studies and anecdotal evidence.

2.2 Detailed methods of the literature review

I conducted searches of studies published in the last 10 years up to the 3rd April 2009 using Medline and Embase databases. The following paragraphs outline how I selected the search terms and the studies included in the literature review.

2.2.1 Search terms

I divided search terms into two groups – one relating to the technology in question (i.e. EHRs) and the other relating to the social processes surrounding the technology.

The first group included descriptions of EHR systems in healthcare. As mentioned in Chapter 1, these are many, varied and have been used relatively inconsistently in the literature. Nevertheless, as my focus was on the more complex end of the EHR functionality spectrum (see Table 1.2), I restricted my keywords to systems holding patient information electronically with a view to facilitating data sharing across different healthcare settings. This also reflected the way EHRs were viewed more generally in the context of the National Programme and therefore fitted in well with the overall macro-environment of my research. More specifically, terms in the first group were identified on the basis of a recent systematic review of the eHealth literature and included the following (also see Glossary for more comprehensive definitions):(5)

- Electronic health record (this included “interoperable electronic health record”)
- Electronic patient record
- Computerised medical record/Computerized medical record
- Hospital information system
- Electronic medical record
- Computer-based medical record
- Digital medical record
- Integrated care record
- Longitudinal health record
- Continuity of care record
- Personal health record

The second group of search terms focused on social processes surrounding the technology. In order to reflect the complexity, temporal and interrelated nature, I

selected terms that related to the process of technology implementation. Here, I limited my search to those that had been identified as playing an important role in relation to the implementation and adoption of EHRs throughout the literature. Terms were based on a related paper by Cooper and Zmud, presenting a holistic set of terms surrounding implementation and adoption over time from initiation to routine use (and everything in between).(36)

Search terms in the second group were the following:

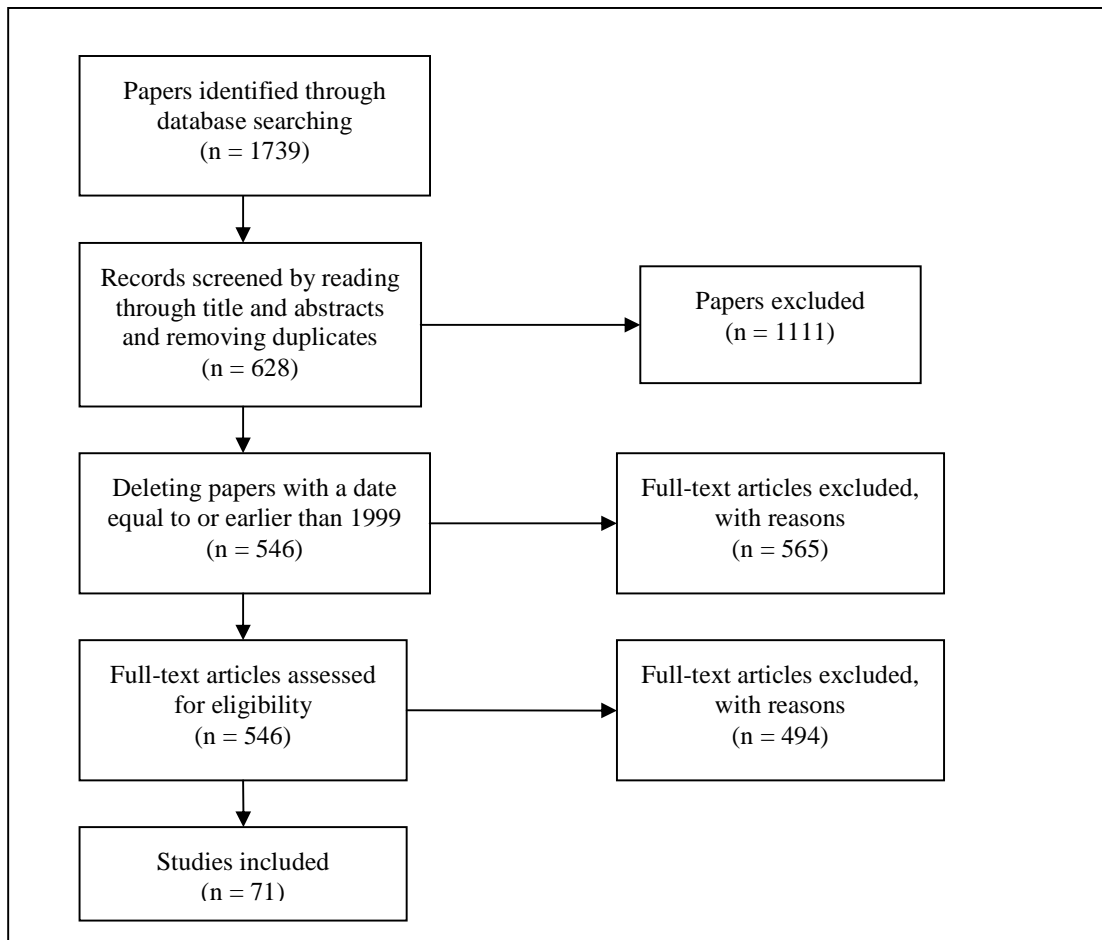
- Implementation
- Diffusion
- Initiation
- Adoption
- Adaptation
- Acceptance
- Routinisation/Routinization
- Infusion

Terms within groups were combined using the Boolean operator OR and groups were combined using the Boolean operator AND. Searches were run on the 3rd April 2009 and the literature was re-visited periodically throughout my research (please refer to Chapter 8 for a literature update). Detailed search histories can be viewed in Appendix 1.

The initial searches yielded 1739 articles. After a first round of selection, and removing those that were judged not relevant from reading titles and abstracts only and deleting duplicates, 628 articles were identified. Due to the large volume of papers and the rapidly evolving nature of the field, I focused on those published after 1999 as these were most likely to considering EHR functionality that was to an extent comparable with the systems currently available; 546 references remained. The selection criteria outlined below were applied to these 546 references. The final number of references included in

the literature review was 71 (see Figure 2.1 for a flow diagram of the selection process). The methods of individual studies and associated quality considerations are summarised in Appendix 2, where I have also summarised my critical appraisal of each study.

Figure 2.1: Flow diagram of the selection process



2.2.2 Selection criteria of studies included in the literature review

In line with my focus on social processes surrounding technology implementation and adoption (see Chapter 3), I employed the following inclusion criteria for studies:

- A primary focus on facilitators or barriers from implementation and adoption of systems in organisational transformation (the process).
- A focus on people and organisational issues (e.g. social/technical issues and human factors, further described in the theoretical underpinnings of this thesis in Chapter 3).

- Articles with lessons learned from implementations labelled as “failed” and “successful”.
- Papers that reviewed other studies of implementing IT systems in healthcare settings and had multiple recommendations.
- I did not limit myself to articles that focused on secondary care or EHR systems in particular. I also included papers from primary care and those that focused on related systems such as computerised (electronic) decision support systems (CDSS), computerised physician order entry (CPOE) or personal digital assistants (PDAs) as these are often part of an EHR, and the lessons between settings may be transferable (see Glossary for definitions of terms).

I excluded articles that:

- Focused on the impact of IT on the quality, safety and efficiency of care (as my focus was primarily on process issues).
- Evaluated technology that is not commonly associated with core EHR functionality such as speech recognition, electronic signatures and tele-care applications.
- Focused on personal health records (i.e. those that allow patients access to their own health records); my primary interest was on the use of EHRs in the healthcare setting.
- Focused on the implementation of IT in developing countries due to different contextual circumstances.
- Had a primary focus on coding and standards (see Glossary) as I was mainly interested in how the technology was adopted and implemented as opposed to how data would be used from it – the latter was more likely to become important once the technology was more established.

I also considered how the traditional systematic method to literature searching (i.e. based on RCTs and associated keywords) fitted in with my qualitative methodology and associated epistemological assumptions. Applying search criteria and selecting articles

from searches of databases based on keywords is an essentially positivist approach but I drew on these techniques to thematically identify relevant studies. Although the overall positivist tradition does not fit with my ontological and epistemological assumptions, applying the systematic approach to literature searching helped to place my research into context.

2.3 Results of the literature review: implementation and adoption of EHRs

The literature review yielded a mixture of case studies, literature reviews and anecdotal recommendations or reflections on existing efforts to implement EHRs and/or associated functionality. Papers came from a variety of countries including: the US (38 papers), the UK (nine papers), Canada (six papers), the Netherlands (five papers), Germany (three papers), Sweden (two papers), Denmark (two papers), Norway (two papers), France (one paper), Finland (one paper), Australia (one paper) and New Zealand (one paper).

As discussed in Chapter 1, definitions of EHRs were many and varied.(17;37) Accordingly, a range of different technologies and capabilities of components was investigated in the studies in a variety of implementation settings. As outlined earlier, I used the term EHRs as an umbrella term for IT applications that help to facilitate data sharing between different healthcare settings and associated management and clinical functionalities. I used the term “implementation” to refer to the process from deciding to purchase a system through to its routine use, whilst acknowledging that in reality it is an ongoing process and never complete. Similarly, I conceptualised “adoption” as the process of using the technology, from initial trying out to more embedded use.

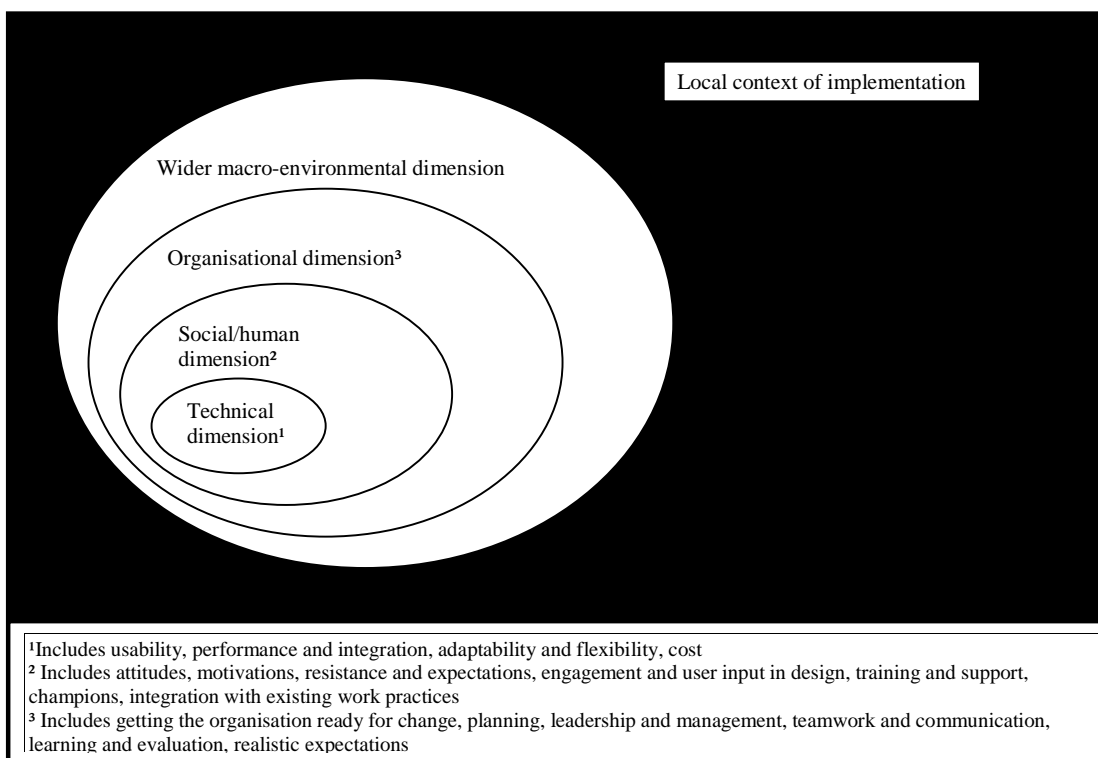
Methods employed in original research papers providing an insight into implementation and adoption processes were mainly qualitative, drawing on data obtained through interviews, observations and documents. A few quantitative studies were also identified, and some original research drew on mixed methods (mainly qualitative in combination with surveys).

Several studies attempted to devise models of implementation including those based on critical success/risk factors (with an ingredients-to-success-type of approach) and temporal stages.(27;31;38;39) However, for the purposes of my study, the introduction of technology into healthcare seemed to be most appropriately viewed as a process where technological and social factors shape each other during the various stages of implementation.(27;40-42)

Overall, studies indicated that between 50-70% of IT projects in healthcare were “unsuccessful” (or labelled as such).(35;38;43;44) These “failures” were due to a number of interrelated technical and social factors, which will be discussed in turn.(20;22;31;38;42;44-50) Of particular importance seemed to be the complex social consequences for users faced with new technologies in the organisation situated within a wider macro-environment.

I developed a model (Figure 2.2) to illustrate the dimensions and factors identified in my literature review. It has to be kept in mind that some factors are interrelated and may fit under two or more dimensions. Also, the complexity of the process and variations in context mean that the factors identified are not prescriptive for implementation “success”.

Figure 2.2: Dimensions and factors identified in the literature review



Note: A graphical representation of the socio-cultural factors surrounding the implementation and adoption of EHRs identified in the literature review. Factors included in the overall dimensions are summarised at the bottom of the Figure.

I will now discuss these dimensions in more detail, based on the findings from my literature review. In doing so, I will begin with the micro-environment (i.e. the technology and the user), before moving to the organisational and wider macro-environment.

2.3.1 Technical dimension (the technology...)

Factors under the technical dimension relate to the design of the technology itself, which can play an important part in influencing adoption behaviour of users, as technical issues can lead to significant levels of frustration.(35;51) Equally, user satisfaction and adoption can also be positively influenced by a well-functioning technology.(16;25;52) The way humans and technology interact is commonly referred to as *ergonomics* or

human factors. The most important aspects in relation to EHRs in this respect include usability, performance and integration, and flexibility and adaptability. I also included a small section on cost, which is a related factor.

2.3.1.1 Usability

Usability problems can be significant barriers to the implementation of IT in healthcare, as systems that are difficult to use are often rejected by users.(27;29;32;35;44;53) Conversely, if a system is perceived to be user-friendly and easy to learn it is likely to be adopted more readily than one that is perceived as difficult to browse and learn.(28;42)

Usability issues are commonly conceptualised to be due to a poor alignment between work practices of users and software specifications.(16;54;55) This can result in ‘workarounds’ (see Glossary) and potentially adverse effects on patient safety.(52) For example, the increased availability of large volumes of data in electronic systems may mean that the record is difficult to browse for users.(52;56) Similarly, interfaces in EHR applications may require a large number of clicks for users to navigate them, which can significantly slow down work.(19;29;40;44;57;58) The difficulty for designers therefore lies in balancing the complexity of information needed for day-to-day healthcare activities whilst retaining a certain amount of interface simplicity to make the system usable.(30;52;54) In doing so they also need to bring together the often large amount of information required by healthcare staff in a limited amount of screen space.(31;52)

Software and hardware usability can be improved by making the design as intuitive as possible.(27;47;59-61) This can, for example, be achieved through the increased use of graphics or “visual hierarchies”, but also through standardised symbols, alerts and reminders.(52;62) Testing and developing systems with users to identify issues have also been recommended to improve usability and avoid frustration.(52;63) More specifically, the basic design of an EHR should provide an overview (which means finding quickly what one is looking for), have a predictable structure (e.g. through use of headings, consistent buttons, tables and graphs) and be clinically relevant.(19) Conversely, barriers

to adoption in terms of usability include non-intuitive data entry, hardware design (e.g. lack of portability), time required for maintenance (e.g. repair), and the lack of some features desired by users.(64)

2.3.1.2 Performance and integration

Frequently, EHR users and managers need to rely on developers to tell them how the system should perform and what it can and cannot do in line with technical specifications.(53) As the introduction of technology in the healthcare sector is still a relatively new development, systems can, however, be immature and fail to meet certain standards.(44;51) When considering the necessary integration of systems into the complex and fast-moving nature of clinical work, there is a real danger that users can be frustrated and unhappy.

In this context, the literature highlights that it is important that using the application does not take significantly longer than the system that was previously operational (whether this was paper or electronic). Slow speed of systems, and an associated perceived decline in human performance, has frequently been found to be a barrier to adoption.(22;28-31;40;42;44;45;52;55;58;62;64-68) System stability in particular can contribute to slow speed.(22;51) However, it is also important to keep in mind that an initial slowing down in work practices initially needs to be expected. This should ideally ease off as users get used to the new system and become more proficient in using it.(69;70)

Any new technology should also integrate relatively easily with existing IT systems, which can be facilitated by developing standards for interfacing.(15;17;22;27;29;45;47;48;56;61;64;71;72) Problems with systems integration can slow down clinical work and result in user frustration.(31;32;40;44;49;63;69;70) However, the literature indicates that there is an ongoing tension between standardisation to allow interfacing and keeping systems flexible enough to fit in with the complex work practices of users.(17;19;53;58)

2.3.1.3 Adaptability and flexibility

As designers often lack insight into clinical practice and the day-to-day reality of delivering care, adaptability and flexibility to tailor systems to the context of use is considered important.(73) Whilst lack of systems flexibility to fit in with the nature of clinical responsibilities and local needs can be a barrier to adoption,(22;49;55;74) the opportunity for adaptation can facilitate adoption and user acceptance.(25;40;45;52;63;71) These factors are also important when considering that many systems are developed internationally. For example, Aarts and colleagues describe an in-depth qualitative study of a CPOE implementation in a Dutch hospital.(40) Here, the purchased US system needed to be (and was) adapted to the Dutch context through translation of terms and specification of different clinical pathways (see Glossary).

However, as with systems integration mentioned above, this need for adaptability and flexibility needs to be balanced with standardisation and interoperability, especially in relation to large-scale systems.(28;75)

2.3.1.4 Cost

Several studies indicate that the cost of systems and the associated implementation process can prevent organisations from embarking on IT projects.(19;25;28;30-32;44;47;53;59;63;67;70;74;76-78) This is particularly pertinent when considering the current economic climate.(79) Specific issues here include the high initial investment cost of systems, ongoing costs (e.g. for training and maintenance) and a lack of quantifiable returns from these investments.(25;45;47;49;78) More specifically, there is currently no business case (see Glossary for definition) for EHR implementation and its cost effectiveness is based on estimation in the long term.(53)

2.3.2 Social/human dimension (those that interact with the technology...)

As outlined above, tailoring of systems to the context in which they are used is viewed as important and this can be facilitated by involving users in design and implementation

activities.(56;80) These considerations go beyond a sole focus on technical features to a recognition of the role of social factors surrounding technology implementation and adoption.(73)

Users of EHRs may include clinical staff such as doctors and nurses (who are often the focus of studies reported in the literature) and also administrative staff and allied healthcare professionals. Different staff groups may be expected to use similar technology but their work practices, patterns of communication, backgrounds, place in the hierarchy and resulting needs are likely to vary.(27;46;55;56)

The following paragraphs will explore the role of the user in EHR implementation in more detail. Areas of particular importance here are attitudes and expectations, user involvement in decision making and design, training and support, the role of key individuals, and integration of the system into existing work practices.

2.3.2.1 Attitudes, motivations, resistance and expectations

The literature indicates that EHR implementations can be characterised by a lack of user acceptance and satisfaction resulting in resistance using the system.(19;28;30;31;38;41;42;44;47;49;52;60;62;69-71;74;81) High levels of resistance among clinical users in particular can threaten implementation as they typically have a high degree of professional autonomy.(22;31)

Here, attitudes and expectations were found to play an important role, with users tending to have pre-conceived ideas about software and hardware capabilities, potential benefits of the technology, and its influences on work practices.(55) If, however, the product delivered and expectations do not align, this can result in negative attitudes and resistance using the new technology.(44;55;63) Attitudes to technology can be influenced by demographic and individual factors such as level of experience with technology, salary status, personal values and norms.(42;56;60;74;77) Negative attitudes are often also exacerbated by previous negative experiences with technology and the

many examples of “failed” healthcare IT implementations reported in the literature.(28;30;31;44;53;70)

However, the literature also shows that attitudes and expectations can be managed. In this context, it is important to communicate effectively the potential value of the new system, potential dis-benefits, and anticipated effects on work practices.(25;31;32;35;42;44;45;49;51;56;58;61;64;81) Conceptually separating organisational and individual benefits as well as gains from different aspects of the system can be helpful, as different benefits may be motivators for different groups of stakeholders.(28;56;61) For example, studies have shown that managers tend to view EHRs primarily as a means to facilitate organisational processes, whilst clinicians tend to view them as primarily facilitating clinical processes.(18) As a result, clinicians tend to be most concerned with usability issues, whilst management tends to focus on business process issues.(30) Mapping potential changes in processes for different stakeholder groups before and after implementation can help to anticipate problems and align perspectives, as well as plan for mitigating action.(71;80)

Several studies have supported the notion that if desired benefits do not materialise and the system is perceived to be of limited value to users, resistance is more likely to occur.(40;62;65) Conversely, an identified individual need for the system can facilitate adoption,(61;70;80) but this needs to be characterised by an alignment of relative efforts and benefits for different stakeholder groups.(19) For example, Van Ginneken argues that, in relation to EHR implementation, users will only use the technology if the resulting benefits are motivation enough to invest efforts to learn the system.(19) In this context, it is important that the relationship of benefits and efforts is relatively balanced for all stakeholders. For example, benefits of the system are most obvious if clinicians are inputting structured data directly but they are often reluctant to do so as it tends to increase their workload and may not yield visible benefits in the patient encounter itself.

It is reported that motivations for using a new system therefore need to be identified and systematically targeted, whilst concerns and barriers to use need to be voiced, openly discussed and addressed as early as possible in order to facilitate user ownership.(20;23;25-27;42;47;50;56;61;63;65;66;71) This needs to involve outlining the benefits of using the system for different user groups.(27;56;66;82)

Concerns most commonly voiced amongst healthcare staff in relation to EHRs, and the NHS CRS in particular, include those relating to confidentiality and security.(15;19;27;31;50;51;67;70;72;74;76-78) Other concerns about IT in healthcare settings were found to relate to a fear of increased workload; worries that faults in the system may lead to threats to patient safety; concerns over how the system will influence individual roles and responsibilities; concerns that it will become outdated relatively quickly; and concerns over how it will affect doctor-patient relationships.(19;31;35;42;47;49;53;55;61;69;70;76;77)

2.3.2.2 Engagement and user input in design

As attitudes and a lack of motivation can lead to resistance, active user involvement at every stage of the design and implementation process is considered vital to increase ownership.(15-32) Here it is important that users do not feel that the system is imposed on them and that the decision to implement was made without their consultation.(20;45;47;58;59;63;65;82)

Design of the system should to be tailored to individual needs and this can be achieved through close collaboration between system designers, management and end-users.(21;24;28;29;42;47;50;51;54;56;60;62;69;71;75;76) If requests or feedback can not be incorporated, users need to be informed and reasons why need to be communicated in order to mitigate frustration.(23;29;56;63) The importance of involving end-users is illustrated in a study by Erdley and colleagues describing the development of a new information system in US prenatal care.(73) This was characterised by a lack of collaboration between designers and nurses (the users),

resulting in a “technically correct but unwieldy application”. Dargoso and colleagues describe a more successful user engagement model relating to the implementation of an obstetrics system in US secondary care.(23) During the roll-out (see Glossary) problems with the design and functionality of the system were discovered. As a response to complaints from users, the implementation team (see Glossary) reviewed the performance of the system, heavily involving users in the process. A new improved system was launched tailored to the needs of users, which increased user acceptance.

Despite an increasing recognition in the literature that senior clinical input in system design and implementation strategy is important, other users’ needs, including those of nursing and administrative staff, have been somewhat neglected.(16;48;54;83) It is, however, important that a system fulfils a variety of requirements. In this context, Johnson and Turley illustrate how the cognitive needs of clinicians vary.(57) Study participants were asked to examine different cases on the EHR and were instructed to think aloud. The authors found that nurses tended to view the patient in observational terms (e.g. in relation to monitoring and documenting changes), whilst clinicians tended to view the patient in causal terms (e.g. in relation to diagnosis and treatment).

2.3.2.3 Training and support

Once a decision to implement a certain system has been made and process mapping (see Glossary) has occurred, training and ongoing support for users is important as this can facilitate adoption and user acceptance.(21;22;24;28;29;32;42;45;47;50;51;53;55;56;58;61;62;65-68;76;77;84)

“Well-trained” users also tend to be more satisfied with a new system and if a system is perceived as being easy to learn it is likely to be more readily adopted.(42;69) Conversely, if training is not adequate this can decrease confidence and inhibit user acceptance.(35;70) Most studies included in my literature review concluded that, in hindsight, training efforts should have received more attention.(28;47;56;63) Therefore, it is of primary importance to allocate sufficient time and resources for training in

advance. This should also involve helping clinical users to free up time e.g. by reducing their workload.(19)

The literature indicates that ideally, special attention should be paid to target ward managers, senior staff and local leaders with thorough training so that they can help to train other staff.(56;61;71) In one case study discussing the introduction of a documentation system in a Canadian hospital, for example, some nurses were trained as “change managers” and acted as coaches in the initial period after go-live.(39) This involved providing support and collecting feedback from users, which was then incorporated in the design of the system. The authors conclude that drawing on these key individuals was vital as they, as peers of the user group, understood existing work practices. However, it is also important to recognise that training by peers may have unintended consequences as it may involve learning to use a system from a certain perspective as opposed to the way intended by management.(56)

A variety of training approaches can be used including web-based formats, classroom-based formats, reading material and one-to-one training. Most studies indicate that training sessions with the possibility to try out a system and one-to-one training sessions tend to be most effective.(21;23;27;35;55;70) This can be done in the healthcare setting itself or through simulated user scenarios,(51;61;71;81) with users preferring training in settings close to their work due to busy schedules.(29;69)

However, it is also important to acknowledge that not all training formats and contents are appropriate for all types of users. Training therefore needs to be tailored to existing levels of experience, skills, needs and emerging problems.(27;29;41;60;69;84) Here, the literature indicates that an initial assessment of current skills and contexts before training commences and associated tailoring can be helpful.(47;51;52;64;66)

Training needs to begin well before a new system is implemented and continue when it is more established to allow any problems that arise to be dealt with effectively. This can

help users to gain increasing proficiency and to adapt to potential software changes.(20;24;27;29;39;51-53;56;69;71;72) Similarly, whilst extensive user support during initial go-live is most important,(20;47;66;84) ongoing help also needs to be available when needed after go-live.(21;47)

2.3.2.4 Champions

The value of key individuals in facilitating the adoption of IT systems in healthcare has repeatedly been highlighted. These may include IT and clinical leaders, local champions, respected peers, opinion leaders, so called “super users” and “boundary spanners”.(19;20;22;24;27;35;42;44;45;47;51;60;61;70-72;80;83;85) The role of these key individuals may involve winning over others, feeding back emerging problems, facilitating user engagement, and communicating the vision.(24;35;42) Conversely, if champions themselves either are or become negative, then this can compromise implementation and inhibit adoption of other users.(35;40;76)

As organic spread of adoption has been found to be most effective, key individuals are ideally peers of the user group.(56) This is slightly complicated by the variety of user groups in the healthcare environment, and one may therefore need to consider involving departmental leaders from different specialties.(22;85) Range of influence of key individuals seems important in this context. For example, Sicotte and colleagues describe how the influence of some project champions can remain local, whilst others may have a wider range of influence across implementation sites.(31)

2.3.2.5 Integration with existing work practices

As alluded to above in relation to many other dimensions identified in this review, it is important that the new system is effectively integrated with existing work practices and professional responsibilities.(16;17;22;29-31;44;47;48;52;53;56;70;80) The literature illustrates how IT systems can significantly change how users work in a variety of ways. For example, clinicians may report an increased focus on data entry activities, which may negatively affect their attitudes towards the system.(28;30;74)

Effective integration can be facilitated by a thorough analysis of existing individual work practices before the system is introduced and a recognition that these vary across individuals and settings.(15;16;19;20;24;27;37;42;49;52;58;60;85) System designs need to be configured accordingly, so that they fit in with existing routines and roles of different users.(29;35;57) During this process, sufficient time and resources need to be allocated so that healthcare staff can modify existing practices and develop new routines.(28;29;56;63;85)

Integration into work practices is a large area and depends heavily on the setting and the technology in question. One particularly interesting example is provided by Morrison and colleagues in relation to changes in collaborative working as a result of the introduction of an intensive care EHR.(86) Team interactions using a trolley with paper notes were compared to using EHR functionality on a trolley by the patient's bedside. The authors report how group formation during the ward round changed with the introduction of the EHR. When using paper records the healthcare team was oriented towards the chart, whilst four months after the EHR was introduced the consultant was oriented towards the screen and staff who could not see the screen tended to "wander". One year after EHR introduction, staff increasingly focused on the conversation between the consultant and the patient as opposed to the record. With paper records, the consultant pointed to items on the record during the consultation, whilst four months after the implementation the consultant used the mouse. However, this pointing could only be seen by staff who could see the screen. A year after the implementation the consultant stood further back from the screen so that the staff was better able to monitor his expressions. The authors also report changes in conversational patterns: before EHR introduction, conversations were initiated through either leaning forwards or through handling the record. Afterwards, conversations had to be initiated verbally, which resulted in a general decrease of communication between the healthcare team.

2.3.3 Organisational dimension

Individual users and technology can be conceptually placed in a wider organisational environment.(45) However, despite having some characteristics of a “conventional” organisation, healthcare differs from other industries mainly in relation to the complex, socio-political hierarchical structures within and between organisations.(22;40) Findings from other industries may therefore have limited applicability and a thorough examination of the healthcare context from an organisational perspective is clearly needed when examining EHR implementation.

On a Trust or hospital level, organisations are likely to vary in attitudes and levels of support from management; existing and previous technology implementations; sizes, hierarchies and structures; local policies, resources and business cases; champions, infrastructures (see Glossary) and layouts.(28;30;32;41;42;46;66;74) Equally, on a departmental or professional level, variations can include different staff and patient groups, procedures, experiences, support, attitudes, leaders and resources.(32;46)

The literature shows that of particular importance when considering EHR implementations from an organisational perspective are: preparing the organisation for change, planning, leadership and management, teamwork and communication, learning and evaluation, and realistic expectations. These will be discussed in turn.

2.3.3.1 Getting the organisation ready for change

Many studies have shown that when implementing an EHR, the organisation needs to be adequately prepared for the change to come.(25;32;38;42;77) An assessment of readiness should include mapping of the following areas, so that specific organisational aspects that need attention can be identified and addressed before the new system is introduced:(20;21;25-27;35;38-40;46;60;66)

- existing IT systems and infrastructure
- technology experiences and history of change projects
- aims, motivations, attitudes and needs

- potential barriers and concerns
- financial and staff resources.

Getting the organisation ready for change should, however, not only involve a recognition of the current state of affairs in relation to the organisation and its environment.(35;39;66;85) It should also be characterised by attempts to establish an inner-organisational feeling that something needs to change to which the technology can be the solution. In this context, James and colleagues state that the key to “success” was to identify a business need for the IT system so that stakeholders felt that they were “building a solution, not just implementing a system”.(85)

If concerns arise in relation to any of the aspects outlined above, they need to be addressed before any implementation efforts are started. The literature shows that in particular allocated time and additional staffing resources are often underestimated.(15;21;25;31;35;39;44;51;85)

It is of concern that in relation to NPfIT applications some of the points outlined above have remained unresolved. For example, Nikula uses the notion of “change exhaustion” to consider the volume of innovation and changes one organisation or individual can cope with.(18) In line with this, interviews conducted by Hendy and colleagues, with secondary care managers and clinicians about barriers to implementing the NPfIT indicate that some Trusts are still “recovering” from merging, which may make staff more resistant to change.(26) Other concerns in relation to the NPfIT include Trusts fearing the loss of existing IT systems and the timelines allocated for implementing NPfIT applications.(26)

2.3.3.2 Planning

Effective strategy planning is not only essential when preparing for the change but also during IT implementation. Drawing on lessons learned from similar ventures can facilitate this process.(17;50;75;81;84;85;87)

During the initial planning phase, considering how a new system will integrate with existing work practices, as well as potential issues surrounding data migration (see Glossary), data entry, interfacing and design is particularly important.(22;29;61;78;84;85) Implementation timelines need to be specified accordingly, but these need to allow enough slack to accommodate unanticipated issues.(22;24;28;31;63) Similarly, organisations should allocate extra financial resources for unexpected expenses such as extra staff for additional training or for supporting the initial implementation period.(75)

Strategic implementation approaches naturally depend on the setting and the system in question, but the literature indicates that they commonly take the form of either introducing functionalities incrementally with increasing capabilities, or simultaneously with a so-called “big bang”.(19;47;84;88) An incremental or phased approach seems to be better suited for complex organisations and systems as staff may feel overwhelmed by too many changes at once.(19;21;28;32;40;47;50;63;71;85) As part of this approach, some have advocated the initial parallel use of paper and electronic systems.(22;56;63;71) Naturally, there may be tradeoffs. For example, using parallel systems does not allow for the maximum potential benefits of either system to be realised, and often results in increased workloads for users.(19;29;56) Similarly, a stepwise approach introducing change gradually can make the change process very extended, which may result in difficulties in keeping staff motivated.(19)

Piloting (see Glossary) and testing of a system is commonly viewed as important in order to assess how the technology is likely to be integrated in organisational practices, if designs need to be revised, and to test implementation strategies.(22;31;38-40;50) A risk assessment and devising mitigation strategies before implementation can further help to plan for worst case scenarios.(22-24) However, the literature also shows that planning of the implementation process needs to be sufficiently flexible in order to cope effectively with unexpected situations such as technological glitches.(22;27;41;72)

2.3.3.3 Leadership and management

IT implementation not only needs to be a priority for management and receive sufficient financial support,(28;31) but skilled leadership and clear management structures are also important in supporting IT introduction.(15;20-23;25;31;35;39;40;42;44;45;47;84) In this context, management needs to have clearly defined responsibilities, act in line with the overall business strategy of the organisation, have an holistic overview of the issues, an understanding of the risks to implementation and the potential consequences of the system, whilst still being flexible and responding to emerging issues.(15;25;30;31;35;42;82)

As mentioned above, staff ownership can be promoted through involvement in decision making.(30;39;61) In doing so, management needs to be willing to receive and incorporate feedback as well as be transparent in relation to decision making.(30;75) The literature indicates that whilst “top-down” approaches imposing mandatory systems are unlikely to be effective as they tend to alienate staff, a degree of management leadership is needed to ensure that systems are used.(35;56;88)

Leaders further need to share and communicate both short-term and long-term goals, including a shared vision.(20;22;25;27;28;30;31;35;42;50;56;61;63;65;70;72;75;81;82;85) The literature shows that here, goals are ideally framed in relation to differences between the current and the future state, outlining the process of how to “get there” before beginning implementation.(21;25;41;85) However, it is also important that during this process, goals are adhered to without increasing the scope of the project, which can result in a loss of focus (this is commonly referred to as “scope creep”).(21;44)

Local implementation teams commonly lead EHR implementations ensuring that both staff and management requirements are reflected in the strategy.(27) These teams need to have sufficient resources and should be selected carefully based on a range of skills complementing each other. The literature shows that such teams should ideally include

an experienced project manager, clinical champions representing users, and managerial as well as technical members.(15;24;27;28;31;39;41;51;84) Changes in membership, lack of defined roles, negative attitudes, lack of leadership and skills, as well as a lack of close working relationships with users can inhibit implementation.(29;44) Despite the central role of the implementation team, it has repeatedly been highlighted that a certain degree of individual and departmental independence is important as individuals need to be given sufficient autonomy in decision making.(21;28;81)

2.3.3.4 Teamwork and communication

During EHR implementation, effective communication, teamwork, cooperation and trust between all stakeholders is important to ensure that the system is implemented effectively.(20;22;25;42;45;65;68;70;72;74;85) This requires a particularly close working relationship between users, IT staff and managers.(38;73;82) Effective communication with users can, as stated above, facilitate engagement and acceptance.(25;27;50;65;66;84;85) It may involve keeping staff abreast of current developments and progress as well as receiving feedback of experiences.(21;39;82) Formal mechanisms of communication can include posters, regular newsletters and internal reports, but these are often unidirectional (i.e. from management to staff).(21;81;82) Raising awareness of the imminent change before go-live should involve explaining why the new system is to be introduced, how the change will be managed, and openly inviting feedback.(39;69;81)

Effective communication and close collaboration between organisational stakeholders (including users and the implementation team) and system suppliers is also important when considering EHR implementations.(19;21;23;27;35;47;51;61;63;70;73;75;85) The literature indicates that this should ideally involve suppliers working alongside organisational staff incorporating requested changes.(27) As these parties are often not used to working together, team building exercises can help to build relationships and open channels of communication.(21;22;66;73) The importance of effective communication with suppliers is further reinforced by studies indicating that the most

“successful” implementations tend to be those where systems have been extensively customised to local needs.(54;62)

Overall, agreed terms of communication (such as robust contracts), alignment of different goals and objectives, and open two-way communication channels between different stakeholder groups can be helpful in avoiding misunderstandings during the implementation process.(27;31;45;63;82) In the context of EHRs, this also involves facilitating communication and partnerships between often very different organisations that may need to share electronic information (e.g. primary and secondary care, or different specialties).(31)

2.3.3.5 Learning and evaluation

The literature has repeatedly highlighted that formal evaluation is important for identifying benefits, for monitoring progress and for identifying areas for improvement.(15;19-21;24;29;32;35;38-40;45;50;68;72;75;80;82;89) Hence, it has been argued that around 10% of the total implementation budget should be allocated to evaluation activities.(75) However, the majority of implementations lack robust evaluation activities, which is probably due to a lack of expertise in this area.(24;35;76;89)

During evaluation activities, many have argued that change is best conceptualised as a learning process with opportunities to adapt, as unintended consequences are always likely to emerge.(22;27;31;32;40;44;56;65;74) Formative evaluation efforts that assess the achievement of goals periodically throughout the implementation period are therefore particularly appropriate as they can help to identify and address problems as they emerge.(31;35;42;75;89) McGowan and colleagues outline how such formative evaluation may be conceptualised by drawing attention to the following three elements:(89)

- **Technology:** Including an assessment of system capabilities, system reliability, and suppliers. It should also involve comparison with expectations and organisational needs.
- **Organisational:** Including an assessment of existing work practices and organisational readiness before the system is implemented. Any barriers identified should be addressed.
- **Cost:** Comprising a local cost assessment including the initial investment as well as maintenance costs. Additional staff resources, training and ongoing support should also be considered.

The literature indicates that EHR evaluation should ideally combine qualitative and quantitative methods.(42;75;85) Qualitative enquiry is best suited for gaining an insight into processes (e.g. individual work and organisational processes), whilst quantitative methods can help to assess cost implications and potential quantifiable system impacts (e.g. effects on clinical outcomes).

Overall, there is still a need for more rigorous evaluation activities in relation to EHRs, and quantitative evidence in relation to returns on investments is still lacking.(17;30;74;76) Barriers include the difficulty of finding appropriate evaluation expertise and problems with measuring the contested notion of “success”.(17;34;75) For example, outcome measures are difficult to determine in the complex healthcare environment and tend to vary with different IT systems as well as across settings.(75;82)

2.3.3.6 Realistic expectations

Realistic goals and setting interim milestones can facilitate implementation as opposed to extreme ambition.(27;39;61;63;71;84;85;87) The need for realistic expectations is most commonly expressed in relation to timelines, including the need to acknowledge that organisational change is often longer than envisaged.(32;39;71;75;81;85) Delays in implementation timelines can, for instance, occur as systems need to be adapted to work in the complex healthcare environment and as staff get used to new work practices.

Therefore, a certain degree of realism as opposed to extreme ambitiousness can help to ensure that stakeholders remain positive and do not become disillusioned.(31) In relation to the NPfIT, however, many have questioned the ambitious implementation timelines.(25;26;35) Pagliari argues that it is in the very nature of complex IT programmes such as the NPfIT to take longer and cost more than anticipated.(75)

Similarly, visions behind EHR implementations need to be realistic and leaders should balance pursuing goals with flexibility, acknowledging that programmes do evolve and that strategies may need to be changed along the way.(38;45;75;80) For example, the complete elimination of paper records is likely to be unrealistic and it may take time before users fully utilise all functionalities of a new system.(51;56;61) Equally, organisational productivity may go down initially and benefits may take a long time to be realised.(20;23;30;47;53;61;75)

2.3.4 Macro-environmental dimension

The technical, human and organisational dimensions discussed above are situated in and influenced by a larger environment including a web of other healthcare organisations, industry stakeholders (e.g. system suppliers), the media, governmental bodies and associated policy, professional groups and the general economic landscape.(22;26;32;35;46;50;51;72;76) The literature shows how these associated factors can shape EHR implementations in important ways.

In relation to large-scale EHR projects, political and economic factors seem to be particularly important and will be discussed in more detail below. In relation to the former, several authors have argued that the real benefits of EHRs can only be realised if systems allow sharing of information across healthcare organisations.(19;28;47) Due to the often fragmented nature of healthcare systems, some have argued that this may be best achieved by a national approach to implementation setting common interoperability standards.(25;49;50;67;71;72;80) As described in Chapter 1, such national approaches are now increasingly pursued, but this also means that they are often politically-

driven.(77) A danger with such approaches is that they may result in resistance by users as they are likely to be perceived as imposed.(87)

Economic considerations are also important when implementing EHR systems as these are often expensive and benefits may not be directly visible. Incentives for use are therefore important for motivating both individual users and healthcare organisations to adopt and implement systems.(70;77;80) Most studies refer to financial incentives in this context (both in relation to individual users and organisations),(19;47;50;53;67;72;74) but some also highlight the potential of demonstrating improvements in the quality of care.(27)

2.3.5 The notion of fit

As stated in the beginning of this chapter, it is important to consider the interrelatedness of the dimensions discussed in my literature review. Ammenwerth and colleagues put forward the notion of “fit” in this context.(43) The assumption is that the better the alignment (or “fit”) of human, technological and work process factors, the higher user levels of adoption are likely to be.

However, the notion of “fit” does not need to be restricted to technological and human dimensions. Several other authors have drawn on the concept to explain their findings, arguing that models relying on identifying factors for “success” fail to pay attention to dynamics between individual dimensions and the way they affect each other.(40-42) For example, Aarts and colleagues explain a CPOE implementation in a Dutch hospital as being characterised by a lack of fit between technological and environmental factors.(40) Similarly, Yusof and colleagues propose an IT implementation model that emphasises the importance of the alignment of human, organisational and technical factors.(42)

2.3.6 Methodological considerations

Overall, my literature review indicated that evaluations of EHR implementations reported in the literature have in the main been quantitative, focusing on improvements (or lack thereof) in the quality, safety, and efficiency of care. However, such investigations are often based on largely unquestioned assumptions of the effectiveness of technology (e.g. that systems do improve efficiency and quality of care). They also fail to account for different periods of change and transformations over time, often coupled with continuous efforts to keep technology “working” as needs change.(3;66) For example, an implementation initially labelled as “unsuccessful” may in fact be labelled “successful” at a later point in time and different stakeholders may use different criteria of “success”.

Qualitative studies can take these complexities into account. They are particularly well-suited to study the complex implementation and adoption processes paying attention to the range of dimensions in which technology is situated (i.e. social, organisational and macro-environmental dimensions) without neglecting local contingencies.(90-92) However, in relation to investigating EHR implementation and adoption, qualitative methods have so far mostly been used as “add-ons” to quantitative investigations or for retrospectively explaining results of such studies. As a result, many qualitative papers identified in my literature review lacked rigour.(17;19-21;25;48;49;53-55;59;62;65;67;70-72;76;78;80;83;84;89) They were also mainly based on reflections after a judgment on “success” or “failure” of the implementation had already been made.(23;24;38;39;51;61;63;68;73;75;81;82;85;87;88) This may be due to a lack of funding for qualitative evaluation activities with quantitative evidence of effectiveness taking priority over relatively time- and resource-intensive qualitative investigations.

Nevertheless, some studies included in my review have consisted of original research employing qualitative methods.(15;16;18;22;26;28-32;35;37;40-43;46;50;56;57;60;66;77;86;93;94) These studies tended to be conceptualised as case studies permitting a detailed insight into the variety of local processes at play. However,

many lacked a longitudinal dimension, resulting in a failure to provide insights in relation to developments over time. An exception was the work by Morrison and colleagues,(86) who gathered data at three different time points throughout the implementation of an EHR (one month prior to deployment, four months after deployment, and one year after deployment). Another valuable aspect of this study was that the researchers attempted to interview the same interviewees repeatedly, helping to trace changing attitudes over time.

Another important component of good quality studies of the implementation process is formative evaluation, where emerging findings are fed back to inform implementation efforts in real time in order to identify and address any emerging problems as early as possible. An example of this is given by Rose and colleagues,(52) who used their qualitative findings to inform implementation strategy and EHR design through a combination of task analysis and focus groups with users. Similarly, Greenhalgh and colleagues,(35) conducted a qualitative evaluation informing systems implementation. Although this particular study had no explicit longitudinal element at the time it was conducted, a follow up study traced changes over time.(95) The authors conducted a combination of interviews and observations of stakeholders at four SCR Early Adopter (EA) sites (i.e. the first sites nationally to introduce this new system, see Glossary for more details). As a result of the findings, they recommend changes to the national consent model at the time, advocating a move from “implied consent” where patient consent to view the record was implicitly assumed, to “consent to view” where patients were asked for permission every time their record was accessed.

Triangulating data from different sources is important in order to confirm the validity of emerging findings. The main data collection strategy in studies identified were interviews, but some studies also drew on documents, observations, meeting notes and video recordings. Greenhalgh and colleagues offer a good example of gathering data from a variety of sources including questionnaires, monitoring statistics, field notes, documents, interviews, and informal stories.(35) Here quantitative data were also

gathered and proved valuable in providing context to aid the interpretation of qualitative findings.

Lastly, studies identified had a tendency to concentrate on one group of stakeholders (mainly either implementation teams or users) whilst neglecting the connections between the two. As mentioned previously, the implementation of eHealth technologies is, however, often best conceptualised as a process where various stakeholders need to work together to re-organise the way they work, particularly in relation to major transformative IT innovations. This is evident in a national implementation (such as the NPfIT), where the focus of enquiry should not only include the immediate environment (i.e. the technology, implementation team and users) but also the organisational and macro-environment (e.g. political and economic).

I have summarised my critical appraisal of each included paper in detail in Appendix 2. Overall, the majority of studies were from the US, which may mean a lack of transferability to the English context due to the different healthcare system and socio-political context. However, findings may to some extent be applicable as the focus was often on single implementations (i.e. the micro-context). Most included studies retrospectively reported on lessons learned from single small-scale EHR implementations. They also lacked clarity, rigorous methods, and consisted of discussion rather than empirical papers.

2.4 Chapter summary

In summary, the literature indicates that a variety of technological and social (including organisational and macro-environmental) factors need to be taken into account when considering EHR implementation and adoption. These factors are both interrelated and context dependent, somewhat complicating the conclusions that can be drawn. Even if all factors are adequately attended to, this does not necessarily guarantee implementation “success” as local contingencies vary.(40)

Nevertheless, my literature review has also shown that social dimensions relating to the immediate use of the technology (and particularly user attitudes and integration into work practices) are often at the heart of problems encountered when attempting to implement complex technological systems, due to the often significant changes to established practices that are required. Factors relating to the immediate use of the technology also tend to permeate other dimensions identified as important.

Problems may be particularly exacerbated in a national implementation context such as the English venture if systems are viewed as imposed by users and as having limited customisability due to the focus on large-scale interoperability. Investigating the adoption and integration of Lorenzo is of particular interest as, in theory, the approach of “co-creating” the system in collaboration with the NHS should help to address these problems.

The focus of my study was therefore exploring the views and experiences of users and the consequences of Lorenzo for their work practices. As the process of implementation and adoption was placed within a complex web of other social factors (including organisational and macro-environmental), adoption issues were investigated in the wider setting, trying to disentangle the ways in which different factors were intertwined and influenced adoption behaviours locally. In order to conceptualise this complex environment as well as the interrelatedness of technical and social dimensions, I viewed, in line with the literature, the implementation of Lorenzo as a process in which implementation and adoption unfold over time.

The qualitative methods employed, which are described in Chapter 5, reflect this explorative nature of my study. In doing so, I built on the strengths of a range of studies identified in this literature review, incorporating a longitudinal real-time element and employing a range of data collection methods for purposes of triangulation. My detailed aims and objectives will be outlined in the subsequent chapter.

Chapter 3: Aims, objectives and research questions

3.1 Introduction

As illustrated in Chapter 2, there are many potential avenues to explore when considering large-scale EHR implementations, although the central theme of interrelated social and technical factors pervades all of these. Within the context of the Lorenzo implementation, some of the factors surrounding the technology clearly stood out from the literature review and were therefore the focus of my study. These include the immediate environment in which the technology was used and integrated within user work practices (the micro-environment), the way the technology was introduced within the organisation (the meso-environment) and the national implementation strategy in which these developments were situated (the macro-environment).

As the first two chapters have outlined, Lorenzo presents inherent tensions at all levels. On one hand, the implementation strategy of nationally procured systems meant limited user input into design, whilst on the other hand, the way the system was intended to be built from scratch provided a potential opportunity to increase user input and thereby facilitate the integration of the system within user work practices. Keeping these considerations in mind and my overall focus on exploring process issues as outlined in the previous chapter, my aims, objectives and research questions are outlined in the paragraphs below.

3.2 Overall aim

The overall aim of the research was to explore the views and experiences of users as well as organisational consequences of introducing Lorenzo and how these evolved over time in the complex environment of a national EHR implementation.

3.3 Objectives

The detailed objectives of my study were to:

- **Explore** the attitudes and early experiences of NHS staff implementing and using Lorenzo software as part of the national EHR implementation over time.
- **Explore** how technological and social factors (individual, organisational and macro-environmental) shaped each other over time.
- **Identify** mechanisms by which different organisational and macro-environmental factors shaped the implementation and adoption of Lorenzo over time.
- **Theorise** about how the integration of the software could be facilitated and derive potentially transferable findings to other settings.

3.4 Chapter summary

Having outlined my aims and objectives, I will now move on to delineate implications for the theoretical and methodological framework in answering these questions. Keeping in mind the importance of appreciating the interrelatedness of social and technical factors, and the complexities involved in investigating social processes on different levels (including micro-, meso- (i.e. organisational), and macro-levels), I will draw on a range of selected theoretical and methodological approaches.

Chapter 4: Theoretical and methodological underpinnings

4.1 Introduction

As discussed in Chapter 2, a range of interrelated technical and social dimensions on a variety of levels need to be considered when investigating the process of technology implementation and adoption in healthcare. My focus was therefore on exploring the complex interrelationship between social and technical factors, beginning in the micro-environment (see Figure 2.2). Here, I was particularly interested in the views and experiences of users as well as organisational consequences of introducing Lorenzo and how these evolved over time in the complex environment of a national EHR implementation.

This chapter will outline the theoretical and methodological underpinnings of my research. As my focus was on exploring unfolding processes from the perspectives of organisational stakeholders on the ground, I will first outline how I approached my study from an interpretative angle drawing on hermeneutic principles. I will then, in attempting to anchor my study theoretically, move on to describe how I used Actor-Network Theory (ANT), an increasingly influential, but still deeply contested, approach to understand humans and their interactions with technology. As ANT did not fulfil all my requirements, I looked widely to identify other theoretical lenses and practical approaches that had the potential to address gaps identified in relation to ANT. These were many, often looking at either macro- or more specific social and technical processes and from various disciplinary backgrounds. I therefore drew on a range of theories to obtain a holistic picture of the implementation landscape, including micro- and macro-developments.

I will explore how integrating ANT with these other theoretical lenses can usefully inform the design of investigations focusing on the implementation of EHR systems into

healthcare settings. In doing so, I will argue that it is necessary that efforts are informed by guidance on how to use conceptual considerations in practice. I suggest that combining a case study-based approach informed by multi-sited ethnography and drawing on ANT offers a method for a theoretically-informed, yet practically applicable approach to such research.

4.2 Ontological considerations and epistemological approach

Blakie defines ontology as “claims or assumptions that a particular approach to social enquiry makes about the nature of social reality” and epistemology as “assumptions about knowledge and how it can be obtained” (here, the sociological approach).(96)

Ontological and epistemological views of the researcher influence how data is collected, analysed and translated into theory. Throughout my study I therefore attempted to be as explicit as possible about my assumptions and methodology (also see Sections 4.3.5 and 5.5 where I elaborate on my assumptions in more detail). In terms of ontology, I viewed participants as knowledgeable whose knowledge could be accessed with the methodology employed, and interpreted by me. I assumed that reality exists in the minds of individuals and by investigating their perceptions I attempted to gain an insight into their subjective realities.

As I was trying to understand participants’ views, I approached data collection and analysis with an interpretivist angle informed by hermeneutics. Hermeneutics is an epistemological approach that is concerned with the interpretation of texts and language.(96) Texts are viewed as “records made of social life” and hermeneutics involves “the application of approaches that have been established to interpret them”.(96) The underlying assumption is that the whole of a phenomenon (i.e. the subject of investigation such as the implementation of Lorenzo) can be understood by examining its parts (e.g. the way it is integrated with user work practices). Hermeneutics involves the researcher continuously moving from this “whole” to the “parts”, trying to understand these and then refer back to the “whole” to achieve true

understanding.(97;98) This activity is characterised by understanding and explanation, involving attempts to disentangle how parts of a phenomenon contribute to the “whole”.(97) It may involve engaging with a text (this may be an interview), thinking how it fits in with the overall context and then re-engaging with it with the wider context in mind. This seemed particularly pertinent when considering the complex contextual circumstances in which Lorenzo was implemented as discussed in Chapter 2.

However, I not only focused on the texts themselves, but also on intended meanings of these texts. Interpretivism helped me to achieve this. This is because an interpretivist approach assumes that people constantly make sense of their worlds by attributing meanings to experiences. The researcher therefore needs to understand and interpret these meanings in order to make sense of why people behave in a certain way.(96) It is assumed that subjective meanings are often hidden but can be expressed and accessed through language which can be shared between individuals.(99) Again, this approach was particularly well-suited to my study as my literature review (Chapter 2) indicated that subjective experiences of various stakeholders can play an important part in shaping the process of EHR implementation (e.g. in relation to attitudes and work practices).

Overall, interpretivist and hermeneutic approaches fit well with the in-depth qualitative exploration of stakeholder attitudes and experiences in adopting new technology.(97;98;100) Drawing on these perspectives allowed me to explore views and experiences of users faced with new technology, whilst paying close attention to the organisational context (including potential organisational consequences) and the macro-environmental circumstances (i.e. the national “top-down” EHR implementation). Verbal and observational data were collected and interpreted by me on the basis of my understanding of the world, trying to disentangle the complex and interrelated social and technical processes involved.

4.3 Theoretical underpinnings and practical implications

Due to the complexity of the environment as well as the constantly evolving nature of processes, studying IT in healthcare is in many ways like trying to “hit a moving target”. It requires different social theories to those that existed before. On the one hand, there is the need to simplify reality, but the flip-side of this is that this simplification should not mask the fine nuances that characterise this complexity.(101) Law and Mol argue that researchers need to acknowledge this challenge, whilst paying attention to multiple possible scenarios. The aim is to try to find out how these different scenarios and associated viewpoints are related, which is in turn assumed to lead to insights into aspects of the complex picture one is studying.

Several specific approaches have been developed to study humans and their interaction with technology in organisations. One of the most commonly cited perspectives – because it pays close attention to complexity – is the sociotechnical systems perspective. A sociotechnical system can be described as a system (e.g. an organisation such as the NHS) where technical dimensions (e.g. a specific IT system) and social dimensions (e.g. attitudes and relationships of stakeholders) are interrelated. The extent to which these shape, fit and complement each other is believed to be important in determining how the overall system (or organisation) functions.(102;103) Central to this is the notion of “organising”.(104) It includes the assumption that a complex system is characterised by a constant process of change, in which related structures re-order themselves continuously.(105) In this context, an organisation is conceptualised as an accumulation of events and actions by different actors, taking the focus away from an organisation as a structure towards an organisation as a process.

4.3.1 A very brief introduction to Actor-Network Theory (ANT)

ANT draws on the sociotechnical systems perspective, but its unique feature is its focus on inanimate entities (these can be technologies) and their effects on social processes. An actor is thus defined as the “source of an action regardless of its status as a human or non-human”. This is a radical notion in that it asserts that inanimate things (e.g. such as

technology) can also have agency.(106-109) An actor can however only act in combination with other actors and in constellations that give the possibility for action. Here, reality is assumed to be actively performed by various assemblages of actors in a particular time and place.(101;108;110;111) Inherent to ANT is therefore a move away from the idea that technology impacts on humans as an external force, to the view that technology has the potential to shape social interactions.(109)

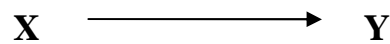
ANT has its own ontological and epistemological position, in essence considering the world as consisting of networks.(112) These networks can include humans, things, ideas, concepts – all of which are referred to as “actors”. ANT assumes that the sum of non-social phenomena can account for something that is social as a result of constellations of human and non-human actors constituting the network. It follows then that ANT is agnostic with respect to a debate which has divided many sociologists - it neither asserts that everything is socially constructed (social constructionism) nor that everything is pre-existent (realism).(111)

Tracing of associations or relationships between network components (or actors) is a key activity in ANT.(113) The central aim is to investigate and theorise about how networks come into being, to trace what associations exist, how they change, how parts of a network form a whole network, and how networks achieve temporary stability (or conversely why some networks are unstable).(108;114;115) The aim is to gain detailed insights into how social effects such as power come into being.(115;116) This is vividly illustrated by a parable offered by Law who describes how objects such as a big office, a computer and a phone can serve to create the manager in an organisation as the source of power.(117) The manager studied in isolation (as a person or “naked ape” as Law calls him i.e. without objects), as opposed to as part of a network, is viewed as relatively powerless.

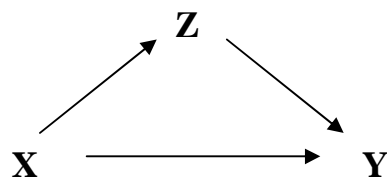
ANT assumes that if any actor, irrespective of its position, is removed from or added to a network, as is the case if technology is introduced into an organisation, then the

functioning of the whole network may be affected.(103;108) However, networks are constantly evolving as social reality is assumed to be both complex and fluid.(118) The composition of networks tends to become particularly apparent when things in a system go wrong, whilst these inter-connections tend to be hidden when things are working smoothly.(109;112;116)

Intermediaries and mediators can form connections or relationships between actors.(113;119;120) The difference between the two is that the outputs of intermediaries can be easily predicted on the basis of their inputs (a black box). In mathematical terms, the assumption here is that X directly causes Y, which would look like this:



Mediators, on the other hand, transform inputs into unpredictable outputs. This means that they can also transform actions, making something happen that is not necessarily related to what set it into motion.(116) In mathematical terms, the effect of X on Y is in this case influenced by some other variable (in this case Z):



ANT assumes that the social world consists of many mediators, which tend to be the focus of analysis as they affect social outcomes in often unpredictable ways, and very few intermediaries.(115)

Since ANT's conception in the 1980s, Latour, Callon and Law have remained the most influential thinkers in this field. They have, as a result, often been the butt of fierce

criticisms, particularly relating to ANT's radical ontological assumptions.(115;116) Challenging criticisms and intellectual exchanges have led to some evolution of the ways in which ANT is formulated,(118) but it essentially remains a “networky” view of the world in which objects can have an important role in shaping social relations.(115;116)

4.3.2 How can ANT inform the study of IT implementations in healthcare settings?

The ANT approach has practical relevance for investigating the introduction of IT systems in healthcare settings. For example, it can be used as a tool for sampling by helping to select relevant informants related to the technology in question. Similarly, it can serve as a roadmap, a way of expressing in simple terms (network terms) the complexity of what is “out there”, and as a way of making sense of social reality by investigating its constituent parts.

Nevertheless, purist ANT studies (i.e. those that adhere to the strict and original principles of ANT without modification) remain uncommon and, even when used, the subject of considerable debate.(108;119;120) A case for such “authentic” ANT studies (i.e. those that adhere to the strict epistemological and ontological principles of ANT without modification) continues to be made,(121) but I believe that such approaches are unlikely to be the most helpful way to study the introduction of technology in complex healthcare settings. I will outline my underlying argument substantiating this assertion in the paragraphs below. In doing so, I examine the value of the pragmatic application of the approach by drawing on existing studies using ANT to study technology implementation in healthcare settings.(106;109;119;122-128)

A summary of valuable contributions of the ANT approach in studying EHR implementation and adoption, as well as potential implications for my study, is given in Table 4.1. The most pertinent issues are discussed in more detail in the following sections.

Table 4.1: Potentially valuable contributions of the ANT approach in studying EHR implementation and adoption

Key notion	Valuable contributions of this notion	Implications for my study	How my research would look if it was not informed by ANT
Translations	Detailed insight into the complexity of different forces at play when artefacts are introduced in a new context	Insight into how software (designed by computer scientists) is integrated into the healthcare environment	Might be tempted to neglect the design context and examine the adoption context in isolation
Active role of objects	How objects can actively transform established practices by influencing the way human actors are associated	The software is viewed as actively transforming the way care is delivered rather than being a relatively passive piece of equipment	Software may be viewed as passive, which may lead to underestimating its influence
Analytical method and theory development	As a conceptual tool to guide the research process, frame the research questions, collect and interpret data and theorise about potential explanations	Focus on a certain technology and sampling different human actors associated with it, notion of networks can help to conceptualise connections and the active role of objects	Sampling may neglect potentially important actors, may result in an a-theoretical approach

		can help to theorise about potential outcomes	
Generalised symmetry	Can help investigators to resist imposing a-priori differences between actors (e.g. human and non-human)	Helps to recognise that objects can actively create unpredictable outputs	Prior assumptions of dualism between humans and objects may distort data collection and analysis
Enrolment	Can help to explore how different stakeholders/actors are enrolled into a network and how relationships are formed over time	Helps to map out interests of different stakeholders and how the most powerful (e.g. managers) try to enrol others (e.g. users in adopting the technology)	May not be able to capture the different power dynamics
Flux of reality and multiplicities	Exploring how complex relationships between actors and effects come about through movements in the network (e.g. power relationships, social effects)	Helps to conceptualise how change is a process and context dependent	A rigid view of reality may be too simplistic and mask the complexity of change

4.3.2.1 Fluidity of reality

Conceptually, the ANT approach can be valuable in helping researchers to appreciate the complexity and fluidity of reality, which may be neglected by assuming a more linear

and causal approach to studying IT implementations.(110;118;129) As a result, ANT helps to conceptualise how different realities are experienced and enacted by different actors, resulting in a nuanced picture of the dynamic relationships between actors without neglecting their interrelatedness. This is important when considering the fast-moving and ever-changing area of healthcare itself, and particularly so in relation to government-led change initiatives and resulting changes in power relationships.

Several authors have illustrated how ANT can be a useful tool for exploring changing power relationships in relation to both healthcare reforms and IT introduction.(115) For example, Lowe drew on ANT to explore changes resulting from a health reform in New Zealand.(130) Here, the organisation, in itself a network, was assumed to be situated in a larger network of politics and other organisations. Managers were enrolled and empowered by the government to achieve the aims of the reform. These managers, in turn, had to enrol individual groups within the organisation. The author describes how government policies focusing on quantification, emerging from concerns about inefficiencies in the health service, resulted in changes in the position of different groups in healthcare organisations over time (e.g. from doctors assuming dominant positions to an increasing influence of nurses).

Lowe's example refers to studying networks and shifting power relationships from a macro-perspective. However, networks can also be studied from a micro-perspective. This may be done longitudinally by comparing how different constellations of actors change over time. It is important that these changes in the network are investigated and documented as they can help to inform future implementations by giving an indication of where to focus efforts and which temporary effects can be expected to attenuate over time. For example, during early adoption of a particular technology, certain problems may be short-lived and ease off with increased use.

4.3.2.2 The active role of objects

The ANT approach can also help to guard against simplistic assumptions in relation to the role of objects in shaping social realities. They are no longer viewed as passive “black-box” containers of information, but as playing an active role that is determined by their position in the ever-changing network. Therefore, another essential value of ANT lies in challenging assumptions of separation between material and human worlds.(116;131;132) This conceptualisation provides a good tool for investigating complex relationships between human and non-human actors in which boundaries in relationships are blurred.(115)

One of the most prominent writers illustrating this active role of objects in healthcare settings is Berg, who investigated the position of the medical record in mediating social relationships between healthcare staff.(133) He describes how the record structures medical work through the processes of reading and writing, how it coordinates care across professional boundaries, and also how it contributes to sustaining power relationships between human actors. These analyses provide a helpful insight into the complexity of different forces at play, illustrating how artefacts can transform care by influencing relationships between human actors.

4.3.2.3 Acknowledging multiple realities

ANT’s focus on fluidity also means acknowledging that multiple realities can coexist, with reality being actively performed in different contexts and by different actors.(110) Social effects are assumed to emerge from these multiplicities. It follows that things (or actors, or tools) are what they are depending on the context in which they are embedded. This means that they can also be multiple, but these multiples are in some way related and can overlap.(110)

Inherent to the notion of multiplicities is that these can be conceptualised in multiple ways and that they are, as a result, difficult to study. I consider below some ways to approach this in relation to different attributes, roles and perspectives of actors.

Firstly, the notion of multiplicities helps to deal with different attributes of both human and non-human actors. This is an oft-cited criticism of the ANT approach: i.e. that it fails to take into account human intentions, interests of different groups, morals, learning, backgrounds, routines, culture and previous experiences of human actors;(111;115;116;131;134) and inherent attributes of objects (e.g. in line with their history).(111;116) Therefore, many have highlighted the need to recognise that different actors can play multiple roles in multiple networks at multiple time points.(10;115;117;134)

Secondly, the notion of multiplicities can also help to conceptualise different roles of actors. Singleton and Michael give a helpful example referring to a case study of a cervical screening programme.(134) The authors describe that when this was introduced, General Practitioners (GPs) seemed to have two roles, including that of an enabler (enrolling other human actors into the network) and that of a critic (threatening the stabilisation of the network). In addition, acknowledging the multiplicity of networks themselves, the screening programme was also described as only part of a larger network and only a small part of the GP's role in general.

Thirdly, the notion of multiplicities can help to conceptualise different perspectives of human actors and forms of non-human actors. For example, Bloomfield outlines tensions between those who manage the introduction of the IT system (e.g. managers and policy makers) and those who need to use it in their everyday work (e.g. healthcare professionals and administrative staff).(3;135)

4.3.2.4 Exploring micro-processes in a complex environment

ANT does not *a priori* divide the world into micro- and macro-contexts or attribute agency to either individuals or social structures.(111;115;130) Rather, agency is assumed not to be limited to individuals, objects or social determinants, but as emerging as an effect of the interactions of network components.(136) These components are

assumed to consist of the same basic building blocks.(137) ANT therefore focuses on examining the micro-context (e.g. individuals directly interacting with technology) and uses findings to draw conclusions about the macro-context (e.g. the political environment in which individual practices are situated).(115;138) This is achieved by incorporating actors from both contexts into the same network.(115;116)

As alluded to above, complexity is, however, difficult to study and it is important to recognise that one will never be able to capture the full picture of social reality.(101) Nevertheless, ANT can help researchers to “zoom in” on network building blocks at any point in time. This focus on micro-contexts can help to shed light on the subtleties of social reality and thereby help to make inferences in relation to wider social processes (“by zooming out”).

From a micro-perspective, healthcare technology may be viewed as a new component being added to an established network consisting of healthcare staff and existing objects (e.g. paper, medical instruments, other information systems). The integration of the new technology requires the formation of new connections and other more established network components to re-organise around this new actor. ANT can help to gain a deeper insight into the processes involved. This can then result in recommendations of how to make the new network (i.e. one now including both humans and technology) more stable and facilitate the effective integration of the technology into the healthcare environment. In doing so, barriers such as difficulties integrating the new software into work practices of users can be identified. This may then help to explain why an implementation was slower than expected or came to be labelled as a “failure” by some. Studies by Berg as mentioned above,(133) are good examples of investigations of these micro-processes.

4.3.3 Potential challenges of using an ANT-based approach

As with all other approaches to social theory, in attempting to answer the question of how social orders are created and maintained, ANT faces epistemological, ontological

and methodological challenges. These are, in line with potential implications for my study, summarised in Table 4.2 below. A more detailed discussion of the most important points is provided in the following paragraphs.

Table 4.2: Additional factors to consider when using an ANT-based approach to studying EHR implementation and adoption

Methodological issue	How this may be addressed	Potential implications for my study
ANT does not a-priori divide the world into micro- and macro-contexts or attribute agency to either individuals or social structures	Broader contextual factors should be taken into account and may be viewed as other parts of the network	Political, cultural and economic environments are important to consider when examining technology implementation and adoption
The number of actors in the network is potentially infinite	Researchers need to make rigorous and pragmatic decisions of where (and from whom) to start and stop data collection. The primary focus should be on answering the research question.	Although the focus may be on exploring changes to work practices, views from other relevant stakeholders such as implementation team members, developers and governmental stakeholders may also be important
Different actors can play multiple roles in multiple networks at multiple time points	May be useful to view networks as consisting of several sub-networks and as changing over time	Can examine how different networks align or fail to align (e.g. use of systems across different wards), how they are positioned in relation to larger networks (e.g. the hospital, the

		historical, cultural, political environment) and how networks change over time (e.g. comparing early and later implementation stages)
ANT is too descriptive and fails to come up with any definitive explanations or approaches of how exactly actors should be viewed and analysed	Important not to lose sight of the wider study aims as ANT can be prone to getting lost in detail	The focus of the study is on examining the changes in work practices as a result of the introduction of the software and all other activity should centre around this primary research question
A truly detached observer does not exist as he/she always comes from a particular position in time and space and plays an active role in eliciting and constructing accounts	Researchers need to be pragmatic and acknowledge their involvement through reflexive accounts	It is important to keep a field journal and reflexive notes throughout data collection and analysis
Human accounts, and often those of the most powerful, are privileged offering little insight into the material world	Need to recognise individual differences between humans and acknowledge that artefacts have certain attributes and a history	Take into account differences between actors by being explicit about their positioning and their history

4.3.3.1 Is ANT a method or a theory...and does it matter?

In fact, it may be precisely ANT's practical applicability that led some to conclude that "ANT's main shortcoming is its being everything but a theory", a criticism which has been partly attributed to its (allegedly inappropriate) naming.(108;116) The essence of

this argument is that the approach is too descriptive and fails to come up with any detailed suggestions of how actions and constellations should be analysed and interpreted.(99;116;120;139) It has therefore been proposed that ANT may be best used in a combination with other theoretical approaches.(138;140;141) The value of combining ANT with other theoretical lenses will be discussed in more detail in Section 4.3.4 below.

It may be useful to consider the traditional notion of theory to explore this issue further. A theory should be able to explain “how and why” things occur by exploring their relationships.(139) Describing how things occur is straightforward using ANT, but why things occur poses a challenge. Other problems facing ANT include a difficulty testing propositions with empirical evidence thus making them difficult to refute. ANT can therefore serve to aid explanation,(115;116) but has limited capability in developing empirically verifiable evidence.

Hence, it may be most useful to view ANT as somewhere between a theory and a method, or more precisely as an analytical technique that can be used to follow actors trying to understand what they do whilst constantly questioning often taken-for-granted characteristics of actors (such as that technology cannot actively transform social processes) and accepting the flux and changing nature of reality.(116;131) In so doing, ANT has been said to be “telling tales about how the world cannot stop transforming”.(131) In telling these tales, the approach can be useful in helping to frame the research question, guide data collection and begin theorising about potential explanations.(142)

Qualitative research, the main method of data collection in ANT, is generally more suited to theory development than to hypothesis testing, shifting the analytical focus to sense making activities, negotiation, differing actor perspectives and emerging effects. Yet, it seems particularly important for researchers not to lose sight of the wider study aims as ANT studies can be prone to getting lost in detail. For example, detailed

descriptions of individual work practices and ongoing examination of how different groupings conceptualise the EHR in different ways, without attempting to relate this to other relevant factors and the study questions, may be unhelpful, resulting in a lack of practical suggestions for improvement.

4.3.3.2 Researching a fluid reality and multiplicities

The challenge for researchers dealing with multiplicities and a fluid reality is to achieve a balance between the focus of the investigation and acknowledging that multiple different realities can exist without letting these differences mask the complexity of relationships. The result is that ultimately a choice needs to be made between which context to study and which part to focus on (without neglecting the whole picture) as one can not possibly capture everything. This is likely to be determined by the research question, practical constraints and the focus of the study. Conceptually, it may therefore be useful to view networks as consisting of several sub-networks. For example, part of the larger network of a national EHR implementation may be healthcare professionals using a particular type of software (such as Lorenzo) in a particular setting (such as a Trust). One could then examine how these different networks align or fail to align (e.g. across different Trusts) and how they are positioned in relation to each other and larger networks (e.g. the hospital, the historical, cultural, political environment).(134)

This leads to another problem. Even if the focus of the investigation is on the micro-context such as, for example, individual healthcare practices and their relationship with IT, the number of potential actors is conceptually infinite, leading to the question of what to include (or exclude) in the network as, for practical reasons, analysis and data collection cannot continue forever.(111;116) It follows that at some point researchers need to make decisions as to where to start and stop data collection. Again, the primary focus should be on answering the research question.(115) This may involve focusing on a particular network or aspect of a network in more detail (e.g. the micro-context if investigating work practices) and is particularly relevant in health services research as

time and resource constraints often limit the breadth and depth to which networks can be examined.

4.3.3.3 The positioning of humans and non humans

Not surprisingly, the equal positioning of human and non-human actors in ANT has stimulated debate. It is not the purpose of my work to delve into detail as to how the two differ, but during my reading, I found one actor that ANT has particular difficulty accounting for: the researcher. ANT views the researcher as agnostic (or detached), typically eliciting textual or verbal data from human actors through qualitative interviews and observations. Here, humans are seen as both informants (i.e. actors that generate accounts) and interpreters (i.e. the researcher as interpreting associations and components of the network).

Alternatively, the researcher may be conceptualised as part of the network, as it is hard to imagine the existence of a truly detached observer as (s)he always comes from a particular position in time and space and thus must play an active role in eliciting and constructing ANT accounts.(115;116;134;143) Researchers also have considerable influence on how actors and informants are selected and this too needs to be taken into account.(115)

This issue is again part of a larger epistemological debate in social science rather than being particular to ANT,(144) but it is nevertheless worth considering as other researchers utilising the approach will be likely to face similar questions. I do feel that it is necessary for researchers to acknowledge that they will be part of the network and will transform it as much as it will transform them as relationships develop throughout the research process, particularly if this involves qualitative methods. Researchers should be explicit about this involvement and show an awareness of how accounts are produced and how choices are made.(115)

4.3.4 Integrating ANT with other theoretical lenses and practical approaches

As outlined in Section 4.3.3, ANT has been subject to several major criticisms,(99;115;116;119;145) which I discussed in the paragraphs above (summarised in Box 4.1).

Box 4.1: Limitations of the ANT approach

1. The role of wider social factors

ANT pays little attention to wider macro-environmental factors.

2. Going beyond description

ANT can help to describe how relationships between actors change, but has limited explanatory power.

3. The positioning of human and non-human actors

ANT networks are made up of a number of both human and non-human actors. These actors are however different in a number of respects and, furthermore, both have a history that is likely to have shaped them, which ANT fails to take account of.

4. The problem of defining the network

There is a difficulty determining where the network boundaries are as the number of actors in any given network is indefinite.

5. The role of the researcher

The role of the researcher in influencing and shaping the network is not accounted for.

In the face of these limitations, ANT has restricted theoretical applicability, which led some to suggest that it is most useful if combined with other more accepted theoretical lenses that can help to address some of its shortcomings. This led me to consider other theoretical approaches which had the potential to address some of ANT's limitations. In

doing so, I looked broadly, specifically searching to identify the issues summarised in Box 4.1. This broad search led me to consider theoretical lenses from a variety of disciplines, in trying to find those that could provide more holistic insights into the implementation landscape than was possible drawing on ANT alone. I therefore specifically searched for more explanatory theoretical frameworks that shed light on the role of macro-environmental as well as organisational factors shaping local developments, and those that took into account the specific characteristics of human and non-human actors. These came from a variety of disciplinary backgrounds including management, organisational studies, psychology, science and technology studies, and health services research. I have summarised those that seemed valuable in addressing the majority of ANT's theoretical shortcomings in Box 4.2 below.(92;113;138;141;146-152)

Box 4.2: Brief summary of the most salient characteristics of some theoretical models that can complement ANT

Strong Structuration Theory

Separates structures from agents and argues that the two have a mutually shaping (or recursive) relationship. In doing so, it seeks to investigate the following:

- External structures (social relations, institutions, power relationships, infrastructures, technology etc.)
- Internal structures in agents (morals, attitudes, skills, thoughts etc.)
- Active agency (why agents act in a certain way)
- Outcomes (how external and internal structures change or stay stable and why)

Greenhalgh and Stones' model

Builds on Strong Structuration Theory to comprise a technology dimension, which includes questioning where and how the technology has emerged, as well as determining how human and non-human agency differs.

Social Shaping of Technology

The way IT emerges is related and shaped by historical, cultural and economic factors. These social processes are assumed to consist of choices made by key stakeholders throughout the design, implementation and adoption circle of a technology. Different choices arising from particular interests (these may be stable or temporary) can have different consequences for different stakeholders – these are examined in the Social Shaping of Technology. Inherent to the approach is the view that technology implementation is a non-linear process consisting of both technical and social transformations.

Social Psychology

Focus on the attitudes of individuals adopting a new technology. The intention to use a technology is assumed to be determined by an individual's attitude, the perceived subjective norm, the perceived usefulness of a system, and the perceived ease of use of a system.

Normalisation process theory

Focuses on how innovations become embedded within collective clinical practice over time and what inhibits and/or facilitates this process. Takes into account social and organisational processes to achieve routine use (including ways to achieve it) locally i.e. micro- and macro-processes. Assumes that normalisation (or routine use, embedding into day-today practice) is affected by:

- “Interactional workability” – the way it affects peoples’ interactions and practices (including how people’s roles and work practices are aligned, what is possible to achieve in any interaction or practice, if the innovation fits with the general strategic goals of any interaction)
- “Relational integration” – how interventions relate to the distribution of knowledge and fits in with existing relationships (how is knowledge distributed i.e. the knowledge required for an interaction: does it allow adequate knowledge for those who need it,

beliefs surrounding the value and risks of the innovation as well as the knowledge needed to deal with it)

- “Skill-set workability” – the effect of the innovation on the existing division of work (consequences for the allocation of tasks and the perceived legitimacy of this allocation, organisational ability/capacity to implement an innovation)

- “Contextual integration” – the way the innovation integrates with the overall organisational context (organisational practicalities surrounding the implementation such as costs and risks, ownership and potential to change the innovation as well as allowing new practices to emerge)

Theory of the diffusion of innovations

Can help to explain why or why not certain innovations spread in and across organisations as well as how this spread may occur. A range of factors are assumed to determine how well the innovation is accepted and adopted and include the following:

- Innovation attributes
- End-user perceptions
- Strategies on targeting/communicating with and engaging of end-users
- Receptive context and planning
- Attention to both macro- and micro-contexts

Individual adopters of innovations are categorised into the following categories, which characterise the rate of adoption of innovations in organisations:

- Innovators: those who adopt an innovation early
- EAs: tend to have good connections with both innovators and the social system
- Early majority: tend not to have contact with innovators and commonly have no interest in the theory underlying innovations
- Late majority: adopt when the early majority has done so and have a more sceptical adoption attitude
- Laggards: very slowly adopt only after everyone else has done so

Other important individuals:

- Opinion leaders: individuals who can influence other members of a social system, considered crucial in the process of promoting the adoption of innovations
- Innovation champions: charismatic characters that support the innovation
- Boundary spanners: characterised by having both internal and external organisational relationships and an interest in the adoption of an innovation within an organisation

These theoretical lenses can help to address some of ANT's shortcomings in relation to the role of wider contextual factors, going beyond description, reflecting on how the technology itself has emerged, and questioning how both human and non-human agency differs and is determined (addressing problems 1 to 3 in Box 4.1). They do not however address ANT's more practical problem of defining the network.

In the following sections, I will therefore outline how operationalising ANT can be facilitated by using case studies drawing on multi-sited ethnography (addressing problem 4 in Box 4.1). This builds on the issue that ANT and other theoretical lenses summarised in Box 4.2 lack guidance on how to define and hence contain the network in question, as potentially data collection could be infinite.(111;116) Case studies drawing on multi-sited ethnography can help to address this problem and I will discuss how in the subsequent paragraphs.

4.3.4.1 Case studies drawing on multi-sited ethnography

So what exactly is multi-sited ethnography? "Traditional" ethnography is a typically qualitative research approach characterised by the in-depth exploration of a particular setting with the researcher immersing him/herself in data collection and in participants worlds.(153) Multi-sited ethnography, and associated approaches, employ similar data collection methods (i.e. observations, interviews, and collection of associated material), but are characterised by breadth (at the expense of depth that defines the traditional ethnographic approach), drawing on data from different settings to help understand the nature of a particular phenomenon of interest from a broader range of viewpoints.(154-

158) In doing so, multi-sited ethnography aims to gain an insight into both local contexts and the wider social system in which these are situated.(157;158) Local contexts (or multi-sited ethnographic sites) are, although different, to some extent assumed to be related and therefore purposefully chosen, which fits in well with Latour's concept of associations.(157-159)

Ideally, the result of a multi-sited ethnography is a holistic understanding of the complex environment surrounding technology introduction in organisations (e.g. wider political and economic factors). This is achieved by investigating the micro-context of implementation (e.g. a particular ward or hospital) in combination with related wider organisational and macro-factors that may affect the micro-environment (e.g. policy makers, software developers, and the media). The aim is to understand not only the richness and complexity of the immediate implementation setting, but also common influences across settings. In doing so, the approach can also help to focus data collection by sampling sites that are related through a common phenomenon of interest (e.g. the EHR implementation), whilst still paying attention to the complex nature of the wider implementation environment (as discussed in Chapters 1 and 2). The notion of the researcher "following the thing" (i.e. the software) can be helpful in guiding data collection activity during this process.(160) For example, if one starts at a ward speaking to users, who mention a particular implementation team member, one may wish to obtain that person's perspective. This implementation team member may mention another stakeholder such as developers or governmental stakeholders, which can then in turn be followed up. Researchers need to, however, make practical decisions in relation to the degree of depth when investigating these different perspectives, whilst paying attention not to privilege some informants over others.(154-156)

Indeed, multi-sited ethnography has been employed in combination with ANT to investigate complex organisational change in healthcare and beyond.(158;161-165) For example, Bruni,(162) describes an ethnography of an EHR in an Italian hospital. Although this study did not go beyond the boundaries of the hospital, it was argued that

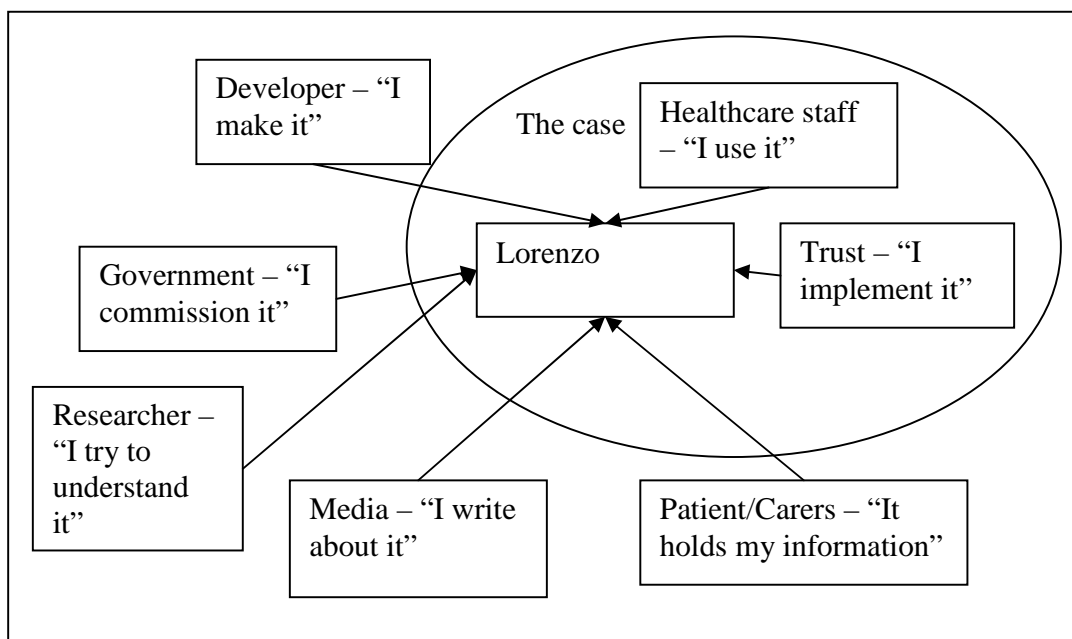
the software helped to facilitate the definition of the ethnographic space by the researcher following it, and tracing its relationships with other actors over time. The author describes that the EHR was still a new addition to the network, “negotiating” its right for existence in the organisation. Effective integration of IT will only happen, it is argued, if it can be absorbed into the network of other existing actors. In a similar vein, Mol describes an ethnography of a disease.(166) It is suggested that this approach can help to capture the complex ways different parts of the body and the disease are enacted by different actors, in different places and at different times.

Using ANT in combination with multi-sited ethnography can therefore help to focus data collection and inform strategic decisions throughout the conduct of the research. By following the technology as an actor and tracing its connections with various other actors organically, this approach can help to understand different perspectives that constitute components of the network and hold it in place. Multi-sited ethnography can help to map both stakeholders and connections between these by examining their relationship to the technology, thereby allowing the implementation to be examined in its full complexity whilst still keeping focused. Here, the technology may be viewed as a central figure through which other components of the network are, either directly or indirectly, related.

Individual organisations may be treated as case studies embedded into the multi-sited ethnography (Figure 4.1). This can help to discover local contextual contingencies whilst retaining the overall implementation picture. Cases can consist of specific groups of people satisfying specific criteria in specific contexts, whilst the case study as a research method consists of investigating a phenomenon (such as the integration of an EHR system in user work practices) within its real life context using multiple sources of evidence.(167;168) For example, a case may be an organisation, ward or community team implementing Lorenzo software. Selecting case(s) is ideally theoretically informed, on the basis of representing a particularly typical or atypical situation or context. Individual case studies can then be compared and contrasted to make theoretical

generalisations about a phenomenon (e.g. software implementation) to other settings. This may eventually be used to inform efforts in other contexts by exploring and theorising about existing and developing connections.

Figure 4.1: Lorenzo software and how it may be connected to cases and multiple contexts



Note: A graphical representation of the context of the Lorenzo implementation and various informants that may be drawn upon. The circle illustrates the case (i.e. the Trust) and the immediate use of the software, whilst stakeholders outside of the circle present those that can provide an insight into the case without being necessarily directly related to it.

Although somewhat related, the important conceptual difference between multi-sited ethnography and comparative case studies is that the former not only compares between settings (or cases such as organisations), but also investigates relationships between settings and with wider structures.(157) To what extent a case study of a technology (as the case) differs from case studies of organisations drawing on multi-sited ethnography, is open to debate and depends on the aims of the study in question. If this focus is on exploring work practices of healthcare professionals in the context of a national implementation (as in my study), it is important not to conceptualise the technology as

the focus of the investigation (by conceptualising it as a case), but to place the organisation at the heart of the enquiry, without neglecting the wider factors that can shape it (and vice versa). Altogether, combining the two approaches can be extremely helpful: the in-depth case study approach illuminates the complexity and interrelatedness of factors influencing implementation and adoption of technology locally, and the breadth associated with multi-sited ethnography allows the wider contextual picture to be incorporated without over-emphasising its importance.

4.3.5 My role as a researcher

Having outlined how issues 1, 2, 3 and 4 in Box 4.1 can be addressed by drawing on a range of additional theoretical lenses and methodological approaches, I now, building on ontological and epistemological considerations discussed above (Section 4.5), briefly reflect on my role as a researcher conducting the research. This is a related practical issue and can be addressed by a reflexive research approach, explicitly acknowledging that my presence may have an effect on existing networks and that my orientation can have major consequences for selecting informants and exploring relationships. This is in part the result of personal preferences (e.g. I am necessarily going to follow what I feel drawn to), ontological and epistemological assumptions (as outlined in the beginning of this chapter), and emerging results. I will discuss issues surrounding reflexivity in more detail in Chapter 5.

4.4 Chapter summary

In the previous chapter, I outlined my aim to explore the views and experiences of users as well as organisational consequences of introducing Lorenzo and how these evolved over time in the complex environment of a national EHR implementation. With this focus in mind and building on the range and interrelated nature of social and technical factors identified in Chapter 2, I have outlined theoretical and epistemological implications above.

To reflect the complexity of the implementation and adoption process, I considered how drawing on an ANT-informed perspective can usefully inform my work. The main value of the approach lies in a more sophisticated appreciation of the fluid and multiple nature of reality, the view of the active role of objects in shaping social relationships, and a theoretically informed approach to guiding sampling and data collection.

I then attempted to apply the ANT approach to the context of my study, outlining both practical and conceptual challenges and potential ways to address these. As ANT did not fulfil all my requirements, particularly in relation to explaining theoretical insights gained, the role of individual, macro-environmental as well as organisational factors in shaping local developments, and practical ways to focus data collection, I specifically searched the literature for approaches that could address these shortcomings. Based on this, I developed a theoretically informed methodological framework to studying IT implementation in healthcare drawing on ANT and a range of selected approaches which address its shortcomings.

Having explained the methodological rationale for my study, I will now move on to discussing the methods employed in my fieldwork.

Chapter 5: Methods

5.1 Introduction

In line with the literature, which highlights the interrelatedness of social and technical factors in relation to EHR implementation and adoption (see Chapter 2), I approached data collection and analysis by drawing on a sociotechnical systems perspective. I used a modified ANT-based approach, which pays attention to these complexities (see Chapter 4).(106;107;109)

In line with the importance of integration of the software into existing work practices in particular (see Chapter 2), I broadly approached data collection by examining the immediate sociotechnical environment in which Lorenzo (as part of a nationally procured EHR) was implemented without neglecting the organisational and macro-environmental context. As my focus was on exploring process issues, my study was qualitative in nature and included a combination of face-to-face/telephone interviews, examination of documents and activity oriented observation. I aimed at exploring the views and experiences of users as well as organisational consequences of introducing Lorenzo and how these evolved over time in the complex environment of a national EHR implementation. I also incorporated a longitudinal dimension in order to examine changes over time.

Many previous studies have investigated small-scale EHR implementations in local hospitals of “home-grown” systems (Chapter 2). The implementation of the NHS CRS is the first national EHR implementation in the world, posing new and complex sociotechnical challenges. Many other countries are likely to follow suit in the coming years, which makes real-time investigation of local processes important for facilitating local but also national and international implementation of EHR technologies.

This chapter will outline the methods I employed in more detail. I will begin by discussing my sampling strategy, before moving to a description of procedures employed and my approach to analysis. The chapter will conclude with some reflections on my role as a researcher in the process (building on Section 4.3.5), ethical issues, and considerations surrounding rigour and transferability of findings.

5.2 Sampling

In line with my overall methodological framework, sampling of cases, multi-sited ethnography informants and other participants was purposive (within the constraints of gatekeeper influence) by sampling human stakeholders related to Lorenzo (see Chapter 4). This is a defining characteristic of interpretative qualitative research where the aim is to explore emerging issues and perceptions of individuals in order to obtain an in-depth understanding of their “worlds”. In doing so, I conceptually divided sampling into Trusts (the case studies), multi-sited ethnography informants and participants in interviews and observations. Considerations relating to each of these will be discussed in turn.

5.2.1 Sampling of Trusts

Drawing on the case study approach helped me to examine three Trusts, conceptualised as cases, in detail. I approached a total of six Trusts, including two mental health, two acute, and two community Trusts. Three of these were approached directly by me, whilst three were recommended by NHS CFH. In order to ensure some degree of variation, I selected an acute (recommended by NHS CFH), a mental health (approached directly by me) and a community Trust (recommended by NHS CFH) representing distinct differences in settings and demographics, whilst at the same time being comparable as they were all implementing identical software (Lorenzo). This allowed an in-depth insight into the multi-faceted forces at play in each setting over time, and a detailed comparison of similar and disparate issues between settings.(169) This in-depth approach can be at the expense of breadth, but paying attention to the complexity and interrelatedness of factors influencing implementation and adoption of Lorenzo locally

(Chapter 2), as well as drawing on multi-sited ethnography, should have helped to counteract this (see Chapter 4).

In line with the aims and objectives of my study (Chapter 3), I defined a case as a Trust being the first to implement Lorenzo as part of the National Programme (i.e. the EAs or first-wave implementing organisations in NME). In some instances, this included a single healthcare setting (e.g. a hospital), whilst in others that had implemented Lorenzo across different organisations, a range of settings were studied (e.g. different locales from which care was provided). Cases were selected to provide an insight into the local process involved in implementing and adopting the new software. Here, the concept of NHS Trusts as cases helped to set boundaries, whilst still allowing for the important role of organisational and macro-environmental context to be taken into account in shaping local processes.

Trusts may be viewed as “critical cases” as they all faced a certain phenomenon (i.e. the introduction of Lorenzo). They were the first Trusts in the country to do so, which allowed me to develop and test theoretical propositions by drawing on all three and then postulating principles that may transfer to other Trusts that were yet to implement Lorenzo or other nationally procured software.

In recruiting cases, I initially liaised with NHS CFH who provided me with key contacts of individual Directors of IT from one acute and one community Trust. Two mental health, one acute, and one community Trust were approached directly by me. All Trusts approached agreed to participate, but some did not as anticipated implement Lorenzo functionality during the period of my study due to changes in implementation timelines. It is also important to acknowledge that selection of cases was restricted to a small number of organisations that had begun implementation (during the recruitment phase there were only six EAs of Lorenzo altogether). Nevertheless, I was able to sample a range of different Trusts using the software in different settings including acute care,

community care and mental health. These Trusts also represented different sizes and scales of implementations with varying levels of early Lorenzo functionality.

5.2.2 Sampling of multi-sited ethnography informants

In line with the multi-sited ethnographic approach and informed by ANT (see Chapter 4), I also sampled a wider range of stakeholders outside the immediate Trust environment, who could provide an insight in relation to developments in case study sites. In doing so, I essentially followed the traces of Lorenzo through case study settings and beyond (the multi-sited ethnography informants). This meant that I not only sampled individuals that used and implemented Lorenzo within Trusts, but also stakeholders connected through the technology from the larger macro-environment. Informants were approached in person at relevant national conferences I attended during the course of my study. These included interviewees and documents from governmental, media, developer, independent sector, and LSP sources. Specific Trusts and Lorenzo itself were frequently mentioned in these. More detailed information on individual participants can be found in Chapter 6.

5.2.3 Sampling of individual participants for interviews in Trusts

In order to obtain a sufficiently rounded understanding of different perspectives, I recruited a variety of key stakeholders from within Trusts. This also involved sampling of deviant cases (i.e. those with conflicting viewpoints) in order to investigate whether a theoretical proposition either applied or needed to be modified in light of these.(170-172)

As Trusts varied in relation to local arrangements and preferences, approaches to recruitment of settings and participants were flexible, being negotiated with key contacts and gatekeepers at each Trust. In doing so, I initially recruited individual informants through the Directors of IT, who put me in touch with implementation team members and relevant Ward Managers/Heads of Services. These, in turn, helped me to approach individual users. Sampling of Lorenzo users was somewhat limited as the software was

initially only used on a very small scale. However, I recruited a range of pharmacists, doctors (junior and senior), nurses (both junior and senior) and administrative staff.

At the end of interviews, I asked participants if they could suggest any other potential interviewees and approached these in turn (snowball sampling). Data collection continued until saturation (the point at which no new themes were emerging) was reached.⁴

As mentioned in the introduction of this chapter and elaborated further below, data from Trusts were collected at two time points. Sampling for the second round of data collection was again facilitated by gatekeepers, but in some instances individuals interviewed during the initial phase were approached directly by me (with permission from the relevant Ward Manager/Head of Service). Speaking to the same individuals during the second round was preferred, in order to investigate changes over time, but often difficult as dependent on the availability of informants.

Overall, sampling individual participants was difficult in the busy healthcare environment and this was exacerbated by the exceptional circumstances in Trusts, where staff members were trying to get used to a new computer system. I therefore tried to be as accommodating as possible.

Participants were contacted via email or phone to arrange a suitable date and time, or approached in person, if appropriate. Upon initial contact, participants were asked if they preferred the face-to-face or telephone interview format. They were provided with an information sheet (Appendix 3) and a consent form (Appendix 4) before data collection activity commenced. Participants who did not respond to my original email contact were contacted via telephone approximately one week later. A small number did not respond to my efforts to contact them, in which case I abandoned my attempts assuming they

⁴ Although I acknowledge that this saturation related to the early adoption/implementation period only.

were not interested in participating. No individual overtly refused to participate, but some were not comfortable with the audio-recording, in which case I took notes.

5.2.4 Sampling of participants/locations for observations

Observations were conducted in case study sites i.e. Trusts. Sampling of observation locations was again facilitated by local gatekeepers including Heads of Service, Ward Managers and Directors of IT.

As the implementation of Lorenzo was limited to a small number of locations within each Trust, I took every opportunity to see the software in use. This involved “back-office” use as well as use in clinics. I also observed some Lorenzo meetings between users and IT Managers. Throughout observations, I made a conscious attempt to study different types of staff using Lorenzo in different settings in order to get a sufficiently rounded understanding of the diverse user- and location-specific issues involved in everyday use.

Observations of Lorenzo in-use were slightly complicated by the fact that the system had extremely limited functionality and was still in the development phases. Gatekeepers therefore were often hesitant to arrange observations, which I felt may have been due to the fact that they seemed to prefer me seeing the system “working well” as opposed to seeing difficulties encountered during early use.

5.3 Procedures

The observational component of my study received ethical approval from the East London and the City Research Ethics Committee on the 2nd of April 2009 (please refer to Appendix 5 for detailed information on ethical and site-specific approval). The interview component was part of the larger evaluation project (as referred to in Chapter 1). It was submitted for ethical review to the same ethics committee but was classed as a service evaluation on the 9th of October 2008 (08/H0703/112).(33)

Overall data collection involved a combination of interviews, observations, and examination of documentary data over a period of 18 months. In line with my study aims, interviews and observations centred on topics exploring the views and experiences of users and the consequences of Lorenzo for their work practices and general organisational functioning in the complex environment of the national EHR implementation (see Appendices 6 and 7 for interview/observation guides). I did consider the use of focus group discussions as a data collection method but decided that this was not feasible due to practical reasons (i.e. availability of clinicians, which also proved difficult with interviews and therefore confirmed this assumption). In some instances, interviews were however conducted in small groups of two or three participants.

Throughout my study, I made a conscious effort to inform data collection through emerging results, by feeding back preliminary findings into subsequent data collection activities. This resulted in evolving interview/observation guides over time, with me focussing on certain pertinent issues in more depth, and a decreasing focus on contextual information as I was getting more familiar with the settings.

I made the decision when to stop data collection in line with my emerging findings (when I judged that saturation was achieved) as well as the practical and temporal constraints that accompanied my work. In doing so, I drafted a grid of what I was aiming to collect in each Trust before commencing data collection. The initial aim was to obtain data from at least four implementation team members and four healthcare professionals, but I was able to (and indeed needed to) gather significantly more data. Nevertheless, the grid helped to monitor progress and facilitated comparisons between Trusts whilst still allowing for individual differences to be captured. This was further facilitated through drawing up overall questions to be answered across cases, which were then further tailored to individual settings and groups of interviewees (see Appendices 6 and 7). In doing so, I paid careful attention to not getting lost in too much contextual detail and thereby losing focus. The fine line between how much contextual data was relevant and

necessary to answer my study questions was guided by careful judgment on my part, facilitated by regular discussions with my supervisors.

At this point, it is also important to note that although my work drew heavily on ethnographic principles, it was not ethnography in the traditional sense. In line with ethnographic approaches, I did attempt to explore the nature of social phenomena by collecting qualitative data from a small number of cases in detail.(153) However, the more traditional ethnographic work also involves a way of immersing oneself in qualitative data collection and in participants and their environment by becoming an “insider”. For me, this was difficult to achieve due to a range of practical limitations including access, time and resources. Therefore “modified” ethnographic approaches are frequently advocated for studying sociotechnical systems (especially the complex and ever-changing social aspect),(125) but these are often characterised by relatively short visits to the field. I utilised such a modified ethnographic approach in my study.

5.3.1 Interviews

As the focus of my research was on exploring processes and experiences of individuals, interviews were employed as the primary data collection method. This allowed me to gain an insight into attitudes and perceived challenges amongst various stakeholders. Telephone interviews were used to complement face-to-face interviews as they are time-efficient and suitable for individuals with busy work schedules and geographically scattered samples.(173;174)

5.3.1.1 Data generation

Interviews were conducted between February 2009 and November 2010. They were one-to-one, digitally audio-taped (in the majority of instances⁵), and semi-structured. In a few cases (n=4), they were conducted in pairs due to convenience or at participants’ request. Interviews lasted between 10 and 80 minutes, with a mean of around 45

⁵ Interviews were not recorded if participants expressed that they would prefer this or when recording equipment failed. In these cases notes were taken.

minutes. The shorter interviews included those that were conducted with busy healthcare professionals in their respective work settings, which meant that in some cases interviewees were called away to attend to a patient.

I developed the interview guide based on my literature review and theoretical underpinnings (Chapters 2 and 4). It focused on general views on implementation strategy, system and use; and included between five and 28 questions (see Appendix 6). The number of questions asked varied between participants as some were not applicable to certain professional groups. Also, in the beginning of data collection, I tended to ask more questions surrounding context, which attenuated over time as I was getting more familiar with the respective contexts.

My central concern was the identification of challenges to the implementation and adoption of Lorenzo with a focus on changes to user work practices. In asking questions, I used the interview guide as an aid to structure the conversation (see Appendix 6), whilst responding to new issues and those pertinent to a particular interviewee/context as appropriate. I increasingly moved towards free interaction with interviewees as I became more familiar with the topic, keeping in mind that this interaction had a specific purpose guided by the issues I needed to cover.

In order to develop a suitably rounded understanding of the most pertinent issues, both negative and positive views from all key stakeholders were actively sought. I employed a non-directive style of asking questions as well as reflecting and probing to facilitate disclosure. Questions were open-ended and I kept field notes and a research journal outlining personal ideas and conceptions in order to make the research process as transparent and reflexive as possible. Emerging ideas were fed back and discussed in monthly meetings with my supervisors as well as periodically with the wider research team of the larger evaluation study.⁽³³⁾ Participants were encouraged to raise any issues important to them which had not been addressed in the interview guide.

A longitudinal dimension incorporated in interviews helped me to capture the temporal dimension of stakeholders' experiences and process changes over time.(175) This deeper understanding would be difficult to achieve looking at snapshots of a large range of different organisations adopting the software. It is particularly important when considering the implementation of Lorenzo software, which is taking place over long timescales and in the context of a rapidly changing NHS and political landscape.

Therefore, where possible, I conducted interviews at two different time points. Across Trusts, the second round of interviews took place once the use of the system was more established, with increased functionality and/or an expanded user base.

More specifically, within Trusts the two data collection points included the following:

- Site B (the acute Trust): shortly after the Trust went live with R1⁶ on one ward (Time 1, T1, February 2009 - October 2009) and when the Trust had implemented Release 1.9 (R1.9)⁷ functionality across the Trust, approximately a year later (Time 2, T2, September 2010 – November 2010).
- Site H (the community Trust): approximately a year after the Trust went live with R1⁸ with half of the podiatry service (T1, July 2009 – February 2010) and shortly after the Trust had rolled out the functionality to the whole service, approximately six months later (T2, June 2010 – July 2010).
- Site Q (the mental health Trust): approximately three months after the Trust went live with R1⁹ (T1, December 2009 – February 2010) and approximately six months later (T2, August 2010 – November 2010), the time after which a certain embedding of the software was assumed to have taken place.(176;177)

⁶ R1 included requests and results functionality (e.g. electronic requesting of radiology results) and recording of allergies. For more details in relation to functionality of different releases please refer to Chapter 1.

⁷ R1.9 included the replacement of the Patient Administration System iPM. For more details in relation to functionality of different releases please refer to Chapter 1.

⁸ R1 included clinical documentation functionality. For more details in relation to functionality of different releases please refer to Chapter 1.

⁹ R1 included clinical documentation functionality. For more details in relation to functionality of different releases please refer to Chapter 1.

As part of this longitudinal data collection, I attempted to conduct serial interviews with the same individuals in order to see whether any of their perceptions/perspectives changed as Lorenzo became more established and increasing functionality became available. However, not all interviewees were willing to be interviewed again due to busy work schedules. Others were difficult to get hold of or had left the organisation. Therefore, some additional stakeholders, who I had not spoken to during T1 were also interviewed. This helped me to understand the perspectives of those who were later users of the system with increased functionality and often shorter implementation timelines. Throughout, I made an active effort to obtain both positive and negative perspectives, searching for disconfirming data.

Some participants, mainly local key gatekeepers, were interviewed more than twice as emerging data were fed back to them periodically and their feedback guided subsequent data collection. Overall, interviews conducted at T2 tended to be shorter than those conducted at T1, possibly due to a deeper understanding of contextual issues on my part.

5.3.1.2 Participants

Interview data were obtained from healthcare staff within the three Trusts (consisting of implementation team members and Lorenzo users), and additional stakeholders from outside the Trusts (including a mixture of governmental, commercial and independent stakeholders).

Implementation team members interviewed consisted of a mixture of Clinical IT Leads, IT Managers (both internal and sub-contracted), and Training Professionals. Users included Ward Managers, Consultants, Nurses (both junior and senior), Ward Clerks, Administrative Staff, Pharmacists, Allied Health Professionals and Junior Doctors.

More detailed participant information is provided in Chapter 7.

5.3.2 Observations

Whilst interviews are well suited to provide an insight into individual meanings of experiences, observations can help to illuminate information flow and informal work patterns, relationships between participants and context, social interactions, and relationships between individuals.(106;124;178;179) They are therefore commonly used to complement interviews for purposes of triangulation.

I employed an element of observation to investigate how context and individual perspectives (from interviews) aligned. In doing so, observational transcribed data were used to inform the rest of my analysis, and to contribute to a deeper understanding of the sociotechnical processes involved.

It is important to keep in mind that observations may be both “formal” and “informal”. This section will describe formal observational activity, whilst informal observational activity, captured in the form of field notes, will be discussed in Section 5.3.3 below.

5.3.2.1 Data generation

I employed a mixture of object/activity/person-oriented observations at the three Trusts with on-site questioning, where appropriate and convenient.(180-182) The concept of “following the thing” (i.e. Lorenzo) and its various associations with different settings helped to define the ethnographic space, as I was literally following the computer and related activities throughout my observational activity. In some instances, I also followed a particular individual or activity (context of use) whilst taking notes.

An observation recording sheet can be viewed in Appendix 7, but again this is intended for guidance only as notes depended heavily on the setting and local practicalities. My initial focus was on observing the natural occurrence of activities, whilst at the later stages of observations (when participants felt more comfortable), I tended to ask some probing questions for clarification of activities and/or functionality.

The length of formal observations depended heavily on the cooperation of Ward Managers/Service Leads and the willingness of individual users to be observed. The presence of gatekeepers coupled with a highly politically charged environment (discussed in more detail in Chapter 1 and 7), meant that data collection was somewhat opportunistic depending on opportunities arising locally.

I was likely to influence participants' behaviour to some extent during my observations, but I did take care not to interfere with the natural workflow (see Glossary) of activities. This was achieved through "keeping out of the way", often spending time in corners, and only speaking to individuals when they initiated conversations.

As observations were even more reliant on cooperation and access of a range of participants, these were not conducted at two distinct time points during the implementation. Although this was attempted it was not practically feasible as these sessions often took a long time to arrange.

5.3.2.2 Participants

The majority of observational data were obtained from observing healthcare professionals using Lorenzo. These included consultants, allied healthcare professionals, and administrative staff.

5.3.3 Documentary data, field notes and other material

Documents can be a valuable source of data in a range of contexts (e.g. legal or historical), and particularly in researching policy implementations.⁽¹⁸³⁾ Advantages are that they are easy to collect and can provide insights into perspectives that are otherwise difficult to access. They are also neither intrusive to collect, nor subject to researcher bias and take little time commitment from participants¹⁰.^(183;184) May helpfully classifies documents into those from primary and secondary sources.⁽¹⁸⁵⁾ The former

¹⁰ Although documents may not be as prone to researcher bias as other qualitative data collection methods are, there may still be some degree of researcher bias in the way they are selected and analysed. Similarly, retrieving documents may require participants' time.

are those that are collected by individuals who were at the event (e.g. me noting down field notes), whilst the latter are written by outsiders and typically for other purposes (e.g. policy documents).

5.3.3.1 Secondary documents

For this particular study, most documents were treated as “secondary data sources” i.e. they were not developed for the purposes of my research but for some other purpose.(184) Research aims can help to determine how documents as secondary data sources are selected, although issues surrounding authenticity (are they genuine?), credibility (are they free from errors?), availability (are they accessible to the researcher?), meaningfulness (do they make sense?), and representativeness (are they typical and do they represent what one is looking for?), need to be kept in mind.(184-186) My focus was on the Trusts, drawing on multi-sited ethnography as appropriate (see Chapter 4). I was therefore interested in obtaining documents that were about Lorenzo and the Trusts from a range of different sources.

Documents were collected in order to gain an insight into governmental plans and media perspectives (as these were often difficult to access in any other way), to gain an overview of local and national implementation activities, and in order to make better sense of other data by helping to place them into context.(187) As such, documents were mainly used as a complementary data source and to aid understanding of interviewees’ perspectives. Context was particularly important in my study as the field is littered with jargon and interviewees often assumed understanding on my part, which was not necessarily the case at the time of interviews and observations.

Trusts documents consisted mainly of descriptions of situations and concepts (e.g. product descriptions); plans of action (e.g. the Project Initiation Document, PID, see Glossary); overviews of organisational structures and processes; and monitoring of progress (e.g. Lessons Learned Reports). In addition, I collected overarching documents

related to Lorenzo, published by governmental bodies such as NHS CFH and LSPs, as well as publicly available press documents.

More specifically, as far as I was able to be selective, my main selection criteria for documents included the following:¹¹

- Those that provided context relating to the capabilities of the software
- Those that provided context to the implementation strategy and anticipated benefits, both locally and nationally
- Those that provided information on the organisational context, history and progress of implementation
- Those that provided insights into the perspectives of stakeholder groups that were difficult to reach with other data collection methods
- Those that related to lessons learned and anticipated challenges of the implementation of Lorenzo from a variety of viewpoints.

Collection of documentary data was opportunistic, dependent on the willingness of the source to share often sensitive information (as in the case of Trust and unpublished documents from NHS CFH and the LSP), and selective (as in the case of press documents and publicly available reports from NHS CFH). Common to all was, however, their intimate relationship with the National Programme and specifically Lorenzo software.

5.3.3.2 Primary documents

I also analysed primary documents drafted specifically for my study. I captured my ongoing involvement, developing relationships with participants, and emerging analytical thoughts in field notes. These also captured informal observations, which involved me jotting down impressions throughout data collection and feedback sessions as well as during conferences. For example, Winthereik and colleagues describe how

¹¹ Please note that publicly available and more general (i.e. non-Lorenzo specific) documents relating to the conception of the Programme were not subjected to detailed analysis but are discussed in Chapters 1, 6, 7 and 8.

resistance to become involved in certain activities (including research) and difficulties in gaining access to participants are an essential part of the data.(188) I kept my field notes in line with these considerations.

The process of drafting and analysing field notes helped to gain an insight into the wider context of the individual cases, how different spatially disconnected actors were related and brought together through the technology (e.g. the implementation team and users), as well as the general set-up of the Trust and related bodies.

5.4 Data analysis

Having described the procedures employed in my study, I will now move on to describe my analysis. Interviews were transcribed by a professional transcriber verbatim using the following notations:

Words Speech particles (er, um etc.)

Inserted by me for explanation []

Untranscribable as difficult to hear (xxx)

Once interviews were returned by the transcriber, I went through each transcript to check for accuracy, to anonymise places and names of people mentioned, and to insert comments for clarification if necessary. This was done by listening to the audio files whilst amending the transcript.

Observations were not transcribed verbatim, but extensive notes, including participant quotations and drawings, were taken by me and subsequently converted to Microsoft Word format.

In line with my methodological framework (Chapter 4), analysis was interpretative and informed by hermeneutics. Broad themes and sub-themes were identified employing thematic analysis and drawing on my understanding of the literature (Chapter 2). Coding

took place simultaneously to collecting the data in order to feed emerging issues back into subsequent data collection activities.

It is important to keep in mind that the inevitably interpretative process involved in this type of analysis is somewhat dependent on my own background and characteristics as a researcher (further discussed below). I hope that through careful attention to detail in outlining the methods employed, the results obtained, and the explanations reached, the research process will become more traceable and transparent.

Analysis was time consuming and the large volume of different types of data meant that answering the research questions needed to be kept in constant focus. The large amount of data collected also meant that to some extent I had to be selective in terms of which instances deserved more thorough analysis than others.(189)

The detailed analytical steps employed are outlined in the subsequent paragraphs.

5.4.1 Analytical steps

Analysis was informed by the approach outlined by Miles and Huberman,(190) and also drew on some analytic concepts discussed by Mason including cross-sectional and non cross-sectional indexing (i.e. examining common as well as specific themes), and the use of diagrams.(187)

The authors describe qualitative data analysis techniques more generally, drawing on considerations from different approaches, and not in the context of strict epistemological and ontological positions. This way of analysis tends to be more flexible than more structured techniques such as for example the Framework approach,(191) which can be restrictive and may lead to focusing on specific aspects whilst neglecting others. This is particularly important when considering the complex and constantly changing implementation environment of Lorenzo.

Miles and Huberman propose that analysis should involve the following steps, which are applied to my study in the following sections below:

- Developing a coding framework
- Coding the data
- Examining coded data in more detail
- Description of coded data
- Explanation of coded data and drawing conclusions.

The use of matrices facilitated the analytical process and also helped to integrate different sources of data and different temporal dimensions.

5.4.1.1 Developing a coding framework

The first step in the analysis involved developing an overall coding framework based on categories and sub-categories identified in the literature review (see Chapter 2). This involved creating definitions as to what each category included.(187)

Categories and sub-categories were defined as follows:

- History and context (including the background of the participant and the setting)
- Technical dimension (including usability, performance and integration, adaptability and flexibility, cost)
- Human and social dimension (including attitudes, motivations, resistance and expectations, engagement and user input in design, training and support, champions, integration with existing work practices)
- Organisational dimension (including getting the organisation ready for change, planning, leadership and management, teamwork and communication, learning and evaluation, realistic expectations)
- Macro-environmental dimension (including other healthcare organisations, industry, policy, professional groups, independent bodies and the wider economic environment)

Limitations of this approach include the danger of having categories that are too loosely defined, certain text fitting into more than one category, the subjective organisation of the framework, its limited explanatory power, and a limited ability to represent complex processes and interrelationships.(187) Developing a coding framework necessitated certain assumptions that shaped the way data were treated, but this initial deductive approach was necessary in order to facilitate indexing (i.e. dropping relevant parts of data in categories), develop structure, delineate the focus of my analytical activity and facilitate retrievability in light of the wealth of data collected.

However, in light of the limitations of this approach, I also paid careful attention to allowing additional themes/sub-themes to emerge that were not necessarily present in the pre-established coding framework. This constituted the inductive part of my analysis and involved examining different data through different lenses (e.g. from different stakeholder viewpoints, looking for potential alternative explanations), focusing on the uniqueness of parts of data, and investigating processes that were too complex to be captured by the coding framework.(187)

My approach to analysis therefore consisted of a mixture of deductive and inductive approaches.(187) This helped me to focus data collection (around answering the research questions, and not getting overwhelmed by the volume of data); whilst being open to emerging issues in the data. Throughout my analysis, I further constantly revised the coding framework in light of emerging themes from the data.

5.4.1.2 Coding the data

Coding the data was essentially a process of organising, by uploading relevant transcripts, notes and documents into NVivo8 and indexing these against both pre-established and emerging categories.(192) In doing so, I paid careful attention to keeping an open mind to both confirming and disconfirming evidence of established themes and sub-themes.

Data from all sources and data collection times were initially coded in the same framework, which helped integration and retrieval of data, allowing for easier comparison across the dimensions of interest. Please refer to Section 5.4.1.1 above, and Appendices 8 and 9 for a more detailed description of the coding framework.

5.4.1.3 Examining coded data in more detail

Miles and Huberman describe several early analytic techniques that can be applied when examining coded data in more detail.(190) The techniques I have drawn on are summarised below.

Firstly, I employed “pattern coding”. This involved grouping items in codes identified in the coding framework into smaller chunks or sub-categories that reflected different recurring patterns in the data (this is also recommended by Stake (189)). The process was characterised by flexibility, with emerging sub-categories being checked in subsequent data collection activities. Patterns were selected based on frequency of occurrence and significance.

Secondly, I drafted “memos”. These are analytical ideas about emerging general and conceptual issues often linking together different codes identified throughout the research. They were noted in NVivo8, my field journal and separate word processing files designated for capturing emerging overarching ideas and developments over time. I also captured issues that I was unclear about and found puzzling in this way.

Thirdly, I and my supervisors held “case analysis meetings” throughout my study. These consisted of discussing emerging findings. In line with suggestions from Miles and Huberman, the main issues discussed during these meetings included: emerging themes, potential explanations and hypotheses, alternative explanations, implications for subsequent data collection, and implications for updating of the coding framework.

Lastly, I created “interim case summaries” consisting of findings from each Trust in order to determine what issues needed further investigation. In line with recommendations from Miles and Huberman, this involved a description of the case (the setting and organisational characteristics), a description of activities (relating to the implementation), and an outline of emerging issues and potential relationships. These case summaries informed further data collection and lead to additional refinement of codes.

5.4.1.4 Description of coded data

Data from different cases was coded in the same coding framework, but initially analysed separately by using the “query” function in NVivo8 to extract case-specific data. This helped to gain an insight into the processes, complexities and local differences, as well as changes over time within different Trusts.

Emerging issues for each Trust were then entered in a tabular format recording key developments at T1 and T2 along the dimensions identified in the coding framework. This process helped me to gain an overview of the most pertinent issues (as expressed in summary statements in the tables), facilitated comparison, and helped me to pull together data from disparate sources. I followed a similar process in relation to cross-case comparisons. Here, summary statements along the identified dimensions were recorded for each Trust and then compared across Trusts.

Throughout this process, I took care not to take individual sources at face value whilst trying to understand the circumstances under which the data were produced. Each of the sources tended to have a different perspective on the situation at hand, which was often particularly evident in documentary data as these were produced for specific purposes and for specific audiences.

5.4.1.5 Explanation of coded data and drawing conclusions

I then examined emerging issues in more detail (see Appendices 8 and 9). This involved recording potential causes for changes over time, tensions and underlying issues, ways in which effects may have been produced, and exploration of links between emerging themes.

Examining sources in relevant codes included either looking for complementary contextual data (providing context to give an insight into the situation at hand), confirmatory data (confirming certain theoretical explanations developed from other sources), and disconfirming data (those that did not fit with developed theoretical explanations). Disconfirming data and inconsistencies between data sources were examined in most detail. These were initially captured in memos and field notes, which helped to reveal tensions and temporal relationships. Studying inconsistencies helped to refine my emerging theoretical explanations and helped me to appreciate the complexities of each individual instance. I also paid particular attention to how different dimensions were related and how changes in one affected the other.

Examining differences between the first and the second phase of data collection was an important component of the analysis and helped me to trace how individuals and organisations adapted to the new system, how attitudes changed, and how the overall implementation developed. I therefore investigated any discrepancies between the different time points in most detail, in trying to disentangle how individuals and organisations had moved from one state to the other.

Overall analytic themes were then selected on the basis of frequency (i.e. how often they occurred), similarities/differences (i.e. clustering themes that had common or uncommon characteristics), and significance (i.e. to what extent they were judged to be related to other emerging issues). Exploring relationships and integration with theory was central to this process, whilst I also recorded how I made choices and reached explanations. Practically, I tested emerging themes against the data by making “if-then

tests”.(190;191) This was visually facilitated by drawing diagrams of relationships between various stakeholders informed by ANT (see Appendix 8).

Analysis within a multiple-case study design is important for the transferability of findings as well as for progressing to a deeper level of explanation and greater appreciation of contextual factors (see Chapter 4).(190) In cross-case comparisons, I therefore examined variations in each case and the relationship between different causes, effects and outcomes.(190) This involved comparing devised explanations from the first/second case with data from the third case and checking if they still applied or needed to be revised.(187) Emerging similarities and differences between cases can provide important theoretical insights and were therefore given particular attention in the analysis stage. Whilst common themes across cases were examined as they were all coded with the help of the overall coding framework, I was careful to preserve “case dynamics” in individual Trusts reflecting local contingencies.(190)

I then integrated my findings with wider multi-sited ethnographic sources (e.g. interviews with wider stakeholder groups, broader policy documents and field notes from conferences), in order to provide context to the case studies and obtain a more comprehensive picture of the implementation landscape.

In line with my interpretivist stance informed by hermeneutics, my analysis focused on examining how participants interpreted the situation (as recorded in the transcripts) and how these different viewpoints integrated to produce the observed effects. Similarly, documents were viewed as socially constructed entities reflecting the social and political context in which they were produced.(185;186) This involved examining the relationships between authors and readers including intended effects, and integration with my own reading (a reflexive process).(185;186;193)

However, reflexivity not only characterised my analysis efforts in relation to analysing documents. I attempted to make my position as explicit as possible throughout my work,

which is why I will now move on to outlining my role as a researcher and potential consequences for my research.

5.5 My role as a researcher

Central to the notion of reflexivity is an awareness of the circumstances under which the research is conducted. This involves a constant questioning of one's own assumptions so that the way data are collected and conclusions are reached becomes transparent.(194-197)

I was a 28/29-year-old female researcher with a background in psychology. I often explicitly referred to this background in interviews, as I felt it might have made participants more relaxed that I “had no idea” about either healthcare professional work practices or computers; although it may have intimidated others. I was also closely associated with the larger evaluation project as the part-time project coordinator,(33) which may have given me some more credibility with the senior staff. I had previous knowledge of the area and some qualitative research experience.

Participants were most likely to perceive me as a ‘stranger’ or an ‘acquaintance’ with little shared experiences.(194;198-200) I therefore attempted balancing rapport whilst still keeping a certain amount of distance as I felt that this was most appropriate.(201) I was also likely to be perceived as an academic, a young married woman (my “brought self”) and as an observer or interviewer (my “situationally created self”).(202)

Throughout my study, I reflected on the effect I may have had on data collection and analysis and captured this in field notes. For example, humans use “typificatory schemes” to make sense of the world and so do researchers in relation to approaching participants, collecting data, analysing and writing up.(203) I did have stereotypes of the “arrogant consultant” and the “hard working nurse” – a constant questioning of these was therefore important. I also considered the impact of my ontological, epistemological, methodological and analytical assumptions on my work.(196;204;205)

The way I approached the setting and the data was influenced by my background, my supervisors, my funders and the University as a whole. Capturing this involved acknowledging that I was entering the situation with a certain amount of “baggage” including pre-conceptions and my own experiences. This most likely affected both the conduct and the analysis of data.(200;204)

Several authors have outlined the importance of reflecting on researcher emotions as this can influence the way data are produced.(194;206-208) I experienced anxiety especially when interviewing individuals in high positions and when under time pressure. Similar issues to consider here included my mood on the day, the impact of sympathy (liking or disliking participants) and whether I felt comfortable during the interview or observation.(206) These feelings during the research process were therefore captured in field notes.(199)

The positioning of bodies in my study was also important, and again captured in field notes paying attention to both my own and participants’ body language.(209) Similarly, notes were kept of what participants said both “on and off the record” with careful attention how these accounts differed and recognising existing hierarchies.(196;210)

I also reflected on the fact that I was paradoxically using technology in my own work (e.g. NVivo, telephone) to investigate the consequences of technology for healthcare professionals’ work practices. This seemed slightly counter-intuitive as it was likely to impact on the way I collected and analysed data, shaping the way particular activities were carried out. It might be argued that, for example, software to facilitate coding inhibits the expression of the naturally “messy” nature of qualitative data. Similarly, using a telephone may inhibit the natural face-to-face production of verbal data. Recognising these complexities was important, but there were also clear practical reasons for drawing on these technologies.

5.6 Ethical considerations

Whilst considering my own role, I also reflected on ethical aspects of my research and the associated responsibility of collecting data from human participants.(200) Applying for ethical approval further sensitised me to arising ethical issues, by helping to reflect on why and exactly how I planned to carry out research activities.

In line with my interpretivist stance I felt that, most importantly, it was my responsibility to ensure that my findings reflected participants' voices.(194;197;204;211) I was aware that participants often placed a great deal of trust in me, for example when disclosing potentially sensitive information (such as criticisms of commercial companies or management).(196;199) It was my ethical responsibility not to abuse this trust.(212)

I also considered how to position myself in relation to viewpoints and opinions expressed by participants, and to what extent to voice these as a researcher.(200;212) I attempted to address this by trying to understand different positions taking into account a variety of circumstances and backgrounds.(200;207;212)

I was also aware of the debate surrounding ethical absolutist (universal ethical rules) and situational relativist views.(194;212) Personally, I adopted a situational relativist position that takes account of the circumstances when making ethical decisions. I therefore attempted to rely on my common sense, subjective judgment and my moral belief system throughout the conduct of my work.(199)

5.6.1 Consent

An important part surrounding ethical considerations is ensuring that participants are sufficiently informed about the study and on this basis consent to participating. Interviews and observations were voluntary in nature and conducted at times convenient for participants. Individuals were provided with information sheets and asked to sign consent forms before data collection commenced (see Appendices 3 and 4). The information sheet explained the rationale of my study in lay-terms, outlined what

participation would involve and that data would be treated in the strictest confidence. It also provided participants with contact details of my supervisors and an independent researcher with knowledge of my study.

Interviews and observations began with an informal chat to make participants comfortable (“Hello, how are you...?”). I also repeated the aims of my study, reminded participants that they could withdraw at any time and that they could withhold information they did not wish to disclose. I answered any arising questions and reiterated that interviews were audio-taped. If participants were not comfortable with the audio-taping, I took notes instead. They were also asked if they wished to see transcripts, which was, however, only requested by one individual.

During this process, I considered that consent may not always be truly informed, as participants may not have strictly understood what my research involved.(194;212) I attempted to address this by being as explicit as possible in relation to my aims and what I planned to do with the data obtained. In addition, when considering observations, I may have observed patients or other healthcare staff who have not given explicit informed consent to be observed. I dealt with this by not noting anything about these individuals. There were no instances during my work where participants indicated that they did not wish to be observed.

5.6.2 Confidentiality and anonymity

As part of the broader ethical debate, it is also important to consider the protection of participants’ anonymity. In doing so, I treated recorded and transcribed data as well as notes from observations in the strictest confidence, anonymising each item by assigning participants and Trusts a number or letter. Recorded data were sent via secure university email for transcription or given to the transcriber in person. Recorded and transcribed data were kept in a secure place (a locked password-protected computer in a locked office at the University of Edinburgh and on my home computer).

As case studies often contain a large amount of detail, anonymisation is an issue resulting in Trusts being potentially identifiable, especially to those with “insider knowledge”. However, there is also a trade-off between anonymising contextual data and helping the reader to understand local dynamics. Whilst I made every effort to anonymise cases and participants, I therefore also acknowledge that those with insider knowledge are more likely to be able to identify locations and/or individuals. In order to reduce this risk, specific job titles of individuals, such as “the Chief Executive” for example, were removed and replaced with more generic descriptors such as “Manager”.

5.7 Quality in my research

Although it has been argued that scientific criteria for rigour in quantitative research (such as validity and reliability) cannot be directly applied to qualitative research, several methods to ensure quality in qualitative research have been outlined in the literature. For example, Lincoln and Guba propose “trustworthiness criteria” including credibility (whether methods are appropriate to answer the research questions), transferability (whether the findings can be transferred to other contexts), dependability (whether they can be repeated), and confirmability (to what extent the researcher has shaped the study findings).(172) Methods employed to ensure rigour and quality in my study will be discussed in the subsequent paragraphs.

Many have advocated the use of triangulation as a means of increasing credibility of a study.(170;172;187;189;213) The underlying assumption is that different ways of data collection, approaching the same issue from a variety of angles, should lead to similar conclusions resulting in a more holistic picture than could have been obtained relying solely on one method of data collection. It follows that triangulation can help to judge whether an observation is valid. If contradicting evidence is found by drawing on different methods, the interpretations may need to be revised accordingly. A common way to achieve this is data source triangulation, which I also used in my study. Here, different types of data are collected in different contexts (e.g. including interviews, observations and documents). Whilst data sources can complement each other to result

in a more comprehensive picture, triangulation can also help to address weaknesses of each individual data collection method. For example, observations can help to gain an insight into more informal work practices, whilst interviews are well suited to access participants' meanings constructed on the basis of experiences.

Another way to increase quality in qualitative research is respondent validation, sometimes called member checking.(170;172;187;189;190;213) This involves participants helping to verify and/or revise emerging conclusions reached. I employed this strategy by feeding back emerging findings to both implementation team members and service leads periodically throughout my data collection period. I do, however acknowledge that this type of respondent validation represented a particular viewpoint – in this case, that of managers rather than users of the software. This was to some extent addressed by discussing emerging findings periodically with my two PhD supervisors.(172) This “fresh” perspective (of a doctor and a nurse by background) helped me to refine my analysis and explore the data from different angles. It also helped me to keep focused on my overall study aims.

The use of theoretical sampling is also often advocated.(213;214) As discussed above, sampling was informed by my theoretical perspective (e.g. ANT, multi-sited ethnography, see Chapter 4), with my research questions in constant focus. This meant that participants and Trusts were initially sampled in line with their relationship to Lorenzo. It also involved drawing on a range of perspectives in order to ensure that many viewpoints were represented.(170) At the later stages, I focused on sampling deviant (or negative) cases in order to investigate whether a theoretical proposition either applied or needed to be modified in light of these.(170-172) Practically, I approached this by applying rival explanations and testing whether these explained the data better, ensuring that findings did not occur due to chance, searching for evidence that refuted explanations, and by following up unexpected findings.(190)

Transparency throughout the research is also often advocated as a method to help the reader ascertain the quality of a study.(170-172;187;190;213;214) In relation to method, this may entail a detailed description of the steps involved in collecting data, reasons for particular choices of methods and sampling strategies, and the involvement of the researcher. In relation to analysis, transparency means seeking potential alternative explanations and being explicit about how interpretations and conclusions were reached. This then allows the reader to assess whether conclusions make sense and how they emerged from the data. Lincoln and Guba refer to “thick descriptions” in this context. These can emerge from the researcher’s “prolonged engagement” with the subject of study and include detailed accounts of how the research was conducted, the context, and researcher involvement throughout the process.(172) I made a conscious attempt to address these issues by outlining steps involved in data collection and analysis in detail, whilst critically reflecting on my own position (as discussed in Section 5.5 above).

With this in mind, there is, however, also a need to be pragmatic. For example, Barbour cautions that such methods to ensure quality need to be applied sensibly.(213) I attempted to address this by approaching data collection and analysis in a pragmatic rather than prescriptive way, whilst keeping an awareness of quality issues. This would, for example, be the case where my common sense (or discretion) indicated that participants were too busy to conduct an extensive amount of member checking as their primary concern was the implementation at hand. In these cases, I deliberately tried not to irritate individuals with repeated phone calls and emails.

5.8 Transferability

Transferability is the qualitative equivalent to notions of generalisability and external validity often employed in quantitative research. It involves assessing the extent to which research findings may be transferable to other settings.(170;214) Critics of qualitative, and particularly case study research have, however argued that is difficult to generalise from such studies and apply findings to other contexts.(187;215)

In attempting to address these concerns, Flyvbjerg,(167) outlines that the ability to generalise from a case study depends on how it is sampled. Cases can be selected on the basis of being either typical or atypical. If the case is a typical (or critical, as in my study), one is able to generalise to other cases on the basis of developing detailed theory and then testing if it applies (theoretical generalisation). This can then help to either confirm or refute developed theory (i.e. concluding that something found in one case also applies to other cases means that it is likely to be generalisable).(167) If the developed theory does not apply to other cases or does not sufficiently explain the observed processes, then it needs to be modified.(167) Sampling atypical, or deviant cases, on the other hand, can help to suggest causes for certain phenomena and help to test out emerging explanations.(167) It follows that although single case studies can help to confirm, refute or develop previously made propositions, multiple comparative case studies are more powerful in relation to transferability.(189)

5.9 Chapter summary

This chapter has built on my literature review and my theoretical approach (Chapters 2 and 4), by applying these and giving a detailed description of the methods employed. My methodological focus was on examining sociotechnical processes of change by investigating the views and experiences of users and the consequences of Lorenzo for their work practices within wider organisational and macro-environmental contexts.

I began with outlining approaches to sampling Trusts (the cases or organisational contexts), multi-sited ethnography informants (the macro-environmental context) and individual participants (the micro-context). A range of qualitative data was obtained from these including semi-structured interviews, observations, documents and field notes. When outlining my approach to data collection and thematic analysis, I attempted to be as transparent as possible, carefully justifying decisions made throughout the process. I then moved to deliberations surrounding consent, confidentiality, ethics and reflexivity, which have shaped my approach. The concluding paragraphs have outlined how I tackled issues surrounding quality and transferability.

The findings resulting from my data collection and analytical activities described here will be outlined in the following chapters. In doing so, I will initially describe case-specific findings and sociotechnical processes of change locally (Chapter 6), before moving on to cross-case comparisons and integration with data obtained from informants outside the immediate Trust environment (Chapter 7).

Chapter 6: Findings from individual case studies

6.1 Introduction

This chapter will report on the findings that have emerged from the data collection and analysis strategies in individual case studies outlined in Chapter 5. My overall aim was to explore the views and experiences of users as well as organisational consequences of introducing Lorenzo and how these evolved over time in the complex environment of a national EHR implementation.

I will begin by summarising the overall data collected across cases and then move to presenting each case study separately, detailing data obtained and theoretical insights gained locally as I go along. I chose this format in order to reflect local dynamics as each case study represented a distinct story. Cross-case comparisons and integration with multi-sited ethnography sources will follow in Chapter 7.

6.1.1 Summary of overall data gathered in case studies

I gathered data from three Trusts with the following characteristics (Table 6.1):

Table 6.1: Characteristics of recruited Trusts

Site	Type of hospital	Foundation status (indicating the level of autonomy)	Location	Number of beds	Approximate annual turnover
B	Acute	Foundation (i.e. more autonomous)	Rural	1,021 beds	<£200m
H	Community	Non-Foundation (i.e. less autonomous)	Urban	N/A	>£200m
Q	Mental Health	Foundation (i.e. more autonomous)	Rural	Mostly outpatients but 359 inpatient beds	>£100m

Overall data collected in case studies comprised interview data from a total of 66 different participants, 38.5 hours of non-participant observation, 149 pages of press statements, 31 pages of field notes, and 15 local Trust documents.

I conducted a total of 88 interviews with 66 different participants within the three Trusts between February 2009 and November 2010 (17 with implementation team members and 49 with Lorenzo users). A total of 41 interviews (with 27 different participants) were carried out in Site B (an acute setting), 26 interviews (with 19 different participants) in Site H (a community setting), and 21 interviews (with 20 different participants) in Site Q (a mental health setting). 16 individuals were interviewed twice, four individuals were interviewed three times, and one individual was interviewed four times. Those interviewed more than twice tended to consist of implementation team

members who were consulted during feedback meetings (as outlined in Chapter 5). Detailed participant information for each case study site is provided in Table 6.2 below.

Table 6.2: Participant information interviews

Interviews at Site B	Interviews at Site H July	Interviews at Site Q
February 2009 - November 2010	2009 - July 2010	December 2009 -November 2010
41 interviews with staff with a total of 27 different interviewees: six operational staff and 21 users	26 interviews with staff with a total of 19 different interviewees: five operational staff and 14 users	21 interviews with staff with a total of 20 different interviewees: six operational staff and 14 users

Observational data amounted to 38.5 hours with accompanying field notes. Observations lasted from 1.5 to 11 hours and were obtained from a total of eight different settings (including clinics, back office use, and strategic meetings between users and implementation team members). Differences in the number of hours spent on observations across Trusts were due to the often conflicting local priorities and the lack of availability of gatekeepers to facilitate my visits. More detailed information on observations in each Trust is provided in Table 6.3.

Table 6.3: Observational data collected at the three Trusts

	Data collected at Site B February 2009 - November 2010	Data collected at Site H July 2009 - July 2010	Data collected at Site Q December 2009 -November 2010
Observations (and associated field notes)	10 hours (including an inpatient surgery setting and an outpatient setting where the software was used)	24 hours (including use of the software healthcare settings and staff meetings)	4.5 hours of staff using the software

As outlined in Chapter 5, I also collected a range of other material, including secondary documents and field journal notes. Secondary documents somewhat varied across Trusts, but essentially included overarching policy documents and product descriptions of Lorenzo, searches of press statements, PIDs, lessons learned reports and business cases. Press statements and overarching documents overlapped to some degree with the multi-sited ethnography informants, but I included them in the case studies due to their often intimate relationship with local developments. Details of both primary and secondary documents are provided in Table 6.4 below.

Table 6.4: Summary of documents collected across Trusts

	Site B	Site H	Site Q	Overarching documents
Notes from recruitment meeting	Yes	Yes	Yes	Lorenzo product description and screenshots
Press statements	eHealth Insider (identified via	eHealth Insider and Computer	eHealth Insider and Computer	Lorenzo Review

Chapter 6: Findings from individual case studies

	a search for “[name of case]”), conducted on the 25th June 2009 and repeated on 4th November 2010 – 77 pages altogether.	Weekly (identified via a search for “[name of case]”), conducted in January 2010 and repeated in October 2010 – 60 pages altogether	Weekly (identified via a search for “[name of case]”), conducted on 22nd February 2010 and repeated on 4th November 2010 – 12 pages altogether	Recommendations by NHS CFH, February 2009 Integrated Care Records Service Approval to Proceed (see Glossary) NME by the DH Publicly available
Trust documents	Deployment History Timeline, PID, Electronic Patient Record Next Stage Business Case	PID, two Project Status Reports, several sets of minutes from Lorenzo Steering Group and associated meetings, Interim Evaluation Report	PID, two Deployment Verification Reports, Lessons Learned Report	policy documents cited throughout this study
Researcher field journal	12 pages	5 pages	14 pages	

6.1.2 Individual case studies

Having outlined data collected across Trusts, I will now present my three detailed case studies. Each case study has a similar structure, beginning with an introduction and overview (including a summary of data collected locally), before moving on to describe the individual setting and implementation context. Sociotechnical processes of change in each Trust are then explored and each case study concludes with a summary of potentially transferable theoretical contributions.

Throughout this chapter, common dimensions between case study sites have naturally emerged, particularly in relation to technological and macro-environmental factors. I will explore these in more detail in Chapter 7, and have here focused on discussing the different dynamics in each site. Where similarities occur, I have cross-referenced between relevant sections.

6.2 “We call it Lorenzo”- case study of Site B

6.2.1 Introduction

This case study describes my findings relating to the introduction of Lorenzo R1 and R1.9 in Site B, one of the first acute Trusts to implement Lorenzo as part of the National Programme through the LSP route. Please refer to Chapter 1 for a detailed description of the different releases. Data collection took place between February 2009 and November 2010 and consisted of interviews with a total of 27 different Trust staff including users and implementation team members, as well as Trust and press documents. Detailed methods were described in Chapter 5, but a summary of data collected locally can be viewed in Box 6.1 below.

Box 6.1: Summary of data collected at Site B

- 41 interviews with hospital staff with a total of 27 different interviewees: six operational staff and 21 users
- 10 hours of observations and associated field notes including an inpatient surgery setting and an outpatient setting where the software was used
- Researcher notes from the recruitment meeting
- 77 pages from press searches
- Trust documents including: Deployment History Timeline, PID, Electronic Patient Record Next Stage Business Case
- 12 pages of researcher field journal

I will discuss emerging issues and tensions in the following paragraphs. Section 6.2.2 will set the scene of the implementation, briefly describing the organisation itself and its role in the National Programme. My analysis resulted in five over-arching themes, which I will discuss in detail in Section 6.2.3. How these themes have emerged from the data was outlined in Chapter 5. Section 6.2.4 concludes with a summary of potentially transferable theoretical contributions and the remainder briefly touches on the state of affairs at the time I completed my data collection.

6.2.2 History and context of Site B

6.2.2.1 The profile of the Trust

The Trust was founded in the late 1990s and received Foundation status in 2010. Inpatient care was provided from three main hospital sites with a total of 1,021 beds, whilst outpatient care consisted of clinical support in GP surgeries, community facilities and satellite clinics.

Services were delivered to a rural and disparate community of around 363,000 people covering an area of approximately 1,000 square miles. The healthcare organisations themselves were scattered with over 50 miles between some.

The Trust employed around 5,000 staff and had a turnover of approximately £231m in 2008/09. It was part of a grouping covering the NME area of England.

6.2.2.2 Site B, the National Programme and Lorenzo software

One Site B hospital was the first English hospital to pilot Lorenzo software. It started implementing R1 as a “soft-landing” (as discussed in Chapter 1, also see Glossary), initially running limited new functionality in parallel with paper processes. Implementation began in one surgical ward at the end of October 2008 after a series of missed deadlines (it was originally planned to be June 2008). This was followed by go-live at another surgical ward at the end of April 2009 and an orthopaedic ward in June 2009.

Lorenzo R1 at Site B comprised Requests and Results (R&R, see Glossary) functionality including radiology, endoscopy, pathology and clinical documentation (CDC, see Glossary). The functionality was not Spine-compliant (i.e. connected to the national database that held demographic details) and was mainly used by junior doctors and nurses, who could order tests and input allergies in the record.

At T2 interviews, the Trust had moved to using R1.9 which replaced iPM with the Lorenzo PAS in all services except Accident and Emergency (A&E, see Glossary). This was the first implementation of R1.9 in an acute setting ever, a Trust-wide undertaking with a user base of 3,500 staff. Initially, the go-live with R1.9 was planned to take place in March 2010, but it did not happen until June 2010 after a series of missed deadlines and for a variety of reasons discussed below. R1.9 was used in both inpatient and outpatient departments, mainly by administrative staff, to check patient demographics, and view clinic lists and referral letters. Its clinical functionality was limited.

R1 was, at the time of follow-up interviews (T2), still used on a limited number of wards only and had almost the same functionality as at T1 data collection, although it was now also possible to record surgical notes and use these for discharge communications.

The Trust's short-term strategic direction was to “*concentrate on the core system [R1.9] to get that up and running properly before we then go any further*” (Interview, Manager). This meant rolling-out R1 across the Trust after implementing R1.9 and then introducing the more clinical functionalities such as ePrescribing, which had a planned go-live of March 2011 in three wards initially.

A detailed implementation timeline can be viewed in Table 6.5 below.

Table 6.5: Detailed implementation timeline at Site B

Date	Event from Trust documentation and interviews	Planned event from Trust documentation and interviews	Publicly available documents (press statements and policy documents)
2004			National Audit Office: Lorenzo originally due to go-live
1/4/2006	iPM go-live – interim solution supplied by CSC, first large acute deployment with 3500		Replacing an old Siemens PAS with “ <i>big bang</i> ” iPM implementation, connected three hospital Sites for the first time
21/6/2007	PACS go-live replacing radiography films		
April 2008	PID for implementation of wider Lorenzo functionality signed off		

Chapter 6: Findings from individual case studies

	by Trust Board (see Glossary)		
16/6/2008			Site originally due to go-live with R1
Autumn 2008			Site originally due to go-live with Release 2 (R2)
24/10/2008	Lorenzo R1 “soft” go-live, first acute deployment, initially R&R in one surgical ward		A second soft launch planned to take place shortly
14/01/2009	Lorenzo R1 “hard” go-live (all radiology requests were now supposed to be going through Lorenzo)		
18/2/2009	Second ward went live with CDC, R&R and electronic discharge summary	Planning to roll-out R1 across all 55 wards	
June 2009	3 rd ward went live with R1 in an orthopaedic ward		
July 2009			Planned implementation of Release 3 (R3)
November 2009		R2 due to go-live in all three hospitals	
March 2010			Planned implementation of Release 4 (R4)

July 2010	R1.9 go-live across three hospitals		
2012			Earliest date where full benefits from the integrated Lorenzo solution were to be expected
2012		CSC will stop supporting iPM	

6.2.2.3 The Trust's decision to become an EA

Existing IT solutions before Lorenzo and iPM in Site B consisted of a mixture paper and electronic systems. The Trust had decided to move towards a more integrated solution and had been looking into several options in this respect. According to Trust documentation, these included the following:

1. Keep using iPM: This was not viewed as feasible as the system was considered to lack clinical functionality. Also, CSC was to withdraw support for iPM once comparable Lorenzo functionality became available.
2. Take Lorenzo as a standard implementation through the National Programme: Trusts were expected to do this once R3 was fully developed.
3. Become an EA of Lorenzo.
4. Choose software outside of the National Programme and “*go it alone*”.

The non-financial option appraisal, based on risks, benefits and the local business strategy, left the Trust with no clear preferred option. However, on the basis of financial considerations, the Trust decided to become an EA for both R1 and R2 (Option 3). The decisive factor here was the Deployment Incentive Fund (DIF) of £1 million for each organisation that piloted the first version of the software. This meant that the Trust itself expected to pay a comparably small amount of £215k for implementation-related

activities. In addition, the Trust believed that they would get more support from both CSC and NHS CFH, as well as more input into system design, when implementing Lorenzo through the LSP route.

6.2.2.4 The composition of the implementation team and external support

In line with these expectations, the Trust was able to draw on a variety of skilled NHS CFH staff including a Project Manager, a Test and Issues Manager, and a Test Script Manager. There was further a range of CSC staff on site including a Business Change Consultant, a Project Manager, a Reporting Specialist, four Product Specialists, a Data Migration Analyst, an Interface Analyst, two Testing Leads, Trainers and Floorwalkers (see Glossary). In addition, they sub-contracted a Project Manager from an independent provider organisation.

For R1, the Trust's internal implementation team consisted of eight permanent staff, including a Clinical Lead, and an additional 16 temporary staff (initially planned to be there for a period of 12 months). This team comprised a mixture of Technologists and Management Specialists including Project Management, Change Management, Security and Analytical Support, and Business Change Analysts (see Glossary).

Other staff employed over the course of the project included Project Administrators, Cut-over Managers, Trainers, e-Learning Developers, Lorenzo Build Managers, Product Specialists, Business Change Analysts, Test Managers, Issue Managers, Information Analysts, Business Continuity Coordinators, Clinical Analysts, Communications Leads, Configurations Specialists, Application Support Advisors, Data Cleansing Specialists, Service Desk Managers and Operators, Benefits Analysts and Floorwalkers (see Glossary).

The Trust also had a Steering Group and a Change Management Board overseeing the implementation and monitoring progress. Members included the implementation team,

representatives from commissioning, the SHA, NHS CFH, the PCT, CSC, patients and finance.

6.2.3 Sociotechnical processes of change

6.2.3.1 Lack of observable progress with many issues encountered using and implementing the software

Although all interviewees supported the basic vision of “going electronic”, over time there were increasing doubts as to whether Lorenzo was the most appropriate system to achieve this vision. This development seemed to be due to a lack of observable implementation progress and the issues encountered when using and implementing the software locally, particularly in relation to R1.9. Difficulties and challenges were certainly expected by all, but it was the sustained nature of these that contributed to increasingly negative attitudes.

“Well, I guess my views, you know, haven’t changed dramatically, I mean in the sense that, you know, I still believe in the system and I still think it, you know, ultimately will do a good job. I mean I guess what I’ve seen over the last year has been sort of disappointing as far as the rapidity with which the Programme has evolved and has really become deployable...” (Interview, Manager).

Negative attitudes were particularly apparent amongst the more frequent users who reported that it increased their workloads significantly. There was also a lack of understanding of how exactly Lorenzo could benefit patient care, which led many to conclude that the implementation was a general “symptom” of healthcare being increasingly bureaucratised.

“(Laughs) The general trend is it’s crap but we are trying to let people know to improve it, even we are struggling to use it because it’s so slow and... I mean I’m expecting it to be improved as a system because otherwise there is no point to use it, I think it should be changed if it’s not improving.” (Interview, Healthcare Professional)

These developments were exacerbated by a feeling that issues with the software raised by both implementation team members and users were not addressed by the LSP over an extended period of time, meaning a lack of visible improvement.

“...we’d actually identified for CSC a series of fixes [see Glossary] that we required within certain time bands. So we’d identified something like 90 things needed fixing within two weeks, a further 120 needed fixed in six weeks then another batch in 12 weeks and another batch in 16 weeks. And that was all based on deals we’d done with the organisation but also understanding what the tolerance levels around workarounds were within the organisation. And either because of the noise or because of mismanagement within CSC or because of misinterpretation of the issues that required fixing we still haven’t got all our two week fixes yet. We’ve got very few of our six week fixes so, we felt the organisation could tolerate certain things for two weeks, it had to tolerate some of that stuff for four months. They’ve had to tolerate all the six weeks issues for four months, the 12 week issues still aren’t fixed either.” (Interview, Manager)

Implementation team members stated that this lack of improvement over time was due to a delay on the LSP’s part to respond to change requests and to provide appropriate expertise and support. As a result the relationship with the LSP and the supplier became progressively strained, characterised by repeatedly missed go-live dates as the software was simply not perceived as being ready for implementation.

“Yes, and I think that we had quite a slow model, the service delivery model that’s used to respond to issues and I don’t really, well it doesn’t work. It was broken you know by the whole thing and we still haven’t got lots of things kind of settled yet in terms of where we’re going to get issues sorted out in [software] builds [see Glossary] so yes, its been quite a difficult time and it will be for a little while longer I think, yea.” (Interview, Manager)

These problems may have affected the morale of users, with a number of staff reporting that they were “*de-motivated*” and that some of their colleagues had gone “*off with stress*”. This was often directly attributed to the implementation process. Others, notably the implementation team and the less frequent users, were found to be more positive towards the system characterised focusing on potential future benefits. Implementation team members tended to rationalise negative attitudes amongst staff by stating that

typically “*people do not like change*”. They seemed to desperately try to stay positive in order to move the implementation forward.

However, many negative perceptions were due to basic software performance issues, particularly in relation to R1.9. Here, users referred mainly to usability issues, whilst implementation team members tended to be most concerned with stability.

In relation to both releases, users complained about the large amount of clicks and mandatory screens required when using the system. These were perceived to increase workloads and led many to conclude that Lorenzo was “*not fit for purpose*” and “*lacked intuitiveness*” as information was often difficult to find.

“Two fundamental criticisms remain that the system is not, and what you see on the screen is not intuitive, in other words if you haven’t been taught, haven’t used it regularly enough to remember what all the sequences are, so if you’re only dipping into it occasionally it is actually very, very difficult because it is, you cannot sort of automatically think well this is what I want to do next and look at it and say that’s what I do...the other criticism of it is the speed of the system that you don’t, when you expect to move from one field to another it is not instant and that is a big concern in a system where one feels instinctively that it ought to be.” (Interview, Healthcare Professional)

Implementation team members generally acknowledged that speed and the large number of clicks required was problematic for users. This was further complicated by the fact that Lorenzo did not integrate with the Trust’s existing systems (including paper). As a result, work was often duplicated as records still had to be printed and users had to switch between electronic systems.

“But of course they’re not integrated, all we’re doing is literally downloading stuff from Lorenzo into our radiology information system, it’s populating some of the demographics which saves a bit of time I suppose at this end potentially but beyond that it’s not, there’s no sort of integration.” (Interview, Healthcare Professional)

With R1, these issues had not been resolved over time leading to increasingly frustrated users. R1.9 had, in addition to the problems encountered with R1, a number of more

fundamental difficulties, which according to the implementation team, were due to a flawed data migration process and a general lack of system stability. Symptoms of the latter included freezing of screens, randomly logging out users, and lengthy document loading times (some users quoted 10 minutes).

“Interviewee 1: Yeah or your cards are not working or it goes down, like it went down for a day the other day didn’t it.

Interviewee 2: It’s logged me out a three times yesterday.

Interviewee 1: It really is very frustrating; you just can’t get on with your work.”

(Group Interview, Administrative Staff)

“He selects a patient, then clicks “link to encounter”, clinical note, create note, takes quite a while to load different screens until the note template/form comes up, he types in the name of the surgeon (his name) and the name of the anaesthetist at the top of the form into boxes, types in free text under the headings site/presenting complaint/comorbidity/diagnosis” (Observation researcher notes).

Issues resulting from the data migration process were more fundamental. For example, they included the system displaying wrong information such as showing a patient was still alive when they had died. This, combined with the unpredictable nature of new problems occurring daily, led users to conclude that they could not “trust” Lorenzo.

“No I don’t trust it, on Saturday we had a patient died and on Monday the dietician came up and she said can you just tell me where this man is and I said “Oh he died on Saturday” but “he’s still alive on Lorenzo”, I said “you are joking” cause like ward clerks don’t work weekends, one of the staff had deceased him but they hadn’t gone into the final page so they just come out of it so that man was still alive on Lorenzo, well all his appointments were still open everything. But she didn’t know that and the only reason I knew is because the dietician had come up and asked me where, so I had to ring the helpline and they said well that’s what happens but it’s not, do you understand what I mean? It’s not, you can’t trust it.” (Interview, Healthcare Professional)

In outpatient clinics, problems with R1.9 were still more pronounced as the PAS replacement affected the running of clinics. Here, data migration issues resulted in clinics being under-booked or over-booked, missing information on the system, and patients being booked in at the wrong time and in the wrong clinic. This had obvious

implications for patients, which were more noticeable with the introduction of R1.9 as users could not avoid using the software (as it replaced the existing PAS). As a result, outpatient clinics tended to run late, patients turned up without appointments, and/or had to wait for staff to find the appropriate information.

Accordingly, all implementation team and LSP efforts concentrated on getting R1.9 “stable” in order to address fundamental organisational needs. However, the number of change requests due to the large user base meant that they found it hard to keep up.

“I mean to be fair I mean we have to get 1.9 stable, I mean that is the absolute most important thing but, you know; I mean everything else sort of suffers. I mean we have finite resources and, you know, I mean we have to allocate those as best we can.”
(Interview, Manager)

This focus on R1.9 also led some R1 users to conclude that they were not listened to and lacked support as none of their problems were addressed. The following field notes illustrate this:

“11.30am: We then went to ward [number] to interview the ward clerk (recorded), during the interview the Ward Manager popped in, they were both really negative although the Ward Manager was championing the system a year ago, this was because it had not improved at all over time, they are now using paper whenever they can, the ward clerk has to use the system and is really stressed as it has tripled her workload, after the interview the ward clerk said goodbye to me and said it was nice to see me, I had the feeling that she was almost crying as she told me “I can’t even find out whether people have been discharged on the system, you have to tell them the problems we’re having...nobody seems to be listening to us.”

Consequently, users often did “not bother” reporting arising problems, which may have resulted in the implementation team having a skewed picture of how many problems were actually experienced on the ground. Some users, who had initially championed the software were so frustrated with the lack of progress that they had become “negative champions”,(35) and the loudest and most passionate critics of Lorenzo.

“It’s rubbish it doesn’t work, it doesn’t do what its supposed to do and it’s hard to use and it’s not delivered anything that it’s promised and we’ve lost loads of patients, loads of patients have been lost, not from surgery but from other departments yeah, we call it Horenzo.” (Interview, Healthcare Professional)

Again, less frequent (and often more senior clinical) users who could avoid using the system found the support to be adequate.

6.2.3.2 Integration of work practices with the demands of the software versus integration with existing work practices

As a result of the introduction of Lorenzo, users had to change existing work practices to accommodate the demands of the technology. Some questioned whether this was appropriate, as they expected the new technology to integrate more effectively with their work practices. Implementation team members, on the other hand, stated that existing work practices had to be “*re-engineered*” in order to deliver more efficient and higher quality care. This was, however, slightly complicated as mapping and planning of future work practices had to be carried out in relation to software that was still in development. As a result stakeholders had to make “*best guesses*” of how it would affect clinical work.

“I mean a lot of the R1 functionality works quite well but on the other hand the clinical content is woefully inadequate, you know, I mean they’re working hard to try and develop clinical content but it, you know, without clinical content clinicians won’t use it... I mean we were really, you know, you can only sort of entice people for so long until they finally sort of get fed up and say well, you know, come back and talk to me when you’ve got something to work with and that’s a lot of what we’re having now.” (Interview, Manager)

An additional complication was the often “*messy*” and unpredictable nature of clinical work, which the system could simply not accommodate. Many users commented that they were mandated to use the software, but they stated that this resulted in lower quality care and less efficient ways of working.

“I don’t know if I like it as much as I thought I was going to. I think it’s longer; it takes longer than the other way, than the iPM obviously that was a lot quicker. It’s just the way you seem to be sort of going from one page then waiting for the next one to load in it just seems ages and ages and obviously when you’re busy...” (Interview, Healthcare Professional).

The perceived lack of integration with existing practices resulted from a range of usability issues, which did not attenuate over time. These were perceived to be due to the way Lorenzo was designed, i.e. by developers in India who, clinical staff thought, had a lack of insight into the nature of clinical work in UK healthcare. In this context, a number of issues were referred to frequently.

Firstly, whilst the number of clicks and mandatory screens were designed to improve data quality and recording, ensuring that *“things were done properly”* (according to implementation team members), users stated that this decreased usability as it meant that more time was spent on administrative tasks and data input. This was seen as particularly problematic amongst clinical staff who stated that this mounting focus on administrative duties was detracting from their clinical responsibilities.

“Well put this data in and put that in, well I’m sorry that’s not my job, you know, and putting demographics in isn’t a nursing task it’s a secretarial one, you know, putting ethnicity in it’s not my job it’s, you know, so that was the ethos of it.” (Interview, Healthcare Professional)

Secondly, the system seemed to make workflows more linear than was the case with paper systems. Users were accustomed to carrying out many different tasks in parallel, which the system did not allow them to do. For example, browsing letters and records was complicated as, on Lorenzo, individual patient items had to be opened one by one.

In addition to these more subtle but significant ways in which the system changed user work practices, there were also some basic issues with performance such as slow loading of screens, *“long-winded”* printing, and display of wrong information (as referred to above, particularly in R1.9).

“To do it you have to click on the patient, click on the electronic patient record which is like not, it’s not up its just, you just sit there basically looking at the screen for a while then there’s a list of things that you can go into, you can go into the patient details or you can go into like demographics but it’s all you know you press one button and then it takes a while to come in and then you have to get into another, its hard work.” (Interview, Healthcare Professional).

Users developed ways to cope with these problems and to compensate for perceived shortcomings. Some of these were temporary, and indeed desired by the implementation team, due to the initially limited functionality available and due to running parallel systems (such as for example having to print a paper copy for the file). Other changes imposed by the system were more fundamental, including altered professional responsibilities and adjusted sequencing of care activities.

In relation to the former for example, Lorenzo only allowed nurses who had special training to order x-rays. Other nurses had to ask the doctors to order these, if necessary. Both parties said that this arrangement was inconvenient as it created more work for doctors and nurses believed that some of their professional autonomy had been taken away.¹²

“... for example you get a load of new doctors on the ward and you get a patient in with a specific condition you know automatically before the consultant even comes round what investigations that patient is to have, because there’s a protocol so you know what they’re going to have or you know, because you’ve experienced what they’re going to have so you could in effect order them and we did do, you know, if someone came in with renal colic I would order, you would just do it because that’s what you knew the patient was going to have.” (Interview, Healthcare Professional)

Some avoided using the system entirely reverting to paper notes whenever possible. This was the case especially amongst senior clinical staff, which tended to either partially use Lorenzo, often asking their juniors to input information, or demanding paper copies.

¹² Although it has to be noted that officially most nurses were not allowed to order x-rays – they were doing it informally by completing the cards on behalf of a doctor

“...medical staff sort of dig their heels in and then don’t do it, do they and if they can get out of doing it they’ll do it on paper...” (Interview, Administrative Staff).

Refusal to use Lorenzo amongst some clinical staff was evident despite increasing engagement efforts of the implementation team. This was based on the assumption that once consultants would use the system others would naturally follow, thereby *“harnessing the naturally existing hierarchy”* on the wards (Interview, Manager). Engagement was, however, complicated by the fact that the product in its final form did not exist and could therefore not be demonstrated or trialled.

Others could not avoid using the system and appeared most frustrated. As mentioned above, this was particularly true in relation to R1.9, which contained the basic physical and organisationally essential knowledge that had to be accessed in order to provide care (e.g. where the patient was and which clinic they were booked into). The following paragraphs will explore some techniques employed by users to compensate for perceived problems in more detail.

Getting around issues by doing things “incorrectly”

Firstly, staff developed uses in ways which were not necessarily perceived as *“correct”* by Managers (or as officially sanctioned), but which would get them where they wanted to be in the short-term. This involved leaving SmartCards (see Glossary) in terminals as the long log-in process was perceived to interfere with individual workflows. The following notes from observations illustrate this:

“I asked why he has left the SmartCard in the computer when he went to operate, he said “shhh don’t tell anyone”, the SmartCard system is not ideal as it takes time to log in and out and there is no session persistence, he is aware that this is a problem, he has also lost his SmartCard several times before, other systems to address this problem may be needed e.g. distance scanning (this is possible with some of the handhelds, see Glossary), “officially” he said he should have locked the computer when he was away by pressing Control-Alt-Delete” (Interview, Healthcare Professional).

In some instances, such activities would be reflected in reports generated by the system, affecting managements' ability to track activity levels. For example, users in outpatient clinics tended to book appointments in a way that, although less laborious for them, meant that these appointments would not show on the system as booked.

"...so you're getting a certain amount of 'well I'll just try anything that makes it look like it's worked' and then you get problems with back-end data because there's a diversification of the numbers of processes that people are using cause they are just desperate to try and get from A to B in a day and they'll try any route to get there that looks like it's working to them." (Interview, Manager)

Use of other IT systems to compensate

Administrative staff, who generated discharge letters, reported that the word processing facility of R1.9 was so poor that they would, in many instances, use Microsoft Word in order to send out letters in a timely manner.

"Yeah, when we can if we can't, we go to Word and type it in Word because you can't afford to spend the time." (Interview, Administrative Staff)

Delayed input of information onto Lorenzo

Users also entered information into Lorenzo in back offices typically after clinical tasks had been completed. For example, junior doctors took paper notes during ward rounds and then transferred these to Lorenzo after the ward round had finished.

"Well what we do is we do a clinical ward round and they write the notes.... On paper, we don't actually put anything into Lorenzo directly unless they decide that rather than use our paper flimsy they're going to use Lorenzo for the discharge. We have an agreement that the prescription as long as they print it off and sign it, a printed out prescription can be used for discharges but they will have to do that manually at the time of discharge from the notes." (Interview, Healthcare Professional)

Staff stated that this was mainly due to the busy nature of care provided in wards, which could not accommodate Lorenzo at the point of care. They would therefore often delay data input, taking paper notes during clinical encounters as reminders.

“Well at the moment because we’ve sort of piloted it on the surgical wards we have tried to make an effort to use Lorenzo as much as possible. I mean we were asked to try and request investigations live on the ward rounds using a portable computer but unfortunately as I said because of constraints of time it wasn’t possible to use it that way, it just took too long because we, you know, we have a fair number of patients to see in a short space of time. And so the junior staff are making notes of who needs which investigation and then they’re requesting them via Lorenzo at the end of the ward round.” (Interview, Healthcare Professional)

Using other hardware devices than intended

In line with the delayed data input, there were also some issues with handheld devices. The implementation team initially expected that information would be entered at the patients’ bedside but handheld computers were generally perceived as too bulky, heavy and slow. Therefore users tended to input information at desktop computers in the back office.

Compensating for staff groups who refused to use the system

Some nurses and administrative staff stated that they had to “*fire-fight*” in order to deal with the system, whilst trying to meet the demands of managers, patients and senior clinicians. This resulted in a feeling of being de-valued and led some to suggest that nurses and administrative staff should have been targeted as the primary user base, as opposed to focusing engagement efforts mainly on senior clinicians who had the autonomy to refuse use or delegate to their juniors. These juniors were also often transient and inexperienced, which complicated the situation further.

6.2.3.3 Different foci amongst organisational stakeholders

All local stakeholders hoped that benefits of Lorenzo would be realised in the future, with a larger user base, more functionality and systems integration.

“I mean the advantages are like if you can implement this whole system for the UK or whatever everybody can use it properly then there’s going to be a lot of good benefit I can see.” (Interview, Healthcare Professional)

Users often hoped for benefits relating to the availability and accessibility of patient information, whilst implementation team members mainly referred to improved quality, coding, audits, security and secondary uses of data.

Throughout my fieldwork, implementation team members tended to be more positive than users, despite the numerous difficulties encountered. This may have been due to different foci amongst the two groups: users concentrated on what Lorenzo was at present based on their experiences to date (i.e. a system that was not fit for purpose and created more work), whilst implementation team members focused on what Lorenzo could be in the future (i.e. a system improving the quality and efficiency of care). These different conceptualisations may be linked to the lack of basic agreement on the vision, potentially due to non-existent software and constant changes in the scope of the overall Programme itself. They may also be a symptom of a lack of efficient communication locally, which was complicated by the large scale of the R1.9 deployment.

Users complained about the lack of observable benefits for them and for their patients, which they stated was central to the vision. Implementation team members on the other hand, worked hard towards solving existing problems. They argued that users should not focus on benefits visible in the immediate care environment but on wider organisational benefits to the NHS as a whole.

“Lots of people will say well the fact that it’s secure for the first time is worth 30 seconds, the fact that it’s legible for the first time is actually worth a minute, the fact that it’s timely, i.e. it gets to radiology sooner is worth 15 seconds. And if you start to put all of that value together it actually exceeds the five minutes.” (Interview, Manager)

However, in light of the increasing number of problems with R1.9, reverting back to using iPM was considered a potential organisational back-up strategy. Measuring benefits was perceived as difficult especially in the early stages of implementation, but seemed necessary to motivate users. Some argued that integration with the SCR would

have helped to demonstrate early benefits to users, but this was hampered by a lack of engagement on part of the local health community.

“If we were recording drugs on admission, if we were getting through the summary care record or through a GP system interface, drugs on referral, drugs on admission, current medication, then it would be a far better, or more joined up, process for us but for us to record drugs at admission and then in effect store them and leave them until discharge and then try and make sense well they came in with this and now we’re going to discharge with this, what do we do in the middle, get the drugs chart out and work out this that and the other. Without having a continuous record all the way through the patient stay is a bit of a problem.” (Interview, Manager)

6.2.3.4 Political pressure to show progress versus organisational and technical readiness to implement

All stakeholders felt the political pressure to demonstrate progress, which often stood in stark contrast to the actual organisational and technical readiness to implement. For example, implementing R1.9 across the hospital while the software was still being built meant that users had no opportunity to “play around” with the software during training. It also resulted in a training environment that was different from the live system due to new builds becoming available. There was further a gap between training and actual use of the system, which was attributed to the constantly changing go-live dates. As a result, users did not feel confident in using Lorenzo, stating that they had to “make it up as they went along”, potentially contributing to unintended ‘workarounds’.

“I think the training was, because I went to two lots of training and the second lot of training that I did I felt a bit more confident I thought alright this looks easy, I’m not going to have any problems with this at all. And then it went live and I thought it doesn’t look the same. So I’ve looked at it and thought right where do I go now, so the time taken to, I couldn’t even generate the list of patients at first and they kept disappearing and I’m like well where’s he gone, you know, and then it was just a matter of time but now I can get it up, I get the patients up.” (Interview, Healthcare Professional)

This political pressure intensified over time resulting in increasingly aggressive implementation timelines. It seemed to be the result of a governmental desire to demonstrate to the public that the Programme was progressing.

“I suspect that it’s because the pressure that’s coming from [name of senior staff at the DH] and people like that. If [name of senior staff at the DH]’s saying that you know you need to sort this out before I’ll give you an RKM [Release Key Milestone] then if [name of senior staff at the DH]’s saying it then I know [name of head of IT]’s really important but she’s probably even more important than [name of head of IT].” (Interview, Manager)

The situation was further complicated by the publicly debated “success” of implementation at this Trust in the media. The increasingly uncertain direction of the Programme as a whole, partly due to a change in government in 2010, spending cuts and contract re-negotiations reducing the scope of Lorenzo, may also have contributed. The following press statement illustrates this:

“CSC’s future in the £12.7 billion NHS IT Programme is in doubt after it failed to hit a critical end of March deadline to install Lorenzo Regional Care Release 1.9 at [Site B].” (eHealth Insider, 1st of April 2010)

The local implementation team was therefore increasingly concerned as to whether implementing Lorenzo was the right decision. As future governmental strategies were uncertain towards the end of my data collection, there seemed to be a tendency to “wait and see” what would happen. This may, however, inadvertently have contributed to the lack of progress.

“And that’s because we’re a bit uncertain as to what’s to come in the future, you know, the Programme is uncertain nationally, we need to get through November, we need to get through March before we start, you know, because of what [name of senior staff at the DH] said we need to get through those two big milestones before we actually, there might not be Programme after March. Or just the fact that we miss that milestone if [name of senior staff at the DH] does pull, pull the stumps in November because the first Trust doesn’t go live that was to go live.” (Interview, Manager)

In addition, national contractual arrangements meant that the Trust, whilst being able to delay go-live locally to some extent, had a lack of influence in relation to software design.

“This kind of slightly difficult contractual relationship where unless you throw it over the wall in the right format it’s not our problem... Yes and I actually know it’s not because your company is only going to make money if this Lorenzo system is credible for the rest of the NHS and it doesn’t look credible while you’re being very careful about whether you’re in it with us or not you know, you need to be over on our side of the fence, its needs to worry you as much as it worries us about getting this right and that has been quite a difficult relationship, I think on occasions even though we would count CSC as partners and even though we have CSC staff you know who have worked right along side, embedded in the project team to the point that you know we don’t think of people coming from different organisations.” (Interview, Manager)

LSPs were, as a result of these centrally held contracts, viewed as being motivated by cash-releasing milestones as opposed to high quality implementations. Consequently, LSP efforts concentrated on implementing Lorenzo in as many Trusts as possible, as opposed to getting the system to work “*properly*” in one Trust before moving on to the next. Many therefore reported that, as more Trusts went live, the support from the LSP and NHS CFH had steadily decreased, resulting in a lack of resources to resolve any existing problems as well as concerns over resources for future releases. This also contributed to a perceived lack of support for facilitating the sharing of implementation experiences with other EA organisations.

6.2.3.5 A national solution versus software tailored to local needs

It is important to recognise that, whilst some basic processes might be similar, the needs of the NHS vary significantly between organisations, departments and individual users. More specifically, interviewees repeatedly stated that differences in existing infrastructures and business processes of Trusts, as well as the existence of potentially competing local initiatives complicated the situation further. Hence, there is a difficulty balancing local needs of users and organisations with national requirements for standardisation. An emerging concern here was that the Programme increasingly imposed common business processes across locations, contributing to a lack of individual needs being met.

“Yes cause otherwise it might be something which is so specific that it, other people wouldn’t, couldn’t work with it, I can’t think of an example off hand but everybody has their own slight ways of working so you have to make sure that the core, the basic function is acceptable to everybody and then the more peripheral things you can customise here in the organisation.” (Interview, Healthcare Professional)

The various interests even within the Trust were sharply brought into focus by examining the viewpoints of different stakeholder groups. For example, implementation team members stated that the system had to fulfil the basic requirements of the organisation in order to sustain organisational functioning, whilst users indicated that it needed to be customised to suit their work. Users also believed that they lacked input in decision making, including the choice of the system, and input in the design of the software.

“...so the Trust should be able to configure the columns or some of these other things that, you know, are more beneficial to their business process. And so without that lack of Trust level configurability it gets very hard so we have to go through all these committees, I want this to say this here and I want this to say that there, well we don’t like that and that’s part of the problem with this single instance business and the lack of tertiary level configurability.” (Interview, Manager)

All therefore increasingly believed that a “one size fits all” concept, characterising the Lorenzo implementation, was inappropriate. In this context, there were also some concerns that Lorenzo would be too tailored to early implementing organisations, rendering it unsuitable for the wider NHS. Conversely, stakeholders believed that some “top-down” element was needed to mandate use. In addition to senior organisational leadership and support, this should be driven from within the organisation through middle-managers. It is, however, concerning that some of these had turned into negative champions over time.

“I think that probably the one other thing to do with lessons learned is that I think that sort of level of like middle tier of trust management needed to have got far more engaged both pre and post go-live cause it felt very much as though actually the control rooms and the command rooms were actually running the organisation when actually it wasn’t their job to do that.” (Interview, Manager)

6.2.4 Key themes

A wide array of potentially transferable theoretical contributions emerged from this case study. These are summarised in Box 6.2 below and discussed in detail in the following paragraphs.

Box 6.2: Themes and tensions emerging from my analysis of Site B

<p>Technical dimension</p> <ul style="list-style-type: none">• R1.9 was not stable resulting in issues for users including freezing, crashing.• There were issues with software usability.• There was a lack of software usability improvement over time.• Staff had to change work practices and employ ‘workarounds’ to accommodate the system.
<p>Human/social dimension</p> <ul style="list-style-type: none">• There was no basic agreement on the vision, potentially due to non-existent software and constant changes in scope of the Programme.• There were different foci amongst different stakeholders. These included conceptions of what Lorenzo was versus what it could be in the future.• Tensions as to what extent users should have to change existing work practices to fit in with the technology and to what extent the technology should fit in with existing work practices.• There was a focus on clinical engagement from the start but senior clinicians could and did refuse to use the system. There was a lack of focus on other staff groups that could not refuse to use it.
<p>Organisational dimension</p> <ul style="list-style-type: none">• There was no opportunity to “play around” with the system as the software did not exist, and a lack of ability to plan for changes in work and business processes.• Fundamental issues with the system existed. The organisational focus on stability led to other parts of the implementation being neglected and contributed to

negative user attitudes.

- The Programme as an opportunity to improve business processes (i.e. changes in the way the organisation works) versus an IT project (i.e. “putting the kit in”).
- Large-scale implementation versus getting it to work on a small scale first before attempting wider roll-out.
- Some “top-down” element is needed to mandate use whilst still allowing for user input. This should come from both local management (ward managers and clinicians) and top-level management.
- Communication between the implementation team, end users and senior managers is important but often difficult to realise on a large scale.
- Lack of national funding versus the need for adequate resources to support the implementation.
- Measuring benefits is difficult but necessary to motivate users.

Macro-dimension

- National contracts meant that the Trust had to rely on the LSP to change the software, and supply appropriate expertise and support.
- National solution versus solution tailored to local needs.
- National contracts meant a lack of Trust involvement in decision making.
- The publicly debated “success” of the implementation and the pressure to go-live amplified by media.
- Uncertainty in relation to the future strategy.

As can be seen, the implementation of Lorenzo at Site B was characterised by a number of tensions, which made it uniquely complex. This became particularly apparent over time, as user base and software functionality increased and the national strategy evolved.

Site B attempted one of the first Lorenzo implementations in an acute setting, with the finalised product being built as it was implemented. As a result, a variety of problems were experienced on the ground, including issues with user engagement, lack of ability

to plan for business changes, and a generally unpredictable implementation environment, in many ways paradoxically dominated by a technology that was in its final form just a vision. The lack of agreement in what exactly the software should constitute may have resulted in various stakeholder groups pulling in different directions.

Organisational stakeholders seemed to have done everything as well as they could, with a few exceptions, such as for example in relation to engagement of non-clinical staff. They had, at least initially, strong and visionary leadership, engaged first-wave users, and had sufficient resources. However, they were presented with software that was not fit for purpose for either the organisation or the users. As mentioned in Chapter 1, the fact that Lorenzo allowed a degree of input in software development may be viewed as an advantage over other software, but it was not developed to be fit for purpose in a timely manner and local input in decision making was constrained by national arrangements. The organisation itself had limited authority to influence either the software design or the national strategy. Its fate was placed in the hands of other, more powerful, stakeholders. Over time, and despite desperate implementation team efforts to solve existing problems, this led to disillusioned users who had to change their work practices to accommodate software that was not perceived as usable resulting in increased workloads. It separated administrative and clinical tasks (although generally administrative tasks increased), resulted in duplication of work that was often perceived as irrelevant, and highlighted professional tensions (e.g. by those further down in the hierarchy compensating for those higher up).

Overall, change at this Trust was technically driven and heavily influenced by the national implementation strategy. This resulted in a lack of progress over time and contributed to increasingly negative attitudes amongst all organisational stakeholders. The deployment also brought to the fore some more fundamental tensions in the national implementation as a whole, affecting developments locally. On one hand, policy makers emphasised that the Programme was intended to improve business processes, whereas

on the other hand, local business processes had to be changed in line with technological demands.

6.2.5 The status quo when data collection was completed

When I completed data collection, the future strategy of the Trust was uncertain. It was likely to be primarily dependent on the ability to stabilise R1.9, so that Lorenzo could support the basic needs of the organisation. Otherwise, the Trust would be forced to abandon the Lorenzo route, at least in the short term, and either revert to using iPM or implement another system.

Once a future strategy is determined, implementation of any future system at this Trust is likely to be difficult due to user attitudes in light of past negative experiences. Nevertheless, the Trust also made significant progress in terms of infrastructure and gained IT Management experience.

6.3 “It feels like our baby because we built it” - case study of Site H

6.3.1 Introduction

This second case study describes my findings relating to the introduction of Lorenzo R1 in Site H, a community Trust where Lorenzo software was used in the first clinical setting ever by a small podiatry team. Data were collected between July 2009 and July 2010. It consisted of interviews with a total of 19 Trust staff including 14 healthcare professionals and five implementation team members, collection of over 600 pages of Trust documentation and articles in the media. A summary of data collected at this site can be viewed in Box 6.3 below.

Box 6.3: Summary of data collected at Site H

- 26 interviews with hospital staff with a total of 19 different interviewees: five operational staff and 14 users
- 24 hours of observations and associated field notes including use of the software healthcare settings and staff meetings
- Researcher notes from the recruitment meeting
- 60 pages from press searches
- Trust documents including: PID, two Project Status Reports, several sets of minutes from Lorenzo Steering Group and associated meetings, Interim Evaluation Report
- 5 pages of researcher field journal

The following paragraphs will discuss how users and implementation team members worked through initial doubts and uncertainties in relation to software usability, to developing a product that was viewed as fit for further deployment. The findings are structured in a similar way to those reported in relation to Site B above. Section 6.3.2 will begin by setting the scene of the implementation, briefly describing the organisation itself and its role in the National Programme. My analysis resulted in four over-arching themes, which will be discussed in detail in Section 6.3.3. How these themes have emerged from the data was discussed in Chapter 5. I will conclude with a summary of potentially transferable theoretical contributions derived from the data (Section 6.3.4) and describe the state of affairs at the time I completed data collection at this site (Section 6.3.5).

6.3.2 History and context of Site H

6.3.2.1 The profile of the Trust

Site H was part of a large urban PCT that commissioned both regional and specialty services for approximately 383,000 citizens. At the time of data collection, it was the lead commissioner for four hospitals with a total budget of £511 million in 2007/08. At

the time of data collection, the organisation aimed to become one of the first community Foundation Trusts in England.

The Trust had three divisions including:

1. Children, young people and families
2. Adults and communities: including district nursing, community podiatry and physiotherapy
3. Specialist: including a dental hospital, specialist rehabilitation services and a learning disability service.

As, Site B, the Trust was part of the NME area covering the north of England above London.

6.3.2.2 Site H, the National Programme and Lorenzo software

Ten podiatrists were the first individuals to ever use the newly developed Lorenzo R1 in a clinical context on the 3rd of September 2008. This was initially planned to be a three month pilot of the system but was, at the end of my data collection almost two years later, still ongoing. The complete podiatry team consisted of 19 members. At the beginning of my data collection, ten of these used R1, whilst the rest were still using paper systems. The remainder of the podiatry team started using R1 in May 2010. This meant that from this point onwards the service, comprising 11 different locations, was “*virtually paper free*” (Interview, Manager).

The initial ten Lorenzo pilot users comprised a variety of individuals with varying levels of computer experience, including both junior and senior staff (e.g. the Head of Service), as well as members of the high risk team (i.e. those who treat patients with diabetes).

R1 in Site H included electronic CDC forms, which were developed during regular workshops comprising the initial pilot users, NHS CFH staff, and CSC representatives. Forms included a scoring plan and an evaluation sheet (used at the patient assessment

stage); a discharge letter; a new patient letter; a request for treatment letter; and a general purpose letter that could be sent to other care providers via secure NHS Net Accounts (e.g. GPs). CDC forms supported recording and maintaining medical histories, clinical notes, care events, demographic details, and task management.

Coding was facilitated through the identification of relevant Systematised Nomenclature of Medicine (SNOMED) terms (a list from which terms can be selected) and by incorporating Medipad (by tagging key words for coding). Podiatrists were issued with SmartCards, new desktops and laptops, as well as printers to support R1. Wireless networks had been installed in some podiatry clinics but not all.¹³

Initial implementation in the early stages of the pilot included three forms, but at T2 all six forms were used. In addition, a podiatrist at the local hospital had started accessing Lorenzo, which was perceived to bring increasing benefits as data could now be shared between the two locations. In addition, the Lorenzo reporting functionality in had been developed further and the majority of content development work was finished. At T2 interviews, the Site was waiting to move from the pilot version of Lorenzo to an upgrade (see Glossary) of the software incorporating changes made in other EA sites. After this, the Trust planned to replace iPM with the Lorenzo PAS by implementing R1.9.

At the end of my data collection in July 2010, the Trust withdrew resources (including a sub-contracted IT Manager) for this particular Lorenzo implementation and considered implementing SystemOne instead of Lorenzo across the organisation. A detailed implementation timeline can be viewed in Table 6.6 below.

¹³ Please note: a wireless connection was needed when a user wanted to walk around with a device using Lorenzo. If no wireless connection existed, the user had to plug in the device.

Table 6.6: Detailed implementation timeline at Site H

Date	Event from Trust documentation and interviews	Planned event from Trust documentation and interviews	Publicly available documents (press and policy documents)
03/04/05	Site H went live with iPM		
11/07			Lorenzo was first demonstrated at Newmarket race course
08/01/08-27/06/08		Planned project initiation	
28/07/08-26/08/08		Planned go-live	
25/09/08-16/10/08		Planned project closure	
31/01/08			Full Lorenzo benefits expected by 2012
06/03/08			Delivery dates for R1 in Site H have slipped to July
May 2008	Re-scoping of EA programme (initially had a scope of R1 covering learning disabilities and children's community nursing; changed to podiatry service)		
16/05/08			National Audit

Chapter 6: Findings from individual case studies

			Office: Lorenzo software running four years behind schedule
04/08/08		Planned R1 go-live	
03/09/08	Pilot of R1 started with nine podiatrists	Pilot intended to last until the end of November 2008	
05/09/08			First ever implementation of Lorenzo four years after iSOFT first promised delivery
Nov 2008			Implementation of R2 expected
21/01/09-09/02/09	Local interim evaluation of the introduction of R1	Second evaluation planned for June 2009	
June 2009	Picture upload functionality being used		
July 2009			Planned implementation of R3
02/11/09			Lorenzo has just 174 “regular users”
01/06/10	Whole podiatry service started using R1		
July 2010	IT Manager left, Trust considering to replace Lorenzo with SystemOne		
2012			CSC planning to

			finalise implementation of Lorenzo
2012		CSC will stop supporting iPM	
2016			SHA expects to complete roll-out of Lorenzo

6.3.2.3 The Trust's decision to become an EA

Similarly to Site B (Section 6.2.2.3), interviewees stated that the financial incentives associated with the £1 million incentive payment may have contributed to the decision to become an EA. However, parallels to Site B also existed in relation to perceptions surrounding iPM. Here, Site H implementation team members expressed that iPM did not effectively address the needs of community services and believed they required another application in order to “*move the organisation forward*”. In addition, the EA option seemed feasible as it was expected that clinical benefits would be introduced relatively early.

6.3.2.4 The composition of the implementation team and external support

As already outlined in Section 6.2.2.4 above, the R1 implementation was managed jointly by CSC, NHS CFH and the Trust. However, as Site H deployed on such a small scale, only one Project Manager, who was seconded, worked on the project full time. The other internal implementation team members split their time with other IT projects across the organisation. Additional support was provided during initial go-live by internal Floorwalkers, two NHS CFH staff, and three CSC employees.

6.3.3 Sociotechnical processes of change

6.3.3.1 Small-scale implementation allowing intensive user involvement and support

As in Site B, both users and implementation team members supported the vision of nationally shared EHRs, although initially there were some doubts as to whether Lorenzo was the right system to achieve this. Most stated that, when delivered to the team, the software needed significant further development to be usable.

“Electronic I think it needs to be done now, I think. I don’t know, I just think the day of paper notes is probably gone when there’s so much technology around...If you think about it’s a very ancient way of doing things to write everything down when there’s so much technology out there... Good vision, but whether this system could do it I don’t know.” (Interview, Healthcare Professional)

In addition, some argued that, over time and in light of national strategic developments, the original vision had changed somewhat from the initial expectation of fully integrated care records (i.e. one system used across providers), towards a more contained solution where only certain details could be shared across different local systems.

“I think, for me I suppose the answer to that question has changed in the last 12 months. What would have been ideal is the shared care record vision which was one system like Lorenzo that [Name] is using which had an acute hospital front end, it had a hospice front end, it had a GP front end, you had a pharmacy front end, so effectively you’ve got one health care record with differing access levels depending on what domain or what environment the clinician or indeed the administrator was in and until six to nine months ago I still believed that we could deliver that. [...] I think the only way of doing that now is an expanded summary care record or something like that on the spine. Years ago there was a debate; it was colloquially referred to in the NHS as thin spine, fat spine. The thin spine argument said you’d have a central database for the entire population that’s entitled to use the NHS, all the patient population of England and that would maintain their name, age, date of birth, registered GP and that’s about it.” (Interview, Manager)

However, over time, and as opposed to Site B, all local stakeholders maintained that, despite some initial issues, Lorenzo had developed to be fit for purpose and ready for further deployment.

“Well when we first started using it, it was quite a slow, clunky system, there were a lot of clicks to get to where you needed to get and the machines we were using and the performance of the software generally was just a lot slower. Then obviously I’d missed a big chunk out where I wasn’t using it so I came back and then there were certain steps that you needed to click that had been removed from it and the whole thing ran a lot smoother. And for me obviously because I wasn’t with it right at the start and followed it through, through its transitional period the difference was much more noticeable from my point of view.” (Interview, Healthcare Professional)

This increased confidence meant that the system was rolled out to a larger, although still relatively small, user base (i.e. the rest of the podiatry team). The small-scale deployment was key in this context, albeit somewhat unusual when compared to other NHS CRS implementations (including that of R1.9 in Site B described above), particularly in the London and Southern areas. In Site H, a small team of users actively developed Lorenzo to suit their needs over an extended period of time. The “core” implementation team consisted of a dedicated full-time (although sub-contracted) IT Manager and the Service Lead, who herself was an active clinical user of the system. This was viewed as important by all other users as she understood emerging problems and communicated podiatrists’ interests to the implementation team and the LSP. The IT Manager was viewed in a similar light, often translating user requirements into “*IT language*” and ensuring that suggested changes were incorporated in software design. He had also spent a significant amount of time with users to understand their work practices. As a result, the project was viewed as a “*team effort*” with users actively helping to develop the system to suit their needs. The following researcher notes from a team meeting illustrate this:

“The IT Manager continues [speaking to CSC people] “we need to have intensive workshops for all our forms to move things forward, we keep being told that what we want is not in R1 functionality and that we have to wait for R2, this is getting annoying for us, I am sure there is things we can do to make the forms better”, CSC people do not say much except “yes” and then leave the meeting at 14.30pm.” (Observation researcher notes)

“Podiatrists ask Manager and CSC people some questions “is it not possible to do this?”, The IT Manager asks the CSC people “is there a shortcut key for comments?”, CSC lady: “not that I know of”, IT Manager “or could you make a new ‘other comments’ box?”, CSC lady “this would have to be built as separate data items so it wouldn’t work, I would just do it the latex way”, the IT Manager explains what ‘the latex way’ means to the podiatrists, IT Manager “but I don’t know whether this is clinically viable, we need to think about whether we need to use the comments in our stats or just to inform, if we don’t use it for stats then it can be quite a low-tech option”. (Observation researcher notes)

These two key individuals, in combination with the generally strong sense of the team as a cohesive unit and the *“just getting on with it”* attitude of users, allowed the development of a close relationship between implementation team members and users. Perhaps as a result of this close relationship, but perhaps also because it was possible on a small scale, it was decided to allow users an extra five minutes per appointment when they used Lorenzo. This required the Trust to employ locums, but users argued that it was necessary even at follow-up interviews as the system was still perceived to slow down work.

The two champions may also have contributed to realising visible benefits early, as they knew what podiatrists needed, which in turn helped to engage users. There were some observable benefits, including ability to share information across different geographical locations, but as in Site B more significant benefits were anticipated with an increased user base and once Lorenzo integrated with the SCR.

“But little things that I’ve already decided I like is again a patient from this particular clinic needed to be seen as an emergency the week before, we couldn’t fit them in till this Tuesday so I arranged for them to go to another clinic and I was able to access their records on Tuesday so I could actually see what had happened to them on the Friday. Now that wouldn’t normally happen, I would know they’d gone to another clinic but I wouldn’t know any more than that probably so that was good and I like to be able to do that just to click on that patient, see that they have gone to another clinic, what had happened and I’d got that information in front of me. So I like the fact that I can access the information.” (Interview, Healthcare Professional)

Despite this, however, users initially stated that using Lorenzo was “*just more work*”, as they had to populate the system first in order to get real benefits (which they referred to as “*feeding the beast*”).

“And I think we found it difficult because we’re the only ones populating it so we haven’t got the added benefits of the medication coming up and the general medical problems coming up ...once it’s populated I could see it being a lot better.” (Interview, Healthcare Professional)

As in Site B, implementation team members focused on managerial benefits such as improved security, reporting for performance management, and the ability to monitor the patient population.

Further contributing to engagement and satisfaction, and again, a luxury afforded by the small scale, was the ongoing and intensive support of users by a dedicated individual whom they trusted and who knew the software (the IT Manager).

“I don’t know, like I said I’ve just come back and it’s like [Name of IT Manager] has gone, my whole world has collapsed. You know, because I’m not very good with computers it’s just nice because he understands where I’m coming from, you know, if you go to colleagues that’s fine but we’ve all got our work to do and they don’t want to be showing me or helping me, you know, but [Name of IT Manager] was different he’d just turn up.” (Interview, Healthcare Professional)

When the IT Manager’s contract as an external contractor was not renewed, users were supported by the local IT department. However, this was perceived to lack knowledge of the product and therefore could often not respond appropriately to queries. This meant that users in some instances did not “*bother reporting*” emerging issues as they thought these would not be addressed.

“He [referring to the IT Manager] was very concerned that the people that are supposedly going to be looking after it now don’t know much about it, they’re not up to speed and I did actually made a phone call last week to the IT department on the number I was given as a follow on and they actually said to me I don’t know the first thing about

Lorenzo I'm sorry I can't help you you'll have to speak to [Name of IT Manager] and I said [Name of IT Manager] has gone so who helps me?" (Interview, Healthcare Professional)

Pulling out the important support of the IT Manager was therefore viewed to “*make the Lorenzo project destined to fail*” as users increasingly reverted to using paper records due to not getting adequate support if they encountered problems. However, some implementation team members stated that this scenario would in some ways give Lorenzo a “*real life market test*” as the resource-intensive support of one designated IT Manager would not be scalable when the software would be rolled out on a larger scale.

6.3.3.2 Making an implementation work on a small scale versus the need to show progress

The Trust decided to implement Lorenzo on a smaller scale than other Trusts before rolling it out to a larger user base. On reflection, stakeholders stated that this was the most appropriate strategy locally as they were initially presented with a system that was far less developed than expected. This meant that the originally planned two month pilot turned into around two years of development activity during which the software was tailored to meet user and organisational needs.

“I think when we were told it was going to be a pilot we expected there to be more there to work with than there was and it's been a real development process and I think 13 months on we are ahead but I'm not sure how much further ahead than we thought we would be by this stage.” (Interview, Healthcare Professional)

This intense development activity meant that, over time, users who initially had mixed feelings towards the software became increasingly familiar with the system and expressed at follow-up interviews that they would not like to work without it. These developments were coupled with improved speed and layouts of forms.

“From when we first started to now there's massive differences and I can't imagine as [Name] was saying going back to paper notes.” (Interview, Healthcare Professional)

However, this long and resource-intensive development period also meant a lack of observable implementation progress, i.e. a still relatively small user base. This was the case both locally, but also nationally, as discussed in Section 6.2.3.1 above, with the overall number of Lorenzo users still being limited. The resulting overall pressure to progress may have led to the change in strategic direction and the decision to implement an alternative system, which was generally perceived by the service as inferior to Lorenzo.

However, paradoxically, it may have been exactly the national requirements and arrangements that contributed to the lack of progress initially. The environment in which the Trust implemented was similar to other Trusts and they therefore faced the same challenges. For example, as in Site B, users and implementation team members complained about the slowness of the LSP incorporating change requests.

“So we looked at that, looked at how you could reduce the number of click-throughs, the usability, the process flows, actually using what were forms and whether it was still appropriate and so there were some recommendations for change around that. And I guess part of the criticism I think most people would have is the rate of delivery in terms of trying to get changes to these forms being made and into production.” (Interview, Manager)

As already described in Section 6.2.3.4 in relation to Site B, this lack of responsiveness was perceived to be due to LSPs being driven by payment milestones resulting in a lack of support for individual settings.

“I don’t know how the contracts are written with CSC and iSOFT and all these different things, I don’t know and it’s none of my business but what it looks like from a ground upwards perspective is that it’s written in such a way that CSC don’t actually have to worry about the quality they’re delivering and whether it actually works they just, all they have to do is to just basically just get bodies on the floor and it shouldn’t really be that way round.” (Interview, Manager)

Some therefore suggested that a closer relationship with the software developers may have accelerated software development and implementation activity.

Similarly, as discussed in Section 6.2.3.2, the fact that the software was still in development meant that re-designing business processes was difficult.

“I haven’t even seen R2, I haven’t even had a chance to play with R2 so I don’t even know what it does I just know what I’m told it does. Every time I ask to be able to get my hands on it and play with it and just see how it all works there’s always reasons why that can’t be done...” (Interview, Manager).

It seemed that, in light of this perceived lack of progress Trust management believed that the implementation was simply not value for money, which meant that resources were progressively withdrawn. The general political climate, uncertainty surrounding the strategic direction of the Programme as a whole, announcements of spending cuts and scaled back Lorenzo functionality (as also discussed in Section 6.2.3.4) may have contributed to this decision.

“I think there are several factors now that are impacting on us one which is the general election, the change of government and the financial constraints that the country now finds itself in, because of all of that there’s been a renegotiation of the contract with CSC and we’ve effectively moved or are in the process of trying to remove 350 million pounds worth of functionality...” (Interview, Manager).

Withdrawal of resources was sharply brought into focus by the termination of the IT Manager’s contract, which meant that the local implementation had lost adequate support and an enthusiastic driver. The following researcher field notes illustrate this:

“7th July 2010: just went over again to do my second round of data collection...the general feeling of uncertainty quickly become apparent with the chair stating “we’ll go with it and see what happens and what the PCT wants to do...we’ve put so much work into it now...hopefully it will work, as long as we get enough support.” (Observation researcher notes)

“I was sitting in a room next door to the meeting and chatted to podiatrists one by one, this time it was a mixture of those who had been using Lorenzo since the beginning and those who just started using it (the other half of podiatrists), the whole service is now on

Lorenzo and it seems to be going very well. The problem is that [name of IT Manager] has left quite quickly as his contract has not been extended, everyone feels that the Trust does not want Lorenzo to succeed as the Trust wants to go with SystmOne instead, it is felt that this is why the most important support person was removed from the team, the new podiatrists are getting on quite well which is felt to be due to the fact that the system is now much more developed and due to the hard work of the early user podiatrists, everyone is disappointed and does not know what will happen, they feel that pulling the plug on Lorenzo now would be a major waste of money.” (Observation researcher notes)

The withdrawal of resources also resulted in serious concerns amongst those closely involved in implementing and adopting Lorenzo that their efforts may have been in vain. As a result, they lobbied for keeping the system, but all indicated that the final decision in relation to the future strategic direction was outwith their control.

“Well they’re having lots of meetings where they’re presenting both systems to different people within the Trust and we’re going to go along to those meetings to see what they say and try and influence, you know, peoples’ decisions and say look this is Lorenzo its worked for us why can’t it work for everybody else and then there’s going to be a decision made I guess with whatever they’re going to go with. But at least if they do pull it if they give us something else to work with we’ve all picked up one system really easily I’m sure it won’t be that hard to pick up another information system as long as it works in the same way, you know, that it won’t be the end of the world but it feels like our baby because we built it, but then you can’t be sort of precious about things like that can you because if one system works another one can work as well. It’s just a shame all that work and effort that we’ve put in really.” (Interview, Healthcare Professional)

6.3.3.3 Changes over time: improved usability and learning how to work with Lorenzo

As opposed to Site B, there was a marked improvement in the usability of the system over time, although the most commonly experienced issues were similar (e.g. the layout of forms and speed). This was accompanied by a positive change in user attitudes and more effective integration into workflows.

“When we first started it was really basic. If you were seeing a patient for the first time, when we first started using it, it hadn’t taken over completely from paper records it was in addition to it because that was too much of a big transition to make initially with us using it so we just had a new patient assessment form where we filled in basic details. We had vascular, neurological, other assessment forms that were additional to that but when we first started you couldn’t pull them through into that document by clicking on a

link you'd have to do, work your way through the document and then remember which parts of the assessment led you onto further investigations with the patient and then go into those forms." (Interview, Healthcare Professional)

At T1 interviews (which were already well over a year into the implementation) users, much like those in Site B, stated that using Lorenzo increased their workloads. This led most interviewees to conclude that the system was "*not fit for purpose*".

"Yes, we've seen a 33% plus improvement in performance since we went live. I'd expect another 10% to 15% before we could say it was good." (Interview, Manager)

As in Site B (Section 6.2.3.2), users complained about an increase in administrative activity spent on data input and browsing the system, due to a perceived lack of intuitiveness, the number of mandatory screens and a general slow performance. More specifically, the following frequently encountered issues were mentioned in this context:

- The number of mandatory screens led many to conclude that paper was "*much more flexible*", for example, by allowing completion of sections in the order preferred by the user.
- Lorenzo was perceived to be long-winded and lacking intuitiveness. Users had to spend a long time browsing the system in order to find necessary information. A locally conducted interim evaluation supported these findings, concluding that "*all the pilot users expressed frustration about the fact that it took several clicks to get to a particular screen or field in the system*".
- Generated print-outs were perceived to be hard to read, making it difficult to find necessary information quickly. As in Site B, users had to print from Lorenzo which was viewed as "*long-winded*" and increased paper output at T1. As a set of researcher observation notes reads: "*The podiatrist says to me "the thing that takes the longest is the printing and another thing is that now our paper files are overflowing as we add so much paper through the printing", "it also takes a long time to recover after printing, I have to do the GP letter now and this will take forever"*".

- Language used in Lorenzo was not perceived as being consistent with other software applications, which complicated browsing further. For example, users reported that “*finalise*” and “*finish*” was used instead of “*save*” and “*close*”.
- As in Site B, Lorenzo was perceived to have slow response times, particularly in relation to loading forms: “...with some patients if it was a heavy case it could take them 20 minutes to load a form...so it’s just not workable.” (Interview, Manager)
- The long log-in times were stated to slow down individual workflows (see also Section 6.2.3.2 above).
- Lorenzo did not integrate with wireless networking and the 3G connection used in home visits was perceived to be too slow: “The only time we’re not using it is if we’re doing home visits. We were set up to do it on home visits and I took it to my first patient’s flat of that morning and it took, if I remember correctly about 20 minutes just to get onto the system from the patient’s house, something to do with the signals, I don’t know, and that was the first and last time. I didn’t, I’ve not tried it since because if you’ve got 12 patients to get round you’re not going to be wanting to be an hour.” (Interview, Healthcare Professional)

However, it also has to be noted that a minority reported that Lorenzo was intuitive to use, but these users tended to have limited previous experience with healthcare IT systems.

Paper was omnipresent (e.g. in the form of post-it notes, diary sheets, appointment cards) and was, as in Site B, initially used in parallel to Lorenzo. The following observation notes illustrate this:

“Podiatrist puts away paper notes on the desk and gets the notes for the next patient out, puts the pt number into Lorenzo and finds the patient, podiatrist leaves and comes back after five minutes...”

Lorenzo is still on, on desktop and I see that there are little yellow stickers on the laptop (I try to read them but can't make anything out of them, they seem to be passwords or something)...

1.40pm: podiatrist examines the patient's wound and re-dresses it, now both the desktop and the laptop are on, 1.55: patient gets ready to leave and podiatrist goes out and comes back with a folder and looks at the appointments and fills in the green appointment card and gives it to patient, patient leaves." (Observation researcher notes)

At follow-up interviews, and contrary to developments in Site B, stakeholders reported that system performance had improved significantly over time, particularly in relation to speed.

"I think the speed difference is massive from when we first started to now, you hardly wait at all." (Interview, Healthcare Professional)

In addition, some of the interim 'workarounds', such as printing forms completed on Lorenzo and attaching these to paper files, attenuated when the whole service used Lorenzo. Over time, paper appeared to progressively lose its significance, increasingly being used as a "back-up system".

Nevertheless, as mentioned above Lorenzo still slowed down user work practices, but this seemed to be accepted by most. It also may have been due to some interim 'workarounds', still being present as a result of running other parallel systems. For example, users frequently opened iPM to search for patient identifier numbers that were then put into Lorenzo. The two applications could not be opened simultaneously, which meant they had to close iPM, remember the identifier number and then open Lorenzo to input it.

"I don't know, the system doesn't allow you to do it. But it's good to have the information there, it's good when, you know, sometimes we don't have PAS numbers for patients so, you know, you could put an address search in and you can get your PAS number which then helps on follow on treatment. It's also been good that sometimes the records going onto the wrong patient because the PAS numbers are incorrect to that patient so it's picked up a few things like that but again I can't change that I have to just

write that information down, tell somebody else who works on PAS and then they can change it, so that's been good." (Interview, Healthcare Professional)

Over time, users became more proficient at integrating Lorenzo with their existing work practices, learning to either compensate for perceived problems or to “*work around*” them. Strategies to achieve this were often similar to those described in relation to Site B above (Section 6.2.3.2) and will be discussed in turn.

Firstly, in some instances users skipped certain parts of clinical activity in order to save time. This occasionally took the shape of not looking at previous treatment notes before the patient encounter.

“I think the danger is that someone will pick up a patient and will not have time or not be able to find all the information that they want so won't bother. See now very much you get the notes out, you can open the notes, I mean there's still a danger there now because it's still up to people to actually, clinicians to open those notes and have a look, have a look at the medical history of the patient to see what you're actually dealing with, have a look at the last two or three entries to see what's been going on or the treatment plan and there, you open it up and it's there, you know. On Lorenzo at the moment you've got to search for that.” (Interview, Healthcare Professional)

Secondly, as also observed in Site B, some users would delay recording data on Lorenzo, typing up notes at the end of the day as opposed to after or during each encounter. Several users also took notes on paper and transferred these onto Lorenzo afterwards.

“...it's very frustrating when if you're in a clinic with time pressures, you've got a patient sat there, you need to be getting on to treat them, you know, you might have another few in the clinic waiting you've got to be able to pull that up easily, deal with it. So what we're doing you see there is writing it all down and going into it when we have time later.” (Interview, Healthcare Professional)

Thirdly, users developed techniques to bypass the strict security arrangements imposed by the system. For example, in some clinics where two podiatrists treated the same patient, they tended to share SmartCards with one using the computer whilst the other

one interacted with the patient. In addition, and again also observed in Site B, SmartCards were often left in the computer, due to the long log-in times.

“Some of the high-risk clinics we’ve managed to get a little bit faster but then you’ve got two people working together so one can drive the machine and one can treat the patient, so, you know, you can, but then you’ve got the issue of who’s card is in the machine and who’s treating the patient and that’s, you know, I’m sure Caldicott would have something to say about that.” (Interview, Healthcare Professional)

Other techniques included performing another activity whilst waiting for the system (such as switching on the computer and making a cup of coffee), or inputting less descriptive data as this helped to speed up data entry.

As in Site B, users learned to compensate for persistent issues in system usability. For example, they allocated extra time at the end of consultations for correcting spelling mistakes, which were often not picked up by the Lorenzo spell-check function. The following observation notes illustrate this:

“Podiatrist now completes the clinical note and the scoring plan, ticks several boxes, quite quick, reads through her typing again to check the spelling, corrects some spelling mistakes e.g. typed “hwen” instead of “when”, prints form.” (Observation researcher notes)

Other ways of compensating for usability issues included *“tricking the system”*. Here, some users copied and pasted text from boxes they had completed previously, if Lorenzo did not allow them to move to the next item without filling out a free text box.

As in Site B, users also reported preferring the use of desktops as opposed to handheld devices. Desktops were perceived to be quicker and easier to use with a more familiar interface (including a mouse, a chair and a keyboard). Laptop use, on the other hand, was complicated due to a lack of space as clinics were often not designed with computers in mind. As a result, users in some instances had to input data standing up as

sitting down would have blocked the gangway. Some complained that this hurt their backs.

“...desktop machines are faster, you’ve got a bigger screen, you’ve got, just more usable, more comfortable and you’re not stood up like we are most of the time at a work surface with your neck bent right down trying to type. And of course depending on where the light’s coming through the window you can’t always see the screen and you’ve got to try and keep it confidential as well and there’s people walking behind you, it is a nightmare.” (Interview, Healthcare Professional)

Other issues mentioned at follow-up interviews were perceived as minor and mainly related to the way information was displayed (e.g. forms were too dark or buttons were cut off). Wave two podiatrists were still getting accustomed to using Lorenzo and reported that they needed some more practice. They did, however, not anticipate any major problems.¹⁴

6.3.3.4 Some fundamental tensions remained

Despite these positive developments over time, some fundamental tensions remained. As opposed to Site B, users in Site H tried to use Lorenzo during consultations. According to the PID (see Glossary), forms completed on the system were *“based on contemporaneous data entry”*. However, most users stated that simultaneous data entry whilst consulting was not feasible due to practical reasons (e.g. wearing gloves) and it was perceived to affect communication flow. For example, having to turn away from the patient to input data was reported to make the consultation more formal, resulting in patients being less engaged.

“It means that it’s almost like a barrier to communication because you’re having to take your eyes off that patient and break that communication to look down at a laptop or a computer and I don’t think that’s terribly professional...” (Interview, Healthcare Professional)

¹⁴ It has to be noted that wave two podiatrists had only been using Lorenzo for two weeks at the time of follow-up interviews.

Most computer-related activity therefore took place before the consultation (e.g. bringing up patient details on the screen) and after the consultation (e.g. entering notes). During the consultation, users tended to take notes on paper.

“What I’m doing at the moment is I write it down in rough, the major components and then when the patient’s gone then I go through the list and do type it all up. To me it’s a bit of an invasion of a patient’s privacy, because we’re consulting, if you’re talking to them and then you turn that way and you’re tapping in you’re not paying attention to them all the time whereas, you know, with notes you’re ticking as you go along and you’re keeping eye contact so I’m just taking rough notes and then afterwards typing them in, doing the assessment on Lorenzo then.” (Interview, Healthcare Professional)

I also observed some encounters where data were inputted into the computer during the consultation, but here conversations were structured according to the format of Lorenzo software that dictated the order in which questions were asked. In addition, the patient seemed to take a more passive role than in consultations where the computer was not used.

When trying to use the system during the consultation and depending on the physical layout of the clinic, some users inputted data onto a laptop whilst sitting next to the patient, whilst others used desktop computers. Working on desktops in larger clinics was particularly problematic; as the podiatrist often sat relatively far away from the patient, which impacted on communication patterns. This was more even more pronounced in patients who were elderly and hard of hearing. The following observation notes from a clinic illustrate this:

*“Ipm: patient on bed and p is on laptop, p to patient “I just want to update your notes as it has been a long time since we’ve seen you”.
P is asking patient questions through the room whilst pt on bed and p on desk on laptop ticking boxes, pt seems quite hard of hearing and asks p to repeat quite a few of the questions, have to communicate across the room, paper notes are next to laptop.”*
(Observation researcher notes)

“Podiatrist “do you smoke?”, patient “no”, podiatrist types the answers into the system (maybe they are partly completing it real time), podiatrist “eyesight ok?”, podiatrist asking questions whilst sitting on screen and typing, speaking loudly through room as patient old and hearing not very good and room is quite big, patient repeatedly asks “what” and podiatrist has to repeat question.

Podiatrist looking at some paper notes on the trolley next to the bed whilst talking to patient, rapport seems much better now and pt seems to understand better as not asking “what” anymore.” (Observation researcher notes)

Despite these difficulties, implementation team members continued to believe that the issue could be addressed with new technologies such as pens, tablet software, voice dictation and trolleys.

The second area of tension, much like developments described in Section 6.2.3.4, related to wider implementation progress. Despite having developed a system that worked locally, the length of time and resources required to achieve this resulted in re-consideration of strategic direction. There was thus a fundamental tension between local needs and national pressure to progress. Interviewees stated that the most important issue here was whether any uniform organisational change programme could be implemented across the complex web of different NHS organisations.

“Exactly, there is nobody at the top saying you will do this like this, everybody wants to do it their own way...we’re basically made up of hundreds and hundreds of organisations that hate each other and will not talk to each other, will not play ball together and if you’re going to call it red I’ll call it black just because you’ve called it red, and that’s what amazes me every day of the week... And if they’re all working the same way then IT can start working because IT is quite good in standardised environments but it’s not terribly good when everybody does things differently.” (Interview, Manager)

Similarly to Site B, this highlights the need for balancing implementation progress nationally with investments in making it “work” locally (which is resource-intensive).

6.3.4 Key themes

A wide array of potentially transferable theoretical contributions have emerged from this case study (Box 6.4), some of which overlap with those identified in Site B. They are discussed in detail in the following paragraphs.

Box 6.4: Key themes and tensions emerging from Site H

Technical dimension

- Lorenzo was perceived to be ready for further deployment at T2 but the national and local strategic direction was increasingly uncertain.
- There are trade-offs for either, developing a system that is fit for use in individual settings and developing a nationally shared product.
- Systems integration and benefits realisation (see Glossary) were perceived to be threatened by a potential new strategic direction.
- The larger the user base, the more benefits are likely to be realised but users are motivated by benefits.
- IT systems are unlikely to make individual care processes faster, but they may speed up overall organisational processes.

Human/social dimension

- Champions are vital and their influence should be harnessed.
- Data input at the point of care may not be possible as it seems to impact adversely on healthcare professional and patient interaction. Efforts may need to concentrate on teaching the use of IT systems in the patient encounter as opposed to developing new software that is likely to have similar problems.
- Buildings were often not designed with computers in mind. There is likely to be an increasing need to consider the logistics surrounding space when planning IT change programmes.
- There was no issue with engagement in this small-scale deployment with heavy user involvement in system design.
- The ongoing support from the IT Manager was extremely important, but

resource-intensive.
<p>Organisational dimension</p> <ul style="list-style-type: none"> • It may be difficult to implement one software system across the variety of different NHS organisations. • There was a difficulty planning for changes as the software was still in development. • The lack of senior management support resulted in a lack of commitment to deploy Lorenzo further. • It is important to find ways to “translate” between clinical and organisational perspectives.
<p>Macro-dimension</p> <ul style="list-style-type: none"> • National contracts seemed to inhibit implementation, as there was a perceived lack of local input in decision making as well as a perceived lack of software customisability. • There is a tension between implementing software at a variety of sites simultaneously versus getting the system functioning well at one site before moving on to others. • There was uncertainty amongst all stakeholders as to what would happen in the future, but government support was perceived to be important.

This second case study described how Lorenzo was developed by a small number of users over time to suit their requirements. A long period of development resulted in improved usability and a system that was perceived to be ready for further deployment. During this process, users had to change their work practices in order to accommodate the demands of the new system. This appeared to work relatively well over time, as both social and technical systems merged, with technology being developed to better meet social demands and users flexibly accommodating technical challenges. The relative “success” of this implementation was most likely due to the small scale, somewhat limited software functionality, long development periods with heavy user involvement,

effective local leadership and support, and positive attitudes of users who “*just got on with it*”.

However, despite these positive developments, some fundamental problems remained. One of these included the problem surrounding data input at the point of care, which, although intended by implementation team members, was not viewed as feasible amongst users. Despite accommodating the system over time, they still very much distinguished between administrative and clinical duties, seeing them as separate activities. The key question in this context is whether new emerging technologies are likely to resolve this, or whether efforts should instead focus on teaching how to use existing technologies without disturbing communication in patient encounters.

The long time needed to achieve alignment between social and technical dimensions on a relatively small scale characterised by intensive development activity, resulted in management reconsidering the sustainability of the implementation. In line with experiences of Site B, this was complicated by national arrangements and the ensuing time-consuming nature of technical change requests on the ground.

Despite these constraints, users were able to “co-create” the system to suit their needs, which most likely helped to ensure engagement and positive attitudes. However, one key question relating to the fundamental requirements of a national implementation remained: would Lorenzo be viewed as fit for purpose in other settings? There is clearly a need to balance these different requirements.

As in Site B, developments on the ground were further influenced by the intensified political pressure surrounding the implementation due to changes in strategic direction, increased spending cuts and re-negotiated national contracts. Making the software work on a small scale whilst at the same time having to show progress implementing beyond the service in question presented unique challenges. It seemed that over time the fundamental threat to implementation shifted from the initial sociotechnical challenges,

which were largely overcome, towards macro-environmental challenges beyond the immediate implementation setting.

Both sustainability and scalability of the small-scale successes were therefore barriers to larger-scale progress. For example, the implementation being supported by a dedicated member of contracted staff was one of the key facilitators in the short term, but the resource intensive nature of these arrangements meant that long-term sustainability had been under-estimated, resulting in resources being progressively withdrawn.

6.3.5 The status quo when data collection was completed

When I concluded data collection at this Trust, the future strategy, as in Site B, was uncertain. A strategic decision was to be made by management, influenced by local resources and national implementation plans. Management would either decide to continue with implementing Lorenzo and deploy it to other services, or replace it with another system. Either way, the Trust had gained significant internal expertise and developed improved technical infrastructure whilst implementing Lorenzo.

6.4 “It drives me mad so I just don’t do it” - case study of Site

Q

6.4.1 Introduction

My third case study describes findings relating to the introduction of Lorenzo R1 in Site Q. Data were collected between December 2009 and November 2010. They included 21 interviews with implementation team members and users, 4.5 hours of observations, and analysis of a range of primary and secondary documents. Details relating to data collection and analysis can be found in Chapter 5. A summary of data collected locally can be viewed in Box 6.5 below.

Box 6.5: Summary of data collected at Site Q

- 21 interviews with hospital staff with a total of 20 different interviewees: six operational staff and 14 users
- 4.5 hours of observations and associated field notes of staff using the software
- Researcher notes from the recruitment meeting
- 12 pages of documents from press searches
- Trust documents including: PID, two Deployment Verification Reports, Lessons Learned Report
- 14 pages of researcher field journal

My data provide an in-depth insight into the implementation of Lorenzo R1 as part of the NPfIT through the LSP route in the first mental health Trust ever. The journey was characterised by somewhat limited software capability but a relatively large user base from various professional backgrounds, resulting in uniquely complex challenges. As in the other case studies, I will begin by setting the scene of the implementation (Section 6.4.2), followed by a discussion of five over-arching themes emerging from my analysis (Section 6.4.3), a summary of potentially transferable theoretical contributions (Section 6.4.4), and the remainder briefly touches on the state of affairs at the time I completed data collection at this site (Section 6.4.5).

6.4.2 History and context of Site Q

6.4.2.1 The profile of the Trust

Site Q, a mental health Trust, was established in 2002 and provided day care, inpatient care and community services from over 80 locations for a population of approximately 938,000. It employed around 2,100 staff and had a budget of £100million per year. The Trust gained Foundation status in 2009 and had its services commissioned through five local PCTs. Services were divided into Children and Young People, Adult, Older People, Learning Disabilities, and Forensic Services.

During my study, it became apparent that record-keeping in the mental health setting significantly differed from other care settings (including Site B and H discussed above). This seemed to be due to different characteristics of consultations, where communication was extremely important, sessions tended to last longer, and both paper and electronic notes were narrative in nature. Similarly, there was often a close working relationship with social services and a range of complex cases were managed by a variety of different parties often over several years.

6.4.2.2 Site Q, the National Programme and Lorenzo software

Much like the other two Sites described above, the Trust implemented iPM before Lorenzo. The Trust Board approved a five year strategy to replace iPM and another existing clinical system with Lorenzo in September 2007.

Site Q was the first mental health Trust to use Lorenzo and the fourth Trust to ever use the software. It went live on the 28th of September 2009 with R1 and deployed to all five community teams of Children and Adult Mental Health Services (CAMHS). CAMHS was the smallest service and therefore strategically chosen so that any emerging issues could be resolved before implementing in the larger services.

There were initially about 140 end users, the largest user base of Lorenzo R1 anywhere at the time (compared to one ward in Site B and nine podiatrists in Site H). This was still the case when I completed data collection at this Trust. Users consisted of a range of different staff groups including Nurses, Psychiatrists, Psychologists, Administrative Staff/Medical Secretaries, Occupational Therapists, Family Therapists, Counsellors and Social Workers.

The Trust went live comparatively quickly, rolling out R1 over five locations in a period of two weeks. Despite this, the go-live came to many as somewhat of a surprise as not much had been reported in the media about this site beforehand. This is in stark contrast

with the high profile and often publicly reported and scrutinised Lorenzo deployments in other Trusts (as discussed above in relation to Site B).

According to the PID, Lorenzo was planned to be implemented by 2010 to achieve the “*vision of a single Trust-wide computer system*” (Interview, Manager). The first stage of the project included the following functionality (please also refer to Chapter 1 and the Glossary):

- Core Lorenzo: electronic patient record views, limited task management functionality and patient lists
- Risk Indicator Assessment Form: a CDC form completed at initial patient contact
- Progress/Activity Notes
- Electronic Discharge Summary¹⁵
- Translator Request as part of the Request and Results (R&R) functionality
- Order Communications for Pathology.

At the time of my data collection, core Lorenzo functionality, risk indicator assessment forms and progress notes were used. At follow-up interviews, the functionality of the software had not been expanded but the Trust operated business as usual (see Glossary). R1.9 implementation was planned for March 2011, with an anticipated user base of 1700, and R2 functionality for September 2011. A detailed implementation timeline can be viewed in Table 6.7 below.

¹⁵ The target time with paper notes was seven days to reach the referrer. This is similar to the 18 week target in the acute setting.

Table 6.7: Detailed implementation timeline at Site Q

Date	Event from Trust documentation and interviews	Planned event from Trust documentation and interviews	Publicly available documents (press statements)
November 2005	Trust implemented iPM		
September 2007	Trust Board approved implementation of Lorenzo		
May 2008	Work on R1 risk indicator assessment form began		
October 2008	CAMHS went live with iPM as the first service in the Trust		
April 2009		Planned go-live Lorenzo R1 in CAMHS	
June 2009		Deployment verification (see Glossary) to assess the “success” of the new solution against a set of pre-defined verification criteria	
July 2009		Planned go-live Lorenzo R1 in community homes health team and inreach-outreach	

		deployment	
28th September 2009	CAMHS went live with Lorenzo R1		
9th October 2009			Site Q goes live with R1
December 2009		Planned go-live Lorenzo R1.9 in all services	
January 2010		Planned go-live of Lorenzo R2 at Older People, Learning Disabilities, and Forensic Services	
February 2010			Site Q has 43 “regular users” of Lorenzo
June 2011		Planned go-live of Lorenzo R3	
October 2011-April 2012		Planned implementation of Lorenzo R4	

6.4.2.3 The Trust’s decision to become a Fast Follower

As opposed to Site B and H, who were both EAs, Site Q was a so-called “Fast Follower, which meant that it did not receive the £1 million incentive issued by NHS CFH. Nevertheless, the decision to remain one of the first to implement Lorenzo software was pursued. Like Sites B and H, Site Q was keen to influence the design of the system to suit their needs, and viewed Lorenzo as an opportunity to improve existing systems and business processes. For example, their legacy system (see Glossary) needed replacing as it was too costly to maintain.

The Trust had considered adopting RiO, the NHS CRS software implemented in the London area, but concluded that Lorenzo would be preferable as RiO was a legacy system and had, compared to Lorenzo, limited functionality. Another advantage of Lorenzo was perceived to be the fact that it had the potential to be developed whilst RiO was “hard-coded” (meaning that it was more difficult to change).

6.4.2.4 The composition of the implementation team and external support

As in the other two case studies outlined above, the implementation was managed jointly between Trust staff, CSC and NHS CFH. However, as opposed to the other Sites, who involved subcontractors and a range of staff from CSC and NHS CFH, the most substantial part of the implementation team at this site consisted of staff employed by the Trust itself. Core team members are summarised in Table 6.8.

Table 6.8: Core implementation team members at Site Q

Title	Responsibilities/Details
Senior responsible officer	Making key decisions and reporting to the board
Senior responsible clinician	Working with the senior responsible officer
Informatics Director	In this case did not sit on the board and was represented by the Director of Finance
Programme Manager	Responsibility for Lorenzo project and related IT projects
Implementation Project Manager (R1)	Responsible for responsible training, support desk and day-to-day management (CSC)
Implementation Project Manager (R2)	Responsible for training, support desk and day-to-day management (CSC)
Education Training and Development Manager	
Head of Information Management Services	

Service Desk Manager	
Two Product Specialists CSC	Advising on system capability and supporting future business process maps for both iPM and Lorenzo
Head of Service/Clinical Champion	Representing interests of clinicians and responsibility for clinical engagement
Business Change Lead	Communication and engagement, benefits realisation and business process redesign
Infrastructure and Data Project Manager	Responsibility for infrastructure, interfaces, data cleansing, data migration, data extract and testing
Change and Access Project Manager	Training, registration, support desk, business change and overall implementation
Service Benefits Lead	Supporting local ownership of business process redesign and responsibility for ensuring benefits realisation was owned and managed by the service
Organisational Development Lead	Developing the teams to enable them to implement and own the changes agreed after go-live

The Head of Service and was seconded to take the role of the Clinical Lead for a period of nine months full-time. When my interviews began, this secondment period had finished and they were back in their substantive role as Head of Service, with another Clinical Lead having taken their position.

6.4.3 Sociotechnical processes of change

6.4.3.1 The consequences of national arrangements for local implementation activities

Due to this Trust being a Fast Follower, as opposed to an EA, the arrangements and motivation to implement Lorenzo tended to differ from the other sites (as mentioned in Section 6.4.2.3 above). Most importantly, the Trust had to draw mainly on internal resources to implement the software as they did not receive a DIF. All members of the implementation team worked for the Trust full time and no external contractors were

employed to support the implementation. This was viewed as important as it meant that the Trust could retain developed expertise.

“But up to what we’ve done now I mean we’ve had quite a successful run so far in as much as A) we’ve used operational staff so we’ve not brought in loads of contractors and the knowledge is going to disappear cause of course we need people in our operational services to be able to take this up and run with it...” (Interview, Manager).

Implementation team members’ existing networks (both governmental and commercial), skills and experience meant that the implementation initially appeared to proceed relatively smoothly. The Site had, at the time of my study, the largest user base of R1 in the country over an extended amount of time.

However, the implementation team had to operate within the constraints of the National Programme, which have also been outlined in relation to the other two case studies above. Here, as discussed in Sections 6.2.3.2 and 6.3.3.2 above, the fact that the software was still in development resulted in a difficulty planning for business change.

“But ultimately for me it was a case of we didn’t, the main issues for me from a clinical perspective is we had to do business processes without a system, I’d never repeat that again and I would say that to, I don’t care who it would be, even if it was the chief exec of the Trust I would be saying you get me the product then, you can influence, you get me the product and then I’ll do it.” (Interview, Manager)

Similarly, as was the case in Site B (Section 6.2.3.4), this also contributed to a perceived lack of adequate training and support environment for staff, who missed the opportunity to *“play around with the system”*, and commented that there was a general lack of knowledge of the product nationally (see also Section 6.3.3.1).

As also discussed in Section 6.2.3.5, the fact that the Trust implemented a national product meant that they had limited input into system design as changes to the software could only be made within the constraints of national contract. As a result, stakeholders

stated that they were somewhat powerless due to a perceived lack of input in decision making.

“...the bottom line is that input has been defined within a national contract, it doesn't matter how much I complain about it, it doesn't matter how upset and annoyed CSC may be about it, the fact is it's subject to a wider contract and I think until that, until some of those issues are addressed...how did we arrive at the situation where the supplier is the one that's responsible for the plan and the contract...we were told by the SHA well you're not going to get anything else because you're not the customer.” (Interview, Manager)

Although support from NHS CFH and the SHA was perceived as valuable across case study sites, stakeholders in Site Q argued that these parties paradoxically inhibited local implementation progress as they acted in the interest of the overall national strategy. Consequently, the sharing lessons with EAs was viewed as difficult (as also discussed in Section 6.2.3.4), and national resources were perceived to be centred on Trusts that had the highest political profile (which was stated by managers to include Site B) as opposed to those that had made most progress. As in the other case study sites (see Sections 6.2.3.4 and 6.3.3.4), it was argued that the system should be made to work “*properly*” in one site before attempting wider roll-out.

“I think that, yeah, I mean my view at the time of being in the project was that basically as a Trust I think we were ignored by most because all the focus was on Early Adopters. But if you actually look at our deployment we actually deployed without any support from Connecting for Health, they were not involved in our testing cycles. We went down to one issues management clinic, our project manager would liaise with them as appropriate [...] so it's not as though they ignored us completely but in terms of offering us additional support we didn't get any of that yet we have been the largest deployment for Release 1, you know, across a range of professions, across a range of geographical locations and we did that without them...” (Interview, IT Manager)

As discussed in Section 6.2.3.4, the political profile of implementations was often intensified by press coverage. Site Q therefore deliberately distanced itself from media attention in order to keep external pressures to progress to a minimum.

6.4.3.2 Lack of implementation progress over time

During my 18 months of data collection, Site Q remained relatively static in terms of overall implementation progress, having approximately the same user base and functionality. Similarly to developments in Site B (Section 6.2.3.1), this lack of observable progress seemed to contribute to increasingly negative attitudes amongst both implementation team members and users, as the software did not deliver as expected.

“The main issues going is forward around, obviously we had problems with the late delivery, the thing was two years, maybe three years behind schedule so we were doing things now we should have been doing two or three years ago. It’s just the level of confidence in whether we can get all the clinical documents that we need for mental health actually ready in time for when we need them, so if we need them in 18 months time we don’t have the confidence that they’re going to be there and we’ve mitigated the risk as best as we can and we’ve got fall back arrangements but that’s the biggest problem, it’s just a confidence as to whether we can develop the documents and they’d be fit for purpose in time.” (Interview, IT Manager)

Much like in the other case study sites (see Sections 6.2.3.1 and 6.3.3.2), this was coupled with an increasingly strained relationship with the LSP, which was perceived to lack specialist knowledge of the software, understanding of business processes, and project management skills.

“For instance when we first started mapping for 1.9 we had a project specialist who we’ve still got now that was sent in who was the only resource available, he’d never done any future step mapping before, he’d never been a product specialist in a large trust before and we had a big problem there because we’ve got the experience that’s coming now, with a second product specialist and she came in probably about seven weeks ago now and had we have had her knowledge right at the beginning then we wouldn’t be in, having to review these maps to the extent that we are. But to send into a large trust like us a product specialist that has not got any experience and for him to be told that you’re learning on the job, quite honestly I don’t think that’s good enough.” (Interview, Manager)

Over time, implementation team members became progressively more frustrated with the lack of on-site LSP resource, which may have been due to the fact that an increasing

number of Trusts were going live and resource was diverted. As a result, Managers stated that they had to be “*pushy*” to ensure the Trust would get adequate support, particularly in relation to incorporating locally requested software changes (also see Sections 6.2.3.1 and 6.3.3.2). Perhaps as a result of this, and similar to Site H (Section 6.3.3.2), there was also a mounting feeling that a closer working relationship with iSOFT may have accelerated software development.

This frustration and delay seemed to cascade down to users, who were increasingly losing faith in the local implementation.

“Yeah when we go to Version 1.9, it merges. I think it’s due March yes. There’s a hat over there I’ll eat it if it happens but yeah I think it’s due March which should be interesting.” (Interview, Healthcare Professional)

As in the other case study sites, despite a general support for the basic EHR vision regarding perceived potential future benefits, there was increasing uncertainty surrounding the political direction of the Programme (see Sections 6.2.3.4 and 6.2.3.2) and mounting doubts amongst all local stakeholders as to whether Lorenzo was the right means to achieve the vision (Sections 6.2.3.1 and 6.3.3.1). Some also questioned the appropriateness of the large-scale “top-down” strategy and argued that the “*one size fits all model*” may not be appropriate (see also Section 6.2.3.5). Instead, it was argued that a strategy with a focus on interoperable systems complying with standards and allowing more local autonomy in decision making may be more effective in the long-term.

Uncertainty, frustration with the lack of progress, and progressively more negative attitudes were exacerbated by an increasing number of Trusts “*pulling out of the Programme*” and the often publicly debated implementation problems at EA sites (including those relating to Site B). However, in the short term, the Trust planned to continue “*with business as usual*”, whilst considering alternatives to Lorenzo as a “*back-up plan*”.

“Well there’s obviously, what’s making it difficult is, well obviously we are a fast follower rather than an Early Adopter and it would appear that there seems to be a major lack of confidence in the product because of the issues that have happened at [Place Name] and [Place Name] so, you know, at the same time as doing this project we’re looking at are there any alternatives because do we want to stay on the Lorenzo bus if you like because so many other Trusts have pulled out.” (Interview, Manager)

Pursuing this short-term strategy of continuing business as usual seemed somewhat easier for implementation team members than for users. As described in relation to Site B (Section 6.2.3.3), there tended to be different foci amongst these stakeholder groups. Users tended to be more negative and struggled to find any immediate benefits, with some feeling that the system was a *“means of managerial control”*, as current benefits were perceived to be mainly managerial in nature. When prompted, they mentioned improved legibility and accessibility of information as current benefits, but expressed that these could have been achieved with any IT system. Desired features included integration of Lorenzo with the SCR (also mentioned in Site B) and social care.

6.4.3.3 Accommodating Lorenzo in everyday work

Similar to users in Site B and early experiences in Site H, users in Site Q perceived the system to be *“cumbersome”*, *“time-consuming”*, *“clunky”*, as *“not fit for purpose”*, and as *“not user friendly”*. Some stated that as a national solution, Lorenzo was simply too complex *“trying to be too many things to too many people”* (see also Section 6.2.3.5). As a result, a lack of attention was paid to individual user demands.

Several issues seemed to underlie these impressions. Firstly, as already outlined in relation to Sites B and Q (Sections 6.2.3.1 and 6.3.3.3), Lorenzo was used in parallel to paper and other electronic systems, which resulted in perceived duplication of work. This was likely to attenuate with increasing releases of the software, but for the interim the Trust outlined desired ‘workarounds’ for users. According to Trust documents, these included:

“...printing of Lorenzo notes and attaching these to paper files, creating written notes if there are issues with electronic notes (i.e. paper used as fallback), removing and re-inserting the SmartCard [in order to switch between Lorenzo and iPM as these could not be opened in parallel], closing and re-opening forms, and looking up items in iPM if they were not displayed in Lorenzo”.

Users reported frequently using these desired ‘workarounds’, but they were naturally viewed as time-consuming and as increasing workloads. Printing documents was perceived to be particularly problematic, due to the number of mandatory screens and buttons associated with this activity. One interviewee described the process as consisting of the following steps (in the words of the interviewee):

- *“You say print document and the thing comes up on the screen*
- *Then you hit print document and finish*
- *That [screen] goes off*
- *Another one [screen] comes up*
- *You have to hit local and local printer*
- *Then a print screen comes up*
- *You hit properties and go into flip both sides*
- *Then you hit print*
- *Then you come out of it altogether”*

(Interview, Administrative Staff)

Secondly, and again also reported in the other case study sites (see Sections 6.2.3.2. and 6.3.3.3), there were basic performance issues mainly relating to slow speed. These were actively addressed by the implementation team over the period of my study, resulting in some, but according to users not significant, improvements over time. They included the following:

- **Display of incorrect information:** This included, for example, templates not displaying despite having been created, a closed referral showing as open, and display of the wrong address.
- **Issues with printing:** This included, for example, slow printing, inability to print, or form fields appearing as populated on the screen and printing blank. Users also highlighted that the layout of printed forms was inappropriate as these had many blank spaces and were difficult to skim-read.

- Loading of screens was perceived to be too slow.
- Freezing screens: Some users reported that Lorenzo was “*not responding*” and that they were “*being thrown out of the system*”. This was particularly often experienced in relation to the spell-check functionality. Users tended to attribute these issues to Lorenzo itself, but implementation team members stated that freezing of screens may be due to the Trust’s infrastructure (e.g. bandwidth, see Glossary).
- Issues with the spell-checker: When users inputted clinical notes, they reported that the Lorenzo spell-check functionality would “*jump formatting*” and insert double spaces at inappropriate places. They also reported spending an “*unreasonable amount of time waiting for it to type each letter*”.

Thirdly, users maintained that there were fundamental problems with the way the system was designed and integrated with their work. These were to some extent also experienced in the other case study sites (e.g. see Sections 6.2.3.1, 6.3.3.2, and 6.3.3.3). Implementation team members did not actively address these issues, as they concentrated on the more basic performance of the system. According to users, these problems included the following:

- Mandatory screens and buttons: Users reported having to press a number of mandatory screens and buttons when navigating Lorenzo, making the application “*long-winded*”.
- Layout of electronic forms: Certain items on forms were viewed as inappropriate and/or repetitive, yet mandatory; leading some to conclude that completing the electronic record was a “*tick box exercise*”. For example, questions on the 11 page long risk indicator assessment form had to be completed even if there was no apparent risk to a patient. Some of the questions were also not viewed as appropriate for children, such as those asking whether a nine year old girl was pregnant.
- Language: The language in the system was not consistent, which contributed to a perceived lack of intuitiveness when browsing.

As a result of the issues outlined above, using Lorenzo was viewed as time-consuming resulting in more, and particularly administrative, work for users. Some quoted that activities would take up to five times as long.

“Somebody rang me, 5-10 minutes on the phone, and it takes you, one time it took me over 50 minutes to do it all because it’s a phone call, going downstairs to get the file cause you still have to have the file, finding the file, bringing that up then logging on, waiting, cause I just did this one thing and then putting it all on, trying to print it and it took 50 minutes and that was just a patient had rang me to say that they needed to cancel the session (laughs).” (Interview, Healthcare Professional)

Consequently, users compensated to accommodate the system within their everyday work. Many of these ‘workarounds’ were also observed in Sites B and H (see Sections 6.2.3.2 and 6.3.3.3), and, in relation to Site Q, included the following:

- Delayed data entry (also observed in Sites B and H): As the software was perceived as slow and users were busy, notes were often inputted at the end of the day, or in some instances days after the consultation had taken place. The fact that clinical staff used desktop computers to record information may have contributed to this, as it meant they were less flexible in terms of where notes could be written. Paper notes were frequently used, both during consultations and as reminders when inputting data into the system. As in Site H, clinical users commented that simultaneous data input whilst consulting was not feasible.

“He then puts the SmartCard into the keyboard and picks up a folder of patient notes on his desk, on top of the folder is a small notepad page with some scribbles on it, he then looks at his paper diary (like a book and full of scribbles) and looks up when he saw the patient, “ah 2pm on Friday” (it’s Monday today), he says that he jots down notes on paper “to jog my memory”, it is a girl with an eating disorder” (Observation, Healthcare Professional).

- Using Lorenzo as little as possible (see also Site B): This, for example, included looking up previous treatment notes on paper as it was perceived to be easier to browse than Lorenzo. Some users also skipped Lorenzo entries altogether,

especially when they perceived the activity to be recorded not to be important (e.g. a patient phoning up to confirm an appointment).

“I fill about 5% of Lorenzo in and the other 95% just doesn’t get done because I just emotionally can’t bear to try to do it cause after 15 minutes I just want to throw the computer out the window, it drives me mad so I just don’t do it.” (Interview, Healthcare Professional)

- Cross-referencing to paper files: If electronic forms were too laborious to complete, some users entered “refer to paper file” to avoid duplication of work and entry of the same information into multiple systems. This was in some instances perceived to be a potential safety issue.

“So you end up, because you can’t cut and paste so you can’t say look OK this is the same let’s cut and paste it into here, you end up having to write it multiple, multiple times or you end up having to cross-reference and I actually think it is safer for the child to have all the risk stuff clearly and concisely written in one place. The nature of the form means that one place isn’t the form so I actually write it very clearly in the progress note or the assessment form and I always in the boxes that open up I just put please refer to... form, which then increases the amount that the risk indicator is a tick box exercise.” (Interview, Healthcare Professional)

- “Lumping” of administrative activity: Users tended to “lump” administrative activity in order to avoid going through the lengthy log-in process multiple times. Again, this contributed to delayed data entry.

“The length of time it takes to actually get that note in there is just such hard work and you end up lumping things together because you think I’m not going to open it up again and put a second phone call in, you know, I’ll do it a day later when I’ve done three calls that day and just throw them all in together. I end up keeping a paper note to prompt me because I haven’t got time. I tend to do it all in one big chunk, so I end up doing a paper note saying, you know, don’t forget to write these up. You go in and think right rather than do separate Lorenzo’s for these two phone calls I’ll throw them all in one which works better.” (Interview, Healthcare Professional)

- Planning for a slow system (see also Site H): Some users stated that whilst they waited for pages to load, they tended to complete other tasks such as making a cup of tea or making a phone call.

“Yes you might take a phone call or do some other paperwork, some writing or sometimes you’re just sitting there waiting.” (Interview, Healthcare Professional)

- Using other systems to compensate (see also Site B): As the Lorenzo spell-check and formatting functionality was perceived to be poor, some used Microsoft Word to draft their documents and then copied and pasted them into Lorenzo.

“Yea. It is so laborious, so it’s much quicker to go into Word, write it in word and then copy and paste it... For me if I’m writing something really long I need to be able to think as well and it’s hard to then go back and read it right through, I mean I do but I tend to scan it in a way just to see that it makes sense and like you said Word will correct it for you, so it takes half the...” (Interview, Healthcare Professional).

- Leaving SmartCards in terminals (see also Sites B and H): Despite the fact that computers were located in a locked office, users were instructed to take their SmartCard with them when leaving their desk. However, this did not always happen due to the lengthy log-in process.

“Leaving it in the computer you can only, with Lorenzo it does happen yes because people don’t want to keep logging in...you can’t get in our office without a pass so who you work with is going to steal, they’ve got their own SmartCard, why would they want... I could understand if you was where the public were and they could get at your desk yeah but I think where it’s just clinical staff I don’t think you need to.” (Interview, Administrative Staff)

Altogether, it seemed that whilst implementation team members concentrated on addressing more basic performance issues, some “softer” usability problems were not necessarily considered. However, these tended to be most distressing for users as they were not anticipated to disappear with increased functionality, or to be addressed by the implementation team. This may have contributed to negative feelings and may have demotivated staff using the system.

As a result of usability problems in Site Q, I observed several unintended effects. These included the following:

- The effect of Lorenzo on paper: Due to the limited capabilities of the system, paper was still viewed as the primary record. However, its use had somewhat shifted towards being a proxy for Lorenzo entries. For example, paper notes were often kept as reminders of what had to be inputted. Users also expressed that, since the introduction of Lorenzo, paper records were more distributed throughout the care setting, as different users would take them to their desks to attach the Lorenzo print-outs. This in turn resulted in staff having to increasingly “*chase*” paper records in order to find files.
- Consequences for the nature of notes: Users stated that electronic notes were “*more formal*” and shorter. Some argued that this meant they were “*more to the point*”, whilst others stated that Lorenzo notes lacked detail.
- Delayed data entry into the system meant that Lorenzo was often “*not as up-to-date as paper records*”.
- Knock-on effects on other activities: As users spent an increasing amount of time entering electronic data, lower priority activities would often not get done (e.g. filing).
- Consequences for the time spent with patients: Some users stated that, since the introduction of Lorenzo, they spent less time on clinical activities and more time “*doing admin*” and “*battling with the computer system*”. The increased time spent in front of the computer negatively affected job satisfaction.

6.4.3.4 Fundamentally different viewpoints within the organisation

Despite increasing frustration over time amongst all, it was striking how managerial and user interviewees had fundamentally different viewpoints, particularly in relation to implementation progress. This was most apparent at T1 interviews and seemed to be deeply rooted in a lack of insight into the others party’s world, as well as different assumptions and expectations. As can be seen, there were some parallels with Site B, as described in Section 6.2.3.3, where I discussed the different foci amongst diverse organisational stakeholders. I will discuss a few areas of tension identified in Site Q below.

Measuring “success”

Managers tended to express that the implementation had, at least initially, progressed relatively well, measuring “success” on the fact that users were, despite some “*moaning*”, using the system in their everyday work. The implementation team worked extremely hard to implement Lorenzo with the vision in constant focus, as they wanted the system “*to work*” feeling it “*would be shame [to abandon it] after all the effort and time and resource that’s gone into it*”. (Interview, Manager)

Conversely, users struggled to accommodate Lorenzo in their everyday work, feeling that it was not fit for purpose, increased stress levels and contributed to generally low morale in the Trust.

“It just feels like there’s a system been introduced that actually hasn’t been introduced to marry what goes on here, here’s a system, this is what we do now you follow, get yourself organised into the system rather than let’s see if the two can compliment each other. Because if anything this is against our work, it’s not aiding at all.” (Interview, Healthcare Professional)

Some users even stated that they “*hated Lorenzo*” and that it was a symptom of the general mounting pressure on the Trust to curb spending as well as a sign of the increasing “*bureaucratisation of healthcare*” (as also expressed by users in Site B, see Section 6.2.3.1). They tended to measure “success” on the lack of observable benefits to themselves and patients (as discussed above), which was coupled with a feeling that the system increased workloads and did not visibly improve over time. However, resisting was not an option for most as use was viewed to be a “*directive from the Trust*”. Despite my active effort to sample more positive users, conflicting views remained.

“It’s a fairly universal thing really. I do not know of a clinician anywhere that isn’t struggling with it.” (Interview, Healthcare Professional)

It therefore seemed that the means managers used to measure “success”, namely based on use itself and managerial benefits, resulted in negative attitudes amongst users as use

was compulsory resulting in low morale and feelings that the system was a symptom of managerial control. The underlying tension involved assessing to what extent users needed to be initially “forced” to use the software in order to realise future benefits, and at what point unhappy users over an extended period of time meant that Lorenzo was simply not fit for purpose. This was, however, complicated by the fact that the Lorenzo application was immature and therefore it could be argued that it would not be fit for purpose until it was fully developed.

Assumptions and expectations

There further seemed to be a divergence in the fundamental assumptions and expectations of managers and users. These included the following areas of tension:

- How the system integrated with care activities: Here, implementation team members stated that the implementation was an opportunity to re-design existing business processes whilst users expressed that the system should “*fit in with what we do*” (see also Site B Section 6.2.3.2).
- The implementation strategy: Managers stated that they intentionally began implementation in the smallest service in order to tease out any emerging problems before commencing further roll-out. Users agreed that a stepwise implementation strategy introducing incremental parts of functionality was appropriate, but some stated that piloting should have been done on an even smaller scale.
- Internal resources: Users maintained that they would need additional resources in order to cope with the increased pressure associated with use, mostly expressed in terms of “*more time*” and “*more staff*”. Managers, however, stated that internal resources were adequate. In this context, particular tensions were apparent in relation to administrative capacity. Senior Psychiatrists stated that they needed administrative staff to input their notes into Lorenzo in order to free up time for clinical activities. However, administrative staff maintained that in order to achieve this, the administrative capacity would need to be increased, which was not the case.

- **Standardisation:** Whilst some implementation team members argued that mental health settings were more standardised than other care settings, users stated that standardisation was particularly difficult here as cases were often highly individual and involved a large number of disparate staff groups.

There was clearly a need to align these diverse perceptions in order to achieve an integrated approach to implementation. My findings indicate that different assumptions and expectations between the two parties resulted from a breakdown in communication, leading both to somewhat “pull” into different directions.

Engagement and communication

Perhaps partly due to the relatively large-scale of the implementation, users also often stated that they were not listened to, whilst implementation team members maintained they had done everything in their power to ensure that staff’s concerns were addressed.

“But I’ve had a lot of frustrations with it and continue to have. I don’t really feel, cause we’ve handed information through the system to the Lorenzo representative [each team has one of these to feed back problems], I don’t really feel any changes have been made really, I don’t know no, there was a slight change to the template.” (Interview, Healthcare Professional)

The perceived lack of user engagement may be due to the way they were represented at managerial levels. A Clinical Lead was present and highly valued in ensuring that the design of the system reflected the reality of clinical processes. In line with this, and similarly to Site H (Section 6.3.3.1), the Clinical Lead viewed their role as providing a link between management and clinicians. However, they were not an active user of the system and only represented a fraction of the user base, namely the more senior consultants. Therefore, the implementation team may have had a distorted picture of attitudes and concerns amongst the more frequent, and not necessarily clinical, users.

Similarly, implementation team members may have had a distorted picture in relation to the extent of problems experienced (also described in Site B Section 6.2.3.1). For

example, users expressed that logging software issues added to their workload as calling the helpdesk in some instances literally took “hours”. As in Site B, this may have led to certain problems with the software not being reported. Some users also indicated that there was “no point” reporting issues that support was already aware of, such as the slowness of the system.

“...we know we’re supposed to report all the errors but if you’re struggling with a system that puts you behind in your work then you’ve got to find extra time to report things and it’s stuff that isn’t happening occasionally it’s happening every time we log onto Lorenzo. You end up either not reporting it because it’s just normal to you or not reporting because you simply don’t have the time and energy. So I think the helpdesk have had less calls than they technically should have done... Yeah I think they have a micro-picture but not the full picture of what it’s actually like.” (Interview, Healthcare Professional)

6.4.4 Key themes

A wide array of potentially transferable theoretical contributions emerged from this case study, which are summarised in Box 6.6 below. Some of these overlap with findings reported in case studies B and H above. They are discussed in detail in the following paragraphs.

Box 6.6: Key themes and tensions emerging from my analysis of Site Q

Technical dimension

- There needs to be a balance between user input in design and a solution that organisations can work with to plan business changes.
- Local configuration was limited due to the national nature of the software – some local requirements may therefore not have been addressed.
- Observable benefits for users are important to encourage use.
- As the system was still in development, some fundamental usability issues existed.
- The Trust implemented a “half-finished” solution and users developed ‘workarounds’ for issues that may not necessarily persist in the future.

Human/social dimension

- All stakeholders supported the basic vision, but the product was not perceived to have delivered.
- There were significant differences in attitudes and perceptions amongst implementation team members and users.
- Usability issues resulted in increased workloads for users.
- Some issues of integrating the software with existing work practices were likely to attenuate but not others.
- There were also some “softer” issues with usability where staff needed to use ‘workarounds’ to compensate. These ran deeper and were not necessarily addressed/prioritised by implementation team members although being most worrying for users.
- Users suggested that Lorenzo was a symptom of the increasing bureaucratisation of healthcare and benefits were mainly managerial in nature. There were no perceived direct benefits to users and patients.
- There were different views between implementation team and users in relation to engagement. Engagement of all staff groups was difficult as there were so many in this setting.
- The lack of knowledge of the system may have resulted in inadequate support.
- The Clinical Lead was not an active user and did not represent all user groups.

Organisational dimension

- Issues surrounding the creation of standardised processes created areas of tension.
- There were different views amongst users and implementation team members in relation to implementation scale.
- The system did not exist so planning for training was difficult. The large user base and a lack of knowledge of the system meant that training was not perceived as appropriate.
- There were different definitions of resources amongst staff and implementation

team members: staff focused on capacity, whilst the implementation team focused on funding.

Macro-dimension

- NHS CFH was increasingly viewed as inhibiting local implementation.
- Commercial and contractual arrangements were perceived to inhibit local progress and sharing of lessons between Trusts.
- The national allocation of resources was diverse and often not tailored to Trusts and progress.
- The national implementation was viewed to result in a lack of local autonomy.
- The lack of political direction and the economic recession resulted in uncertainty in relation to the future direction. There was an increasing lack of belief in the product and the national implementation strategy over time.
- There was an increasingly strained relationship with the LSP.

As in Sites B and H, despite all stakeholders supporting the vision of an integrated national EHR, there were increasing doubts as to whether this could be achieved within the constraints of the national strategy and the software in question. In particular, the progress of implementation at this Trust was somewhat hampered by a lack of national resources, slow product development, and specialist product expertise.

Developments led to frustrations amongst all stakeholders, but particularly users, who had to use software that was not fully developed, not fit for purpose, and did not bring any observable benefits over an extended period of time. In many ways, the software increasingly dominated the way they worked, resulting in some undesired ‘workarounds’ and unintended consequences for recording activity (e.g. delayed data input), job satisfaction and patient care (e.g. less time spent with patients). Many unintended effects were likely to attenuate to a degree over time with increasing software functionality, an expanded user base, and more embedded use. However, some of these effects were

likely to remain, particularly when considering the immaturity of Lorenzo in relation to usability.

Differences in perceptions between implementation team members and users were particularly striking at this Trust, possibly due to the uniquely complex nature of the mental health setting. These may be the result of fundamentally different assumptions and expectations as well as a lack of communication between the two groups. Whilst the implementation team measured “success” in relation to use, users argued that it should be measured on the basis of observable benefits. Communication between the two parties was somewhat hampered by the lack of effective “boundary spanners” who could translate between the two worlds. However, this may also be due to the scale of the implementation, as active user engagement on a large scale is by definition extremely difficult.

Investigating the first implementation of Lorenzo into the mental health setting also raised unique challenges, associated with both data entry and the feasibility of a national solution to suit different needs. In this setting, a range of diverse staff groups were required to use one IT system in an extremely sensitive environment. Challenges of using computers during the consultation observed in Site H were therefore exacerbated. Based on my findings, the extent to which computers will ever fit in with the deeply personal relationship between patients and mental health staff is questionable.

6.4.5 The status quo when data collection was completed

As in the first two case studies, the future of Lorenzo at this Trust was uncertain when I completed data collection, being primarily dependent on the future strategic direction of the government. The ability to obtain adequate national resources to support local implementation, faster software development cycles, and additional specialist support were identified as necessary to pursue the Lorenzo route as otherwise the Trust was forced to consider an alternative system. As in the other two case studies, implementation team members expressed that they had developed significant internal

expertise that would facilitate effective implementation of either Lorenzo or a different system.

6.5 Chapter summary

I focused on exploring the views and experiences of users as well as organisational consequences of introducing Lorenzo and how these evolved over time in the complex environment of a national EHR implementation.

Overall, the three case studies have illustrated very different stories of sociotechnical change unfolding over time within their complex individual contexts. Although these stories were to some extent different, reflecting local contingencies, there were also several similarities, not least the fact that all were faced with the same system and placed within a constantly evolving political context characterised by national arrangements affecting local developments.

Drawing on theoretical insights gained from individual case studies, the following chapter will explore similarities and differences between Trusts and potential underlying factors in more detail. In doing so, I will make comparisons across cases and place these within the wider contextual implementation environment by integrating data obtained from multi-sited ethnography sources.

I identified the following over-arching themes across case studies, which will be discussed in detail:

1. Macro-influences: different Trusts, but similar problems
2. Starting points and different developments over time – the role of scale and progress in organisational coping
3. Software characteristics and their consequences
4. Individual coping: intended and unintended ‘workarounds’ and their consequences.

Chapter 7: Comparison of sociotechnical processes of change across cases and integration with the macro-environment

7.1 Introduction

Having described the processes of sociotechnical change in individual case studies in Chapter 6, I will now make more detailed comparisons across Trusts. In doing so, I explored similarities and differences between Trusts over time. The cross-case comparisons broadly involved comparing the dimensions of my coding framework (column 1 in Table 7.1) across Trusts (see also Chapter 5). In doing so, I investigated developments in individual Trusts (columns 2, 3 and 4 in Table 7.1), relationships between Trusts (columns 5 and 6 in Table 7.1) and developments over time (row 2 in Table 7.1).

Table 7.1: Cross-case analysis table

	Site B	Site H	Site Q	Similarities between sites	Differences between sites
Developments over time					
Social/human dimension					
Organisational dimension					
Technical dimension					
Macro-dimension					

This analysis allowed me to examine both local and national processes (by exploring changes over time across micro- and macro-dimensions), as well as the interrelated nature of social and technical dimensions both within and across Trusts. In this chapter, I draw on the relevant theoretical frameworks, but will more explicitly address theoretical considerations and contributions in the following chapter.

My aim was to explore early views and experiences of users and understand the consequences of the system for their work practices as well as general organisational functioning. Drawing on these experiences and insights, I sought to generate a detailed picture of the implementation landscape characterising this unique attempt to implement and adopt nationally procured software.

This chapter will also incorporate findings from multi-sited ethnography informants to complement case study findings. These allowed me to gain a detailed insight into the complex contextual circumstances surrounding the national implementation and include data obtained from various additional stakeholders related to developments in Trusts (the macro-environment). Data were obtained from interviews with governmental stakeholders (n=3), developers (n=2), LSP (n=2) and independent sector representatives (n=7). As already described in Chapters 5 and 6, interviews were complemented by a range of overarching policy and related documents including Lorenzo product descriptions and screenshots, documents by NHS CFH and the DH, and publicly available policy documents cited throughout my thesis.

ANT helped me to investigate the micro-processes of sociotechnical change (i.e. how stakeholders and Lorenzo were interrelated and “re-assembled” to form a new network over time).(115;138) I drew on Strong Structuration Theory and the Social Shaping of Technology to conceptualise the mutually shaping relationship between macro-contexts and these local sociotechnical processes.(138;141) Tracing developments was informed

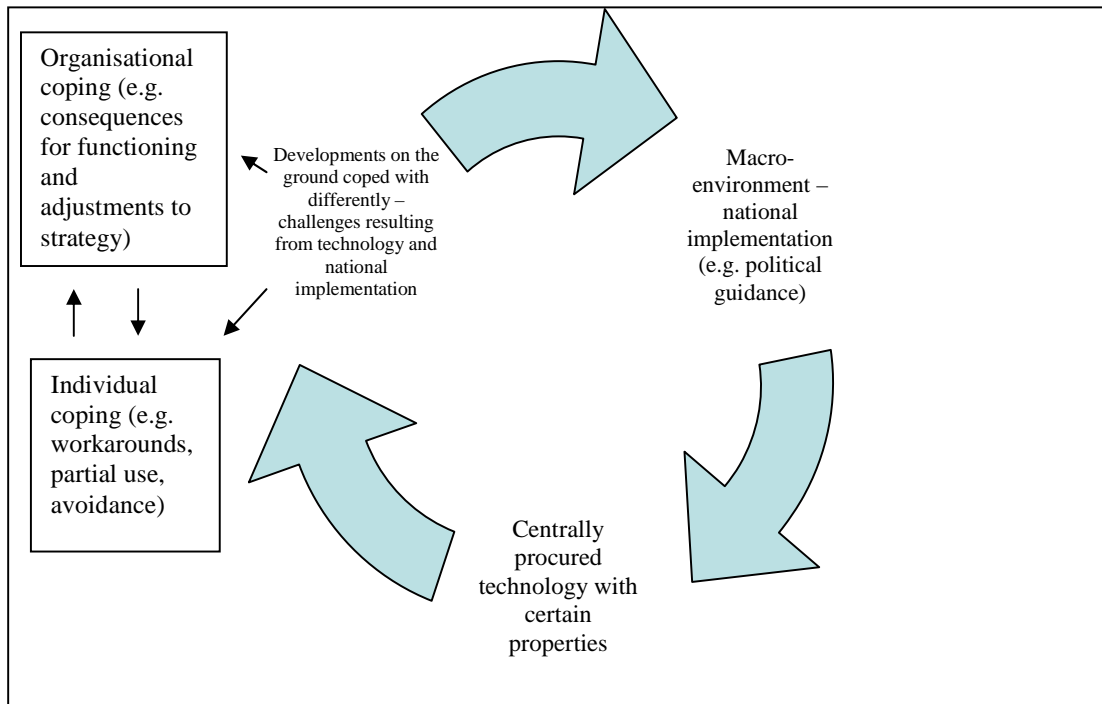
by the Theory of the Diffusion of Innovations and Normalisation Process Theory, which facilitated interpretation of how micro-processes fitted within a larger organisational context and how they “normalised” or failed to “normalise” over time.(92;150;151)

Four themes relating to these theoretical frameworks (see Chapter 4 and Chapter 8) emerged from the analysis:

1. Macro-influences: different Trusts, but similar problems (here I drew on Strong Structuration Theory and the Social Shaping of Technology) (138;141)
2. Starting points and different developments over time – the role of scale and progress in organisational coping (here I drew on the Theory of the Diffusion of Innovations and Normalisation Process Theory) (92;150-152)
3. Software characteristics and their consequences (here I drew on the Social Shaping of Technology and Greenhalgh and Stone’s Model) (138;141)
4. Individual coping: intended and unintended ‘workarounds’ and their consequences (here I drew on ANT).(115;138)

I attempted to develop an overall illustration of the relationship between these themes, which is shown in Figure 7.1.

Figure 7.1: Overall illustration of the national implementation landscape



Note: A graphical model of the overall implementation landscape derived from my findings. Central to this is the circular relationship between local and national developments. Arrows indicate consequences for... and shaping of...elements of the model.

I will now discuss the four themes identified and their relationship in more detail.

7.2 Macro-influences: different Trusts but similar problems

Despite the demographic and strategic differences (e.g. in terms of characteristics and implementation approaches) between Trusts (see Chapter 6), the macro-environment in which implementations took place resulted in similar local challenges being experienced. Strong Structuration Theory and the Social Shaping of Technology helped to conceptualise the mutually shaping relationship between macro-contexts (including the changing political and economic landscape, the national contractual situation, and the pressure to progress) and local sociotechnical processes.(138;141). I will explore the mechanisms involved in Sections 7.2.1 to 7.2.3 below and further elaborate on the consequences for local sociotechnical developments in Section 8.3.1.

7.2.1 The changing political and economic landscape

Since the conception of the Programme over a decade ago, it has been characterised by many changes, not only in relation to strategy, but also in relation to central leadership and a reduction in funding in light of an economic recession.

As a result of the bleak economic climate,(79) centrally funded resources were increasingly withdrawn and the more advanced functionalities of centrally procured software were excluded from contracts in early 2010 in order to save money.(216) This has been coupled with repeatedly missed politically-set deadlines and resulting changes in the implementation timelines. Financial concerns came on top of previous problems relating to contractual negotiations which resulted in two LSPs leaving the Programme early (see chapter 1) and contributed to publicly announced plans of the then-opposition parties to “*abandon*” the Programme.(217)

The change in government in 2010 meant that, despite planned changes, the future direction of the national strategy was, at the time of writing, relatively uncertain. The coalition government had not, despite declaring budget cuts and an estimated £20 billion in NHS efficiency savings, published a detailed IT strategy for the NHS. At the time of writing, it announced an increased focus on systems choice for local organisations and an opening of the software provider market to a larger number of accredited commercial suppliers.(79;218;219)

In addition, major re-structuring of the NHS as a whole was planned to take place at the time of writing. This included the abolishment of SHAs and PCTs, placing the responsibility of commissioning local services on GPs, and increasing the number of Trusts with Foundation status.(79) The National Audit Office published its third review of the NPfIT in mid 2011, concluding that “*progress with the delivery of care records systems continues to fall well below expectations*” and that “*the Programme is not providing value for money because there had been few successful deployments of care*

records systems in acute Trusts".(220) This was followed by similarly fierce criticisms by the Public Accounts Committee.(221) A public consultation on future NHS IT policy in England was at the time of writing taking place, with an announcement on the outcome expected at the end of 2011.(79)

In line with these developments, central leadership of the Programme over time somewhat lost momentum as NHS CFH was integrated within the DH's Informatics Directorate. This lack of clear strategic direction contributed to uncertainty about the future strategic direction of the Programme expressed by many interviewees:

"Well I think the jury's really out on it, the, it's interesting that the minister who's now got responsibility for NHS IT is new to the health field or at least, this is Simon Burns, rather he was in health earlier in his career but as I understand has had no, you know, involvement for some years. So to some extent the politicians who are quite vocal in this area such as Steven O'Brian the Conservative MP he's now gone off to, he's a minister in international development and Norman Lamb who was the Lib Dem health spokesman he's I believe the main policy advisor to Nick Clegg so it's some new faces so what is the new government going to do, I think we wait to see." (Interview, Independent Sector)

As described in Chapter 6, these developments resulted in a lack of resources to resolve existing problems locally, a perceived lack in facilitating the sharing of lessons learned, and increasing concerns over resources and support for future releases. Therefore, stakeholders across Trusts progressively questioned the adequacy of the national implementation strategy and highlighted the need to balance local needs with national requirements for standardisation.

7.2.2 Contracting for health: contractual tensions and resulting powerlessness on all parts

Although there were clear reasons behind large-scale national contracting, primarily in relation to containing costs, these arrangements contributed to perceived powerlessness for stakeholders on the ground. All Trusts expressed a lack of involvement in decision

making relating to software changes and implementation strategies due to the contractual set-up that largely excluded them. As a result, local organisations were not able to customise Lorenzo according to their individual needs and influence deployment timelines in line with organisational readiness. Interviewees from NHS CFH and the independent sector were aware of these difficulties:

“A perfect example with Cerner is with the [name of Trust] bought Cerner before the Programme and then when the Programme was coming along they got agreement to, well they decided to carry on, now that’s very, very sensible, they’ve made Cerner Millennium work, why have they been able to do that, because with their local control and local customisation and the local integration that they’re able to do that the contract explicitly excludes, how stupid is that, they can make Cerner do, the Millennium product work to the best of its ability. The Millennium product is actually a pretty bloody amazing product but the contract has constrained it in the UK. I think [Name] said this wonderfully on a slide yesterday, he said take a product that works well then surround it with information governance, constrictions, surround it with contractual constrictions, surround it with delivery restraints based on the contract and you end up with a product nobody wants or can use, completely bonkers.” (Interview, NHS CFH)

“...the Programme was not going to get involved in some of the change issues that organisations needed to take account of, that was going to be down to the organisations but he was procuring and would introduce a system that would deliver the technology to enable that change. Now that’s all well and good if you engage the people who are going to be using the system in that process but that clearly didn’t happen, I’m not sure it could happen given the scale so, you know, that, how that’s now materialised is you have LSPs who are tied to a very strict contract, they’re not necessarily willing to give more than they can because it may not be sort of commercially viable for them to do that and you’ve got a disengaged user community that feel that these things are being inflicted on them rather than being embraced by them which in my view is, you know, sums up, you know, where we are at the moment.” (Interview, Independent Sector)

Organisational stakeholders also generally viewed LSPs as being motivated by cash-releasing milestones, resulting in overly ambitious implementation timelines and a lack of attention to the time needed for systems to embed. This was perceived to lead to limited efforts in progressing local implementations.

However, my interviews with stakeholders outside the immediate Trust environment also indicated that contractual arrangements contributed to perceived powerlessness among developers and LSPs, who perceived pressure to deliver, stating that contracts inhibited communication and relationship building with Trusts.(222;223)

“...but actually the contractual relationship is between the Trust and whether it be the system integrator or the application provider, that would be a much better model because then the Trust would know exactly what they’re getting from the supplier and the centre’s role has been limited to, you know, providing, you know, doing things to help shortcut the procurement stages and providing, you know, national advice and guidance rather than having absolute central control over these contracts.” (Interview, Independent Sector)

7.2.3 Pressure to progress

All stakeholders were under significant public and political pressure to show progress, as public perceptions of the Programme as a whole became increasingly negative. The media were said to contribute to this by focusing on delays, spiralling costs and technical problems occurring during implementations.

“...a lot of things aren’t in our direct control, a lot of the bad press if you like impacts us quite heavily yet we don’t, it’s not in our gift if you like to do a huge amount about it, so some of the delays that have, experienced so far.” (Interview, Developer)

As a result of this pressure to progress, I observed some tensions between case study sites arising from the perceived distribution of national resources. In both Sites H and Q, stakeholders argued that national support centred on those Trusts that had the highest political profile, which included Site B, where deployments of R1.9 functionality occurred. Political impatience may thus have inadvertently contributed to problems experienced locally (e.g. Site B) by prematurely progressing with implementations.

“Yes, I give him [referring to senior staff at the DH] chapter and verse on why it’s wrong and where it’s wrong and it’s all blindingly obvious in my mind if you look at it properly and, you know, trying to do too much too quickly is the biggest problem.” (Interview, NHS CFH)

“..it’s the same people telling us [Place Name] will be delivered in March, they told us that [Place Name] would be delivered two years ago, [Trust] was going to be delivered in November, well that’s now next July...and when you talk to people from other, particularly the Early Adopters, the pressure they were under to sign off was horrendous, you know, they were saying if you don’t sign this off the Secretary of State for Health is going to have to stand up in parliament and explain why so just sign it, you know, that kind of pressure is horrendous.” (Interview, IT Manager, Site Q)

In keeping with Figure 7.1 above, many of these national developments were the result of attempts to address problems encountered on the ground (hence the circular relationship). For example, as stakeholders increasingly questioned the “top-down” implementation model and associated contractual arrangements as well as political pressure, over time it slowly changed to a more localised approach.(219;224)

7.3 Starting points and different developments over time – the role of scale and progress in organisational coping

As described in Chapter 6, the way Trusts dealt with the challenges arising from this complex environment differed. This was particularly apparent when examining developments over time and can be informed by drawing on the Theory of the Diffusion of Innovations and Normalisation Process Theory (see boxes in Figure 7.1 labelled “developments on the ground coped with differently” and “organisational coping”). These helped to conceptualise how micro- sociotechnical processes fitted within the larger organisational context and how the use of the technology was “normalised” or failed to “normalise” over time (see also Section 8.3.2).(92;150;151)

Despite fundamental demographic differences, the three Trusts implemented (at least to begin with) the same software, all gradually replacing paper systems, but with somewhat different functionalities tailored to their particular setting. Initially, Sites B and H followed a small-scale implementation approach, going live with one ward and nine users respectively, whilst Site Q implemented on a larger scale, going live with 150 users. As time progressed, it became apparent that Site Q, despite the initial “head start”,

remained relatively static over a sustained period of time without visible progress either in terms of a larger scale roll-out or significantly improved software functionality. Site B, on the other hand, due to political and hence media pressure to progress, implemented increasing software functionality as time went on. However, this led to significant problems in the organisation, mainly due to a lack of organisational ability to plan for software that had never been implemented in this setting coupled with the large user base. In contrast, the Site H deployment remained small-scale with no further functionality being implemented over a relatively long period of time. Here, all efforts concentrated on making Lorenzo work, this being achieved through intensive development activity in close collaboration with users. However, this took time, so much so that the overall strategic direction was reassessed in light of resources spent, with hospital management seriously considering switching to an alternative system outside of the government Programme.

[Manager] also tells me that they “have had a bit of a problem in the Trust because the Trust wants to move away from Lorenzo towards using SystemOne, so we are looking for evidence that it is worth keeping Lorenzo”, this is why they are very interested in our results and I am asked to see the Head of IT in the afternoon to report our results to date, there is a board meeting in March 10, “I am probably not supposed to tell you this but I am not very good at keeping secrets”, she also tells me that SystemOne is not good and that she doesn’t want to stop using Lorenzo as it is much better, she feels that they have worked very hard to get Lorenzo where it is now and that there have been significant improvements. (Observation notes, Site H)

As a result of the perceived lack of progress in system development over time, users in Site B were increasingly frustrated; at Sites H and Q, management became increasingly frustrated in relation to the scale of the implementation (i.e. the limited overall number of active users). There seemed to be two different notions of progress across cases, both of which needed to be fulfilled for an implementation to be considered “successful”. User satisfaction appeared to be closely linked to perceived system development progress, whilst political and managerial stakeholders tended to focus on scale (relating to both functionality and user base). Site B illustrated that progress in relation to system

development had not been achieved, whilst developments in Site H indicated that progress in relation to scale had not been achieved. Site Q could be placed somewhere in the middle with an initially promising implementation in relation to scale but lacking progress in relation to software development over time. There seem to be trade-offs with both types of progress as illustrated in Table 7.2 below.

Table 7.2: Benefits and trade-offs in relation to the two different types of progress

	Benefits	Trade-offs
Progress in relation to scale	<p>Satisfying the political drive to demonstrate progress to the public – i.e. numbers of users</p> <p>Keeping in line with contractually set milestones</p>	<p>Lack of software development activity</p> <p>Lack of attention to “good quality” implementations – organisations and users may not be ready</p> <p>Intensive support for users and two-way communication is difficult</p>
Progress in relation to software development	<p>Happy users as software is suited to the way they work</p> <p>Effective support and two-way communication is possible</p>	<p>Resource intensive</p> <p>Not satisfying political drive to progress</p>

As indicated in Table 7.2, progress in relation to scale can have significant implications for those on the ground as two-way communication between managers and users is often not realised in larger scale deployments (e.g. Sites B and Q). As my findings show, here information was often cascaded down to users but feedback from users was frequently

not effectively communicated and incorporated by management. Accordingly, (particularly in Sites B and Q) users were negative, rationalising changes as reflecting a rising focus on bureaucratisation, curbed spending, and increased managerial control. This resulted in low morale especially amongst the more frequent users who could not avoid using the system (i.e. junior doctors, nurses and administrative staff), and who did not see any visible improvements in performance over an extended amount of time. The PAS replacement at Site B exacerbated negative perceptions as stability problems resulted in a large number of frustrated users.

“No I’m still not seeing enough people [referring to patients in a clinic], no matter how many people you see you are still not seeing enough, I think that’s the thing. We were at a meeting and someone said we’re supposed to have five or 10% increase each year, you know I’m seeing people I’m not creating a product here that I can soup up a machine and make it quicker, you know an hour is still an hour but they are always wanting more anyway so you sort of get used to that I think.” (Interview, Healthcare Professional, Site Q)

Initially, negative attitudes were also present in Site H, but here users became more positive over time as they stated they had developed a system that worked for them and brought increasing benefits. This was most likely due to the small-scale deployment, which meant that communication between users and a designated IT Manager was efficient and constant, characterised by a close and personal relationship. Once this individual left however users faced the ‘official’ routes of communication much like those present in larger scale deployments.

“Yeah well if they take him [referring to IT Manager] away then what have we got? We haven’t got anybody to sort of support us and feed us anymore and that’s the most expensive part, the cog of the wheel really, take the centre bit out what have you got, that’s what it feels like to me.” (Interview, Healthcare Professional, Site H)

Despite these fundamental differences in organisational characteristics and type of progress, all three Trusts were in a similar position towards the end of my data collection, reconsidering their strategic direction in relation to systems choice. This may

be due to the fact that they faced similar macro-influences (discussed in Section 7.2 above) and software issues (discussed in Section 7.4 below).

7.4 Software characteristics and their consequences

As a result of the national procurement, all three Trusts had to cope with similar technological issues (see box in Figure 7.1 labelled “centrally procured technology with certain properties”). Strong Structuration Theory helped to explain how software design had significant local sociotechnical consequences for its use in context.(225) The processes involved are further explored in Section 8.3.3.

The biggest challenge in this respect was that Lorenzo was still in development, which affected planning of work and business processes, training, as well as user engagement. It also resulted in a range of unanticipated problems for both organisational functioning and individual contexts of use.

“...my understanding is that we didn’t get fantastic information about that [referring to the system] because there are so many areas in configurability and there would be people who understood in detail that bit of it or that bit of it but not necessarily anyone or any kind of bible that could give you that overview of it because we got a system in development and certainly some of the decisions we made on the basis of, you know our best guesses, given the information we had, turned out to be not so smart.” (Interview, Manager, Site B)

The immaturity of the system also meant that users across professions and different Trusts faced similar usability issues. These included, amongst others, freezing of screens, a long time to load documents, a lack of intuitiveness, long log-in times, inappropriate layouts of forms and print-outs, and the perceived inconsistency of language. Over time some of these issues were addressed, but most users in Sites B and Q commented they were not addressed sufficiently for the system to be considered usable. Users in Site H, on the other hand, suggested that over time system performance had improved considerably, possibly due to the intensive support by a dedicated IT Manager and the close involvement of users in development. As a result, users in Sites B

and Q tended to be relatively negative towards Lorenzo, whilst users in Site H became more positive over time.

“When compared to Cerner he said that it was “clunky” (i.e. has a lot of unnecessary clicks in usability terms) but is a more mature product, also it exists as opposed to Lorenzo, he finds it “puzzling as to why they are implementing something that does not exist”, he has “no idea why they went for Lorenzo” (Researcher notes, Interview, NHS CFH).

Users further complained about the large number of clicks and mandatory screens in the system, which was felt to increase workload; this was a problem encountered in all three case study sites and persisted over time. This indicates that slowing of workflows needed to be expected and planned for by all stakeholders as things may not necessarily have improved over time. At Site H it was addressed by allowing users an extra five minutes per appointment when they were using the software. However, the other two sites did not address this issue, which may have exacerbated negative user attitudes.

Developments at Site B were somewhat different. Despite similar usability issues, the deployment did not initially appear to affect organisational functioning. However, when the hospital implemented extended software functionality replacing the local PAS, stability issues caused a fundamental disruption. As a result, all efforts there focused on resolving these as opposed to usability issues.

“Yes and until we get the R1.9, the PAS base stabilised, we can’t roll-out the other stuff and we’re desperate to do that because that’s the point at which Lorenzo starts to add value, at the moment, benefit? None!” (Interview, Manager, Site B)

Usability issues were addressed by management when organisational functioning in Site B was compromised. In Site H, on the other hand, usability was the focus of efforts from the beginning. Further roll-out was considered once existing problems were addressed and users were relatively happy with the software. It therefore seems important to build on a solid base of usable software before considering further deployment. However, this

was at odds with the context of the considerable political pressure to increase the scale of the implementation (outlined in Section 7.2.3 above).

7.5 Individual coping: intended and unintended ‘workarounds’ and their consequences

ANT helped to conceptualise micro-processes of sociotechnical change as users accommodated the new technology.(115;138) I will explore the processes involved in more detail in Section 8.3.4 concentrating on cross-case comparisons below.

Across Trusts, users had to employ temporary ‘workarounds’ that were accepted by the organisation due to the initial running of paper-based systems (see box in Figure 7.1 labelled “individual coping”). This was perceived by users as unnecessary duplication of activity, but accepted by most as it was expected to attenuate in due course. Site H illustrated that this did indeed happen when Lorenzo was rolled out, which meant a reduction of printing activity.

“There are some annoying delays between having completed the form and printing it, there are some unnecessary pages in between”, he had to click several boxes e.g. “print local” and “print preview” before being able to hit the actual print button, ticking these boxes is compulsory. (Observation researcher notes, Site H)

In addition, all users had to change existing work practices to fit in with the demands of the technology, resulting in ‘workarounds’ that were unintended by management. Across Trusts the most common techniques to achieve this included using other systems to compensate for perceived shortcomings (e.g. Microsoft Word or paper), partial use, and “tricking the system” (e.g. if users could not move to the next item without completing a free text box, some would simply copy and paste text from other boxes). Most of these ‘workarounds’ were what has been classified as “essential hindrance workarounds”.(226) These were used to get around perceived problems in the system that were seen as making use very time-consuming. Most were also viewed as essential

as they were designed to save time on administrative tasks, thereby freeing up time for provision of more direct patient care.

However, there were also some more fundamental changes in work practices imposed by the system, which appeared to be of greater concern to users as they were not expected to attenuate over time and could often not be addressed by 'working around them'. These varied across Trusts, but often represented changes in perceived professional identities resulting from the way Lorenzo re-structured care activities. For example, many clinical users reported an increase in administrative tasks, which they commented was not what they "*signed up for*" as it meant they spent less time on clinical activities.

"I mean the fact that there's no jobs in the NHS at the moment is the only reason why people would have stayed and morale has been, people are just not feeling job satisfaction because as I say when you should be seeing patients you're actually sitting at a screen that is going interminably slow." (Interview, Healthcare Professional, Site Q)

Therefore, most users carefully 'guarded' the interactions with patients, by keeping them as personal as possible. This was particularly apparent in settings where computers were originally planned to be used during the clinical encounter (Sites H and B), which was not perceived as appropriate as users stated it affected the therapeutic relationship (Site H). In other cases, Lorenzo was not viewed as quick and flexible enough to be used in the fast-moving clinical setting (Site B). Consequently, clinical and administrative tasks tended to be separated and handheld computers were used as little as possible. As a knock-on effect, data entry into Lorenzo was often delayed, which meant that the system was not as up-to-date as it was initially planned to be. This issue is likely to remain and pose significant challenges in future deployments as clinical users are likely to resist if IT is perceived to negatively affect the quality of interactions with patients.

"So I think for some of it I tend to try and ask questions and then save it all in my mind until the end. Now really and truly we shouldn't do that either but I just think, I'm thinking patient care and giving them the time, especially if you want to sit and listen to

a patient or talk to them and if they take you onto a different subject and you're not on that bit to click you've got to remember that information whereas on the treatment record card we've got now, you know, if they start talking about medication you can go to medication quite easily, you could write that in." (Interview, Healthcare Professional, Site H)

Similarly, users stated that the balance between security measures and the complex day-to-day service demands characterising the healthcare environment resulted in a system that was not fit-for purpose and access cards needed to log into the system were often shared or left in terminals. Again, this is likely to be of continuing importance resulting in compromised security measures.

7.6 Chapter summary

This chapter has drawn on both case study data and additional stakeholder interviews in order to provide insights into the environment in which the implementation of Lorenzo took place. In doing so, I focused on exploring the views and experiences of users as well as organisational consequences of introducing Lorenzo and how these evolved over time in the complex environment of a national EHR implementation.

As ANT did not fulfil all my requirements, particularly in relation to explaining theoretical insights gained, and the role of individual, macro-environmental and organisational factors shaping local developments, I searched the literature for approaches that could address these shortcomings (Chapter 4). Drawing on relevant theoretical frameworks and applying these to my findings provided insights into how national arrangements affected the way Lorenzo was procured, implemented and used locally. Here, ANT helped to explore the micro-processes of sociotechnical change,(115;138) whilst the use of other frameworks helped to place micro-processes into context, by explaining the role of internal structures of human agents, and conceptualising the environment in which sociotechnical processes were situated and unfolded over time. Particularly helpful in this respect were Strong Structuration Theory, the Social Shaping of Technology, and the Theory of the Diffusion of

Innovations.(138;141;150) I will critically reflect on the usefulness of theoretical lenses used in the subsequent chapter.

My findings illustrate that, despite their differences, Trusts faced similar technological challenges arising from macro-environmental arrangements surrounding the nationally procured software. These were coped with in diverse ways by different organisations (e.g. scale), but coping of users was broadly comparable across settings (e.g. adopting 'workarounds'). I also highlighted the mutually shaping relationship between these two types of coping, outlining consequences of both organisational coping for individual users and vice versa. In conceptualising how sociotechnical change occurred, and how it related to individual and organisational coping as well as national progress, I developed an overall model building on existing theory (Figure 7.1).

Having integrated my findings across cases and with the multi-sited ethnography sources, I will now place them in the context of the evolving literature (building on Chapter 2), before examining the contribution of my study in light of the theoretical lenses employed in more detail.

Chapter 8: Discussion

8.1 Introduction

The previous chapters have outlined how I developed a methodological framework based on sociotechnical theory (see Chapter 4), and applied this to explore the views and experiences of users as well as organisational consequences of introducing Lorenzo, and how these evolved over time in the complex environment of a national EHR implementation.

In this chapter, I seek to integrate the findings of individual case studies and cross-case comparisons described in Chapters 6 and 7 with the more recent developments in the literature and examine my findings in light of the theoretical lenses used in more detail, critically reflecting on the contribution of each to my study in Section 8.4.2. In doing so, I will explore evolving empirical directions and relate these to the progress and challenges encountered throughout the national implementation of Lorenzo as experienced in the three case study sites. This will also involve exploring some remaining tensions relating to macro-environmental developments, and the consequences of technology for the therapeutic nature of care.

This chapter will further discuss how, throughout the study, I found myself increasingly drawn to a critical perspective in terms of theoretical stance, as power relationships have played a more prominent role than originally anticipated (further explored in Section 8.4,1).(227;228) I will conclude with the strengths and limitations of my study before moving to discussing the practical implications emerging from my work in Chapter 9.

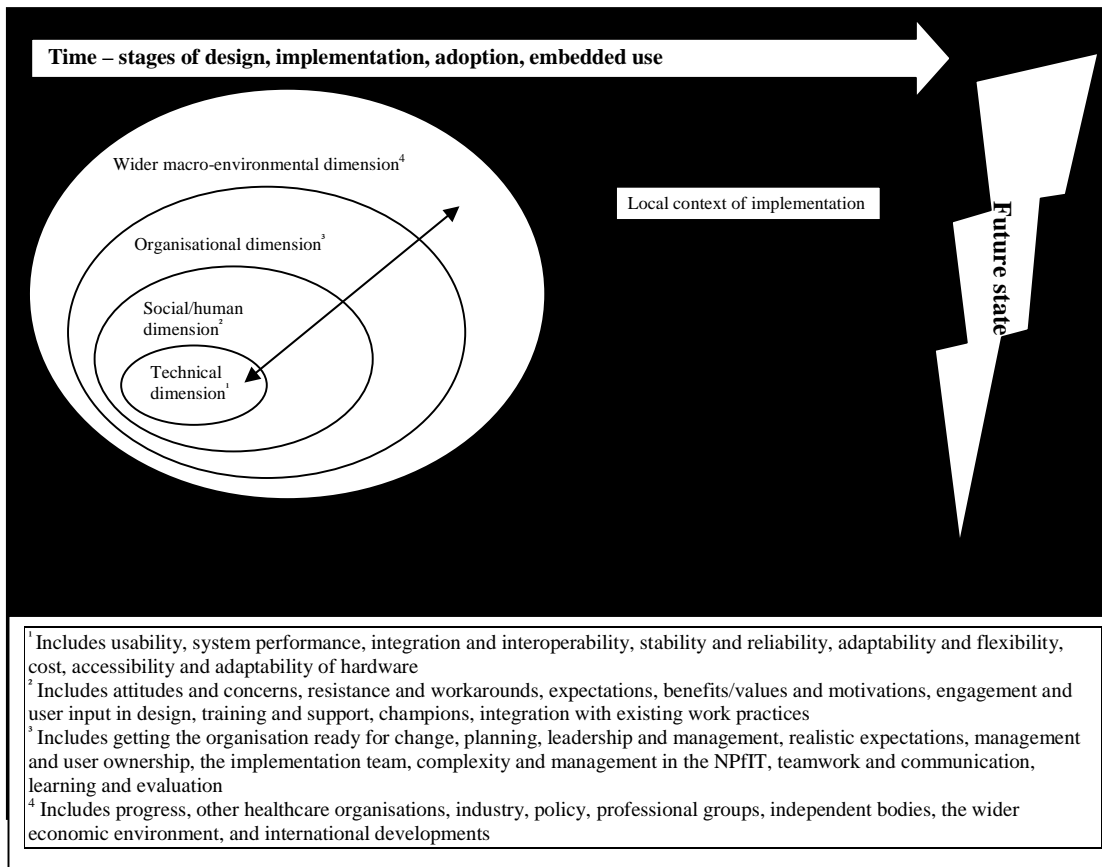
8.2 Literature update

I followed the literature throughout my research and updated my literature review (Chapter 2) periodically. In doing so, I developed an emerging understanding of the existing empirical evidence, and applied it to the English approach to implementing

Lorenzo. This allowed me to contextualise my findings and to refine the model I developed in Chapter 2.

Keeping in line with the structure of dimensions identified in Chapter 2, I examine my findings in light of the evolving literature. Figure 8.1 below presents an updated model, which illustrates the shifting nature of the implementation landscape over time by integrating a temporal element (including the desired future state i.e. some kind of diffusion and “normalisation” of the technology).(92;150;151) It also more explicitly shows how the overall dimensions identified are not only interrelated but also have consequences for each other, which is consistent with the overall sociotechnical approach.(115;138) In addition, I identified a number of other factors under these overall dimensions, which I discuss below. The dimensions outlined in Chapter 2 helped to provide a general framework, as they were broadly supported by the additional literature as well as the findings of my own work.

Figure 8.1: A refined model based on my emerging understanding of the empirical literature



Note: An updated graphical representation of the socio-cultural factors surrounding the implementation and adoption of EHRs identified in the literature review (Chapter 2). Factors included in the overall dimensions are summarised at the bottom of the Figure.

Overall, there is still a lack of research investigating how adoption of EHRs can successfully be promoted.(229) This is particularly true in relation to national and large-scale ventures as these are still in their infancy. The findings of my study have contributed to understanding of these issues in a variety of ways, which I will outline in turn.

8.2.1 Technical dimension

8.2.1.1 Usability

My findings support the notion that usability problems can pose significant barriers to adoption of EHRs. Issues encountered in my case studies in particular related to the difficulty users experienced navigating Lorenzo due to its complexity and in obtaining an overview of a patient or particular care activities. These problems have been frequently identified in previous studies of the more complex IT systems in healthcare such as EHRs.(31;230;231)

The literature suggests that the best way to achieve application usability is through a close collaboration between the designers of applications and end-users.(232;233) This may take the form of continuously testing prototypes in different groups of end-users and subsequent re-design if necessary.(234-237) However, in my case studies this close collaboration was, due to the nature of the nationally procured software and the associated contractual relationships, clearly not possible in most cases. This may have contributed to the lack of progress in systems development and consequently also hampered progress relating to implementation scale. Where a close relationship between users and developers was realised (Site H), the application was viewed as more usable as suggested changes by users were more readily incorporated.

8.2.1.2 System performance

System performance, characterised by the immaturity of Lorenzo, was found to play an important role in my case studies. The most common complaint in this respect was the slow speed of the application, system downtime, and long log-in times. This resulted in usability issues and caused frustration amongst most users. The literature supports these findings highlighting that using a new system should not be significantly slower than the system that was previously operational, irrespective of whether this was paper-based or electronic.(31;230;231;238) My findings build on this, suggesting that emerging problems relating to systems performance can to some extent be counteracted by giving

users more time to compensate for increased demands on their time imposed by the system, as was the case in Site H.

System performance is strongly related to system usability but I discussed these separately as usability issues for users may not necessarily be a consequence of system performance. For example, system performance may also have managerial or technical consequences that are not necessarily visible to end-users.

8.2.1.3 Integration and interoperability

My findings further show that the integration of Lorenzo with existing systems played a more important role than originally anticipated, as the parallel running of systems (including paper as well as other electronic systems) was found to duplicate work thereby slowing users down and contributing to negative attitudes. This is a fundamental problem with individual commercial systems (such as Lorenzo), as these are often not designed to integrate with other existing systems. Lorenzo, despite having initially been conceptualised as an integrated solution to be used across care settings was, at the time of writing, increasingly combined with other systems. This was due to changes in the strategic direction of the overall Programme meaning that the market was likely to open up so that hospitals could choose other software suppliers (further discussed in Section 8.2.4).(219) Therefore, issues surrounding integration and interoperability of systems were likely to become increasingly important. The literature echoes these concerns, highlighting the importance of developing standards and interfaces to connect systems, but these often have obvious cost and time implications.(31)

NHS CFH had developed standards for interfacing of systems,(239) which vendors supplying systems had to adhere to. Standards were also devised to authenticate the identity of users (see Glossary), to ensure the secure transfer of information across applications, and to specify technical requirements.(240;241)

8.2.1.4 Stability and reliability

In my study, stability and reliability issues were frequently regarded by users as causing delay and frustration. However, according to implementation team members, Lorenzo software itself was relatively stable, but existing networks and infrastructures to support the software were often not fit for purpose. They were also different from the environment in which the software was tested, contributing to an inability to plan for mitigating actions. This, in combination with constant system upgrades, tended to give users the impression that the system “crashed”. Despite the relative perceived stability of Lorenzo on part of the implementation team, users tended to be concerned about this “*crashing*”, resulting in a “*lack of trust*” in overall system performance.

These concerns have also been highlighted in the literature, cautioning that it is important to acknowledge that no system can ever be “fail-safe”, even if it is perceived as relatively stable.(242) It is therefore necessary to have systems in place and disseminate a plan of action of what to do in such situations. This will mean devising alternative forms of accessing and storing data in collaboration with application designers and may take the form of reverting to paper processes if necessary. It may also require training on what to do in such situations so that staff do not become de-skilled in using paper systems as a back-up.(242)

8.2.1.5 Adaptability and flexibility

In line with my literature review,(93) the need for a system to be adaptable and flexible in order to suit local demands was found to be extremely important in my study. However, my findings indicate that this also needs to be balanced with standardisation and interoperability considerations, especially in relation to national systems such as Lorenzo.(140;243) There are of course obvious trade-offs relating to an extreme focus on either: a system that is too extensively customised to one organisation may result in difficulty exchanging information with other organisations, whilst a system that is based on the premise of interoperability (such as Lorenzo) can lack fitness for purpose locally.

8.2.1.6 Cost

Stakeholders in Trusts participating in my research were concerned about the cost of implementation, which had, despite being theoretically “free”, more local cost implications than initially expected. This took, for example, the form of having to hire additional staff to allow for implementation activities (e.g. technical specialists and project managers), and compensating for Lorenzo’s local consequences for care activities and organisational functioning (e.g. clinical and administrative locums). Such higher-than-expected EHR implementation costs are frequently found in the literature, and particularly long-term net returns from these investments are still a concern in this context.(31;230;244) Costs therefore need to be carefully planned for and net returns may indeed not materialise.

8.2.1.7 Accessibility and adaptability of hardware

Another very important factor, which was not given enough prominence in my original review of the literature, was the need to provide adequate workspace for users of the new application. The lack of access to computers has previously been identified as a barrier for use, which is also supported in my case studies.(230;231;234;235;245) For example, problems involved healthcare professionals waiting for computer terminals to become available, which slowed down work. A fundamental problem leading to this situation was not only due to issues with access but also due to a lack of attention having been paid to considering the positioning of computers in individual settings, particularly in buildings that were often not designed with computers in mind.

A related issue was the use of handheld computers, which in my case study sites were often not used as intended by management (i.e. during the clinical encounter) due to, amongst others (see Section 8.2.2), practical and space-related problems (e.g. slowness of such devices and difficult positioning on the lap). Similarly, the use of SmartCards as a means for logging into Lorenzo was found to be problematic as it took a long time. These issues are likely to be of remaining concern, as they were often viewed as interrupting clinical care processes, interactions with patients and individual workflows.

8.2.2 Social/human dimension (those that interact with the technology...)

8.2.2.1 Attitudes and concerns

Although significant efforts were made by the government to assess patient and user attitudes, public surveys indicated that there was a widespread unfavourable attitude towards the Programme as a whole, especially amongst doctors.(140;246) Clinicians tended to support the underlying aims of shared EHRs, but not the national implementation strategy.(247) This was also illustrated by my findings, indicating that the overall vision of shared records is indeed still supported by most. There were, however, persistent concerns, heavily influenced by early negative experiences with the software itself. Central attempts were made to address some of these, for example in relation to security and confidentiality, by initiatives such as the NHS Care Record Guarantee, which set standards to protect confidentiality.(241)

It has, however, been pointed out in the literature that if work is disrupted through security measures, this can decrease user motivation to carry out a certain task.(248) Role-based access features (that define the level of access to patient information according to profession, see Glossary) can help address these issues, but may result in reduced user satisfaction due to the limited amount of information provided by the system to each individual user (resulting in an inability to access information), and lengthy log-in times.(31) My findings have confirmed this as users tended to view lengthy log-in times with SmartCards as disrupting their work practices. As a result, cards were often left in terminals, which in turn compromised rather than promoted security and confidentiality.

Of similar concern are changes in professional identity illustrated in my study. This related to a perceived difficulty of integrating Lorenzo into the process of “caring”, which is typically defined by the very nature of human interaction and touch. Caring for patients’ emotional needs is often viewed as an integral part of healthcare professional

work.(249) It is also this interpersonal element of care that often motivates individuals to enter the profession in the first place, being reflected in core healthcare professional values.(249-251) The literature echoes these concerns highlighting that the introduction of technological systems can have significant consequences for the therapeutic relationship between healthcare professionals and patients.(252;253) Indeed, this was also expressed by my participants (and especially clinical users) who stated that they did “*not sign up for this*”, when they reflected on the increasing emphasis on administrative tasks that was perceived to accompany the introduction of Lorenzo.

This is illustrated in the literature, where mounting organisational pressures are often cited as creating increasing conflict between professional, social, institutional and personal values in the caring professions.(251;254;255) For example, Maben and colleagues found that when nurses qualified they had a strong set of professional values, but when faced with organisational reality, they found these difficult to implement in practice due to growing workloads associated with the organisation’s increased focus on achieving governmental targets.(256) However, it is precisely emotional and interpersonal care that makes the relationship between healthcare professionals and patients both rewarding and flexible (e.g. in terms of being able to listen to and tailor treatment to individual needs). The increased focus on standardisation may therefore in fact contribute to inhibiting the fulfilment of wishes of both healthcare professionals and patients. My findings support this notion, indicating that in some instances technology can indeed distract from individualised patient care. This points to the importance of conceptually distinguishing the nature of providing care (which may be facilitated by IT) and the process of caring (which is in its very essence interpersonal by nature).

In relation to the NHS CRS, it has therefore been argued that there is a need to address such existing concerns and map out exactly how new technology can accommodate these.(257) However, it also has to be kept in mind that attitudes amongst parties can change over time as the technology becomes embedded within everyday practice.(258)

This was illustrated by the longitudinal component in my study and particularly in relation to Site H.

8.2.2.2 Resistance and 'workarounds'

My findings have supported the notion that negative attitudes and the feeling amongst users that change is externally imposed can lead to partial use (i.e. only using parts of the system that are perceived as useful), workarounds, or avoidance of using the system altogether ("non-compliance").(223;226;243) Some authors have argued that resistance to technology itself is rare; rather, the problem is more often resistance to the management introducing the technology.(248) In the context of my findings this was expressed through a questioning of the adequacy of the national implementation strategy and users' perceptions of increasing bureaucratisation of healthcare in general, whilst most stakeholders supported the overall idea of EHRs.

High levels of resistance among senior clinical users in particular were found to threaten implementation in my study, as this staff group tended to have high degrees of professional autonomy. This is supported throughout the literature.(31;259) For example, Doolin describes the implementation of an information system that monitored the performance of doctors into a hospital in New Zealand (which may admittedly have been more threatening to users than Lorenzo software). Here, doctors resisted use which ultimately resulted in changing the system itself.(260)

However, resistance and workarounds may also be viewed in a different light. In this context, Ferneley and Sobreperéz argue that resistance to use technology has traditionally been viewed negatively, but is not necessarily so.(226) It may, for example, be a response to an inadequate system and can, in certain situations, be adaptive (e.g. helping to compensate for inadequate technology).(140;231;259;261) 'Workarounds' are viewed as a result of the demands/rules that an organisation imposes through a system, which cannot be accommodated in everyday practice. Indeed, this was the case in many changes to professional practice observed in my study, where users have tried to

accommodate a system that was perceived to be inadequate, not viewed as central to, and/or disruptive to their work as it compromised time they could spend with patients. 'Workarounds' here were mainly due to perceived unjustified "system blocks" by the user such as having to tick a box before moving to the next field,(262) or the general slowness of Lorenzo. When these issues were too disruptive, staff tended to revert to using paper and often entered information into the electronic system later. Organisational stakeholders stated that this 'workaround' in some instances had a knock-on effect on the effectiveness and integrity of Lorenzo such as records not being up-to-date. This highlights potentially adverse consequences resulting from some 'workarounds' in this particular setting. Previous studies have investigated the potential consequences of workarounds for the safety and quality of care, but the mechanisms by which effects are observed are likely to vary across settings and may not be transferable to other IT applications.(263;264)

8.2.2.3 Expectations

Users had pre-conceived ideas and expectations about the potential benefits of Lorenzo as well as the software and hardware design. These were found to influence adoption behaviour negatively, as often expectations and the product delivered did not align. This misalignment of expectations and actual experience is echoed in the literature.(265-267) In my study, users expected Lorenzo to facilitate care when in fact in most instances it was perceived to hinder it. At the same time, benefits to users and patients were limited. Greenhalgh and colleagues state that this mismatch of expectations and reality tends to be the case with "*off-the-shelf*" systems as these have not been extensively customised to suit local needs.(140)

It is, however, important to keep in mind that in the context of the National Programme there are numerous groups of stakeholders making it difficult for all expectations to be met.(140;226;268) My case studies illustrate that certain groups, such as administrative staff (often the most frequent users of Lorenzo), tended to be neglected in management efforts relating to expectation management. This was further complicated by the large

scale of the implementation and a “*strategic optimism*” on the part of policy makers, presenting EHRs as the definitive solution to improve the quality and efficiency of care.(258) My findings illustrate that this resulted in ambitious aims, aggressive timelines and perhaps excessively high stakeholder expectations, failing to pay attention to the complex and unpredictable nature of the national venture. The literature supports this notion by outlining the often high expectations of managers and implementers, who tend to make certain assumptions that may not necessarily be reflected in reality. These include, for example that safety and efficiency of care can be improved through increased availability of information, that clinical information will be entered at the point of care, and that clinicians support the national strategy.(223;247;261;268-270) In contrast, many users in my study viewed the expectations from management as unrealistic and too ambitious. This again was exacerbated by early negative experiences of system use.

8.2.2.4 Benefits, value and motivations

In order to manage expectations, it is important to consider and explicitly state the potential value to stakeholders, the potential trade-offs and anticipated effects on work practices. Here, Klein and Sorra argue that the degree of fit between an innovation and user values is important.(271) To strengthen “*innovation-value fit*” users need to be involved in the decision to introduce an innovation. It is assumed that if new systems address an identified user need, bring associated benefits, and fit in with existing work practices, this creates a “*user pull*” and makes adoption more likely.(223) My study indicates that this has not always been achieved in relation to Lorenzo, as users and organisations expressed detachment from the nationally-led procurement process, resulting in a lack of both organisational and user pull.

The literature further indicates that users need to be able to identify individual benefits to themselves and their patients (not only to the organisation or healthcare in general).(223;267) In this context, it is important that the relationship of benefits and efforts is relatively equal for all stakeholders.(230) For example, secondary use benefits

(i.e. reporting and performance measures) of the system are most obvious if clinicians are inputting structured data, but my study has shown that clinicians were often reluctant to do so as it was perceived to increase their workload and did not yield visible benefits in the patient encounter itself. The benefits of structured data entry were perceived to be primarily organisational and governmental.

8.2.2.5 Engagement and user input in design

In relation to the NPfIT as a whole, a more participatory approach to development and implementation has repeatedly been advocated.(5;247;257;272) For example, Catwell and Sheikh suggest that this should be characterised by early user involvement and development of a shared vision, formative evaluations and testing of prototypes to assess whether the system is perceived as usable, potential re-design so that it fits with users' needs, summative evaluation and benefits identification once implementation completed, and incorporation of issues identified along the way.(272)

Engagement and user input in design is clearly important,(223;236;247;257;270;273-275) but in line with my findings, this may be difficult to realise with a nationally procured solution such as Lorenzo (see also Section 8.2.1.5). The result of the focus on interoperability was limited local input in system design and a resulting application that did in many instances not fulfil user and organisational needs. In addition, the organic development of engagement was hampered from the start as organisations and users were mandated to implement and use Lorenzo. The literature indicates that a potential way forward may be implementing a combination of standardised core solutions and customised elements, corresponding to particular users and environments (so-called *configurational technology*).(276;277)

8.2.2.6 Training and support

Training is clearly important, but also often difficult, particularly in relation to a non-existent solution like Lorenzo, that constantly changes as new builds become available. Across my case study sites, this system immaturity had significant consequences for user

confidence and resulted in problems planning for anticipated changes for both users and organisations. For example, the much desired dummy training giving users the chance to play around with the system was often simply not possible as the technology was not available. The situation was further complicated due to the large scale of the Programme, limited resources, and tight implementation timelines, which restricted intensive training and support. Although the literature highlights the importance of training,

(21;22;24;28;29;32;42;47;50;51;53;55;56;58;61;62;65;66;68;76;77;84;179;278) these circumstances were truly unique as the nature of the national EHR implementation meant that case study sites were in many cases pioneering and encountered many unanticipated situations that could not be planned for.

8.2.2.7 Champions

My findings support the importance of key individuals in EHR implementations,(36;279) and particularly senior clinical and managerial staff, in getting other staff “on board”. However my findings also indicate that some non-clinical staff groups have so far been neglected such as, for example, administrative staff, who used Lorenzo most frequently but did not have representatives from their profession in strategic meetings whilst clinical representatives were more common. Insufficient attention has also been paid to preventing the rise of “*negative champions*” due to delays in software development.(35) My findings support the notion that these can pose a significant threat to implementation “success”.

8.2.2.8 Integration with existing work practices

As discussed in Section 8.2.2.2 above, users often found it hard to integrate Lorenzo into their day-to-day work practices, resulting in partial use, workarounds, or avoidance of using the system altogether.(223;226;243)

This again illustrates the repeatedly highlighted role of user input in design as well as the need for adaptation and customisation, in order to effectively integrate systems with

existing work practices.(140) Nevertheless, even if effective work process mapping occurs (which again is difficult with a system that is being developed as it is being implemented), it will never be possible to plan for all changes as these are often unanticipated and emerge from the situation at hand. Some have stated that there is therefore always a need to try out a new system in practice and then keep re-configuring it based on local experiences.(243) This was, however, in many instances not possible across my case study sites due to the lack of local input in software design and the often delayed incorporation of software changes. The rigidity of the nationally procured software also made it difficult to re-engineer business processes in a way that meant increased efficiency locally (at least in the early stages). Users therefore had to change their work practices to fit in with the technology. It also seemed that there was a lack of attention paid to examining informal work practices that characterise the dynamic and ever-changing hospital environment,(280) such as for example the informal x-ray ordering by nurses described in Site B.

8.2.3 Organisational dimension

Individual work practices were placed within and influenced by a wider organisational and environmental setting.(180;181;281) A word of caution is, however, needed at this point as the NHS is not one organisation, but rather a federated increasingly autonomous grouping of care providers.(282) This became increasingly apparent throughout my research as hierarchies and organisational arrangements, as well as implementation approaches, differed significantly within and across Trusts. It is precisely because of these differences that examining the organisational dimension (conceptualised as the Trust environment) in light of my emerging findings is helpful. I will do this in the subsequent paragraphs.

8.2.3.1 Getting the organisation ready and planning change

It seemed that all three Trusts studied were generally well prepared for the introduction of Lorenzo. They “ticked all the boxes” identified as important organisational “success” factors including strong visionary leadership and a “*risk taking climate*” (see Chapter

2).(277) Similar to individual work practice planning mentioned above, organisational planning was, however, hampered by the fact that Lorenzo software was still in development. As a result, many consequences for organisational functioning, such as for example problems experienced in Site B when the PAS was replaced, were unanticipated.

A mixture of implementation approaches were employed depending on the Trust in question (as outlined in Chapters 6 and 7). This heterogeneous way of implementation helped to suit organisational locales, but may prove problematic in the future as Lorenzo functionality may branch into several local versions resulting in a lack of ability to integrate the functionality across organisations.

8.2.3.2 Leadership, management and realistic expectations

A lack of management support is one of the most important factors contributing to the “failure” of IT implementations in healthcare.(230;268) In my case study sites, local management and leadership structures seemed to be in place, but national leadership was often lacking with changes in key national figures including senior staff at NHS CFH and changes in strategic direction (further outlined below in Section 8.2.4). This, coupled with ambitious national expectations relating to implementation timelines, resulted in increasing levels of frustration in case study sites.

Originally, NHS CFH had put in place clear management standards and structures for the NPfIT as a whole, thereby providing strong national leadership capacity. However, it is of concern that the role of NHS CFH as a designated implementation authority is at the time of writing unclear following its integration into the DH’s Informatics Directorate. A central agency with designated responsibility for setting standards and ensuring interoperability of systems is particularly important with the increasing focus on local autonomy in systems choice.(219)

8.2.3.3 Management and user ownership

In relation to Lorenzo, users themselves were not involved in procurement decisions, which may have contributed to the negative attitudes observed in my case studies. In this context, the management literature promotes the notion of employee participation in achieving higher returns for the organisation.(36;238;283) However, the issue here is that there is often an emphasis on short-term profits and individual measures of performance. This leads individuals to do what is best for them in the short term rather than what is best for the organisation in the long term.

Similarly, some authors have argued that participatory development in government initiatives may not be as participatory as it may seem, as eventually certain objectives need to be achieved.(284) The result is that these objectives may at some point become far "*too important*" to be participatory. This was also reflected in my case study sites, where implementation was driven politically rather than locally. As a result, organisations were required to implement and users were required to use the application.

8.2.3.4 The implementation team

Trusts were responsible for setting up local Lorenzo implementation teams. However, it became apparent during my study that there was a lack of competent health informatics and project management expertise in the NHS, which resulted in Trusts employing often costly sub-contractors to manage implementation activities. As a result, expertise was often not retained within the organisation, which in turn hampered long-term progress as individuals moved on. This was illustrated by my case study of Site H, where the "success" of the implementation was threatened by the departure of the sub-contracted IT Manager.

8.2.3.5 Complexity and management in the NPfIT

The organisational complexity of the Lorenzo implementation was further illustrated by the presence of informal hierarchies across my case study sites such as, for example,

clinicians being relatively autonomous. Much of the existing literature, however, focuses on hierarchical managerialist models, which may not necessarily be relevant to the NHS.

Due to these informal hierarchies, management and leadership in the NHS tend to increasingly shift towards achieving through consensus.(277;285;286) Räsänen and Linde argue that this shift is characterised by the increasing number of multiple projects taking place in one organisation led by Project Managers.(285) Although this “*projectification*” increases participation of various groups, projects are taking place in increasingly larger organisational environments. This means that new tensions can arise with different projects competing for resources and priority. The resulting challenge for management is to keep control over these different structures whilst still allowing for participation and empowerment of different groups.(277)

In my case studies, the implementation of Lorenzo tended to be conceptualised as a project both locally and nationally. The competing nature with other ongoing initiatives and priorities was illustrated throughout my findings. There are several implications of conceptualising such large and transformative initiatives as projects.(284) These include the characteristics of conveying manageability, and, most importantly, a start and an end point. However, some of the more critical thinkers have argued that this view may in fact not fit with the messy nature of reality, in which changes are often ongoing.(284) There is therefore a need to recognise on both organisational and national levels, that the implementation of Lorenzo is a process as opposed to a project and that implementation is likely to be ongoing. My case studies indicate that this has so far not been achieved, which is also reflected in the often unrealistic expectations referred to in the paragraphs above.

8.2.3.6 Teamwork and communication

My findings clearly show that nationally held commercial contracts may inhibit cooperation and trust between different parties, and particularly between local organisations and software developers. These contracts also tended to hinder teamwork

and communication across early implementing organisations, with Trusts wishing for a more open approach to sharing lessons learned. Chesborough outlines how a more productive alternative approach in relation to technological innovation may be conceptualised.(287) In doing so, he promotes an “*open innovation*” as opposed to a “*closed innovation*” model. Closed innovation is characterised by companies developing new technologies, but failing to effectively integrate these into existing business models. The open innovation model allows other firms to capitalise on these technologies through licensing agreements. This means that innovative technologies are more effectively utilised and integrated as experience and systems are shared to benefit both companies and customers. The Lorenzo implementation may be conceptualised as a closed innovation approach, where large-scale contracting inhibited sharing of lessons between implementing organisations and commercial companies.

In relation to teamwork within organisations, some authors caution that teamwork itself may create groupings of those that are viewed as belonging and those that are viewed as not belonging.(288) This may, in some cases, lead to tensions between groups and reinforce occupational divisions such as between managers, clinicians and administrative staff. My findings have illustrated that such tensions may be reinforced by technology introduction as occupational groups and power structures (e.g. between administrative staff and consultants) became more visible with the implementation of Lorenzo.

8.2.3.7 Learning and evaluation

In relation to IT implementations in healthcare, most authors advocate the use of a flexible evaluation model (i.e. being open to emerging problems that arise from contextual contingencies) based on sociotechnical theory.(104;289) This approach proved extremely useful in my study, but I found a lack of theoretical underpinnings of methodologies in the existing literature, particularly in relation to large-scale EHR implementations such as Lorenzo. I therefore developed a methodological framework

based on sociotechnical theory to guide my data collection (see Chapter 3). This approach may also be applied to other contexts.

8.2.4 Macro-environmental dimension

My findings have shown that there is a need to align several different stakeholder perspectives to ensure “successful” national and local implementation. The literature has also highlighted this need in the overall context of the NPfIT.(95) Stakeholders in relation to Lorenzo include not only clinicians and healthcare organisations, but also commercial and political parties, as well as designers, independent organisations and the media. The focus should not be on attempting to streamline these perspectives but on supporting the achievement of the common aim of integrated EHRs by means of accommodation rather than consensus (i.e. parties do not necessarily have to agree as long as they are coherently working towards a common vision).(290)

When examining macro-factors in relation to Lorenzo, it is important to acknowledge that the developments in my case studies have taken place within a wider transformation of the NHS and the NPfIT. This complexity was not adequately reflected in my initial literature review, as existing studies were conducted in a variety of other contexts.

Overall, it is important to acknowledge that there were important “successes” in the Programme as a whole, including, amongst others, the implementation of PACS (which brought immediate benefits to users), GP systems, and the building of both national (Spine, N3) and local infrastructures as well as the development of standards (e.g. the interoperability toolkit).(291) In addition, the Programme helped to develop health informatics expertise within the NHS, although there is still a need to build on this.

However, my findings indicate that local developments were heavily influenced by the changing financial climate, with a resulting tightening of NHS budgets in general and, more specifically, publicly debated concerns about the escalating costs of the Programme.(292-294) As a result, there was a considerable political debate about

changes in strategic direction. Despite the general buy-in into the central vision of the Programme and EHRs in general, the flux of the political landscape in particular, led to a considerable feeling of uncertainty in relation to the future strategic direction amongst stakeholders on the ground (see Chapters 6 and 7). This, in turn, resulted in a “waiting to see what happens” attitude amongst organisations and users, leaving the larger strategic decisions to the more “powerful” governmental stakeholders.

Specifically, progress at the time of writing had been hampered by a lack of central guidance from the coalition government elected in 2010 (as mentioned in Section 8.2.3.2). Initial plans were announced but the implications of the future IT strategy for those on the ground were, as of August 2011, still tentative.(79;219) Part of the discussion was the role of NHS CFH, whose responsibility was integrated with the DH’s Informatics Directorate. The coalition government did not, despite announcing budget cuts and an estimated £20 billion in NHS efficiency savings, publish a detailed IT strategy for the NHS, but indicated that the future of the NPfIT would be characterised by increased local input in decision making and an opening of the supplier market.(79;219;221) In line with the constantly changing nature of the NHS itself (outlined in Chapter 1) these changes were not envisaged to occur in isolation. They were accompanied by a plan to establish new regulatory structures to monitor progress and quality, increased control by local GPs coupled with a decreased input from commissioners and the government, and abolishment of SHAs. This new strategic direction in relation to IT and the general re-structuring seemed to reflect an increasing move towards the NHS as a collection of autonomous organisational units, as opposed to one unified organisation. Conceptually, although placed within the context of a national implementation, this move seemed somewhat at odds with a “top-down” implementation strategy that attempted to implement a programme governed by the “one size fits all” assumption. My findings have illustrated that these tensions were often hard felt on the ground, with organisations striving for more autonomy whilst being faced with centrally procured software lacking customisability.

My research indicates that it is the combination of change reforms supported by IT strategies that can maximise the chances of “successfully” implementing new systems, but the new governmental strategy clearly aims at major re-structuring of the NHS and a separate IT reform. This is of concern, as two disjointed strategies may have undesired consequences with those on the ground finding it difficult to prioritise. Many have therefore questioned whether another resource-intensive reform should be the current priority of an NHS that is already struggling to meet demands.(295) In addition, in line with my findings, the NHS is already suffering from what has been described as “change fatigue”, which may be exacerbated by such developments and there is thus a real danger that both individuals and organisations simply cannot accommodate changes effectively.(296)

These changes in strategic direction have not only been influenced by local developments (Chapter 7), but also by more publicly raised concerns relating to information governance and security from various clinical bodies.(297;298) Several reviews and recommendations published over the last few years in relation to the NHS IT strategy from a variety of governmental and non-governmental stakeholders advocated an approach permitting more local input and choice.(222;292;293;297-301) In doing so, practical ways to address emerging problems have been proposed.(222;293;294;302;303) The central recommendation here was introducing clinical benefits early whilst continuously assessing both risks and benefits. A move towards a greater number of centrally accredited interoperable systems from which Trusts could choose was viewed as essential to increase local autonomy of Trusts. This also involved the ability to keep well-functioning existing systems as opposed to having to replace these with national solutions. My findings illustrate that these recommendations were indeed realistic and desired by Trusts as they were likely to allow some early local benefits to be realised. The increased emphasis on local autonomy was also likely to permit more local input in implementation activities and system choice, which in turn can facilitate local problem solving and engagement.

However, it is important to recognise that this approach is likely to result in a new set of challenges, particularly in relation to systems interoperability (as discussed above). The more localised approach is in many ways similar to the IT strategy that was in place before the Programme was conceived. Back then, some parties argued that there was a greater need for integration as systems needed to be interoperable to bring the desired large-scale benefits. In addition, there was a general feeling that if money to deploy systems would be devolved to Trusts, sufficient IT investment would simply not be made.(304) Therefore, it was suggested that a central solution would be more appropriate. Both of these issues are still of concern in relation to any future strategy. In this context is also important to recognise that this new strategic approach, should it materialise, has to date been largely untested and will need careful planning and flexibility to suit the evolving needs of the NHS.

8.2.4.1 National implementation approaches

These macro-environmental developments outlined above are of course situated in an even wider environment. In the literature, national EHR implementation approaches have received increasing attention over time as, in the hope of achieving significant potential benefits, many countries are actively pursuing the implementation of EHRs that can be shared across care settings. Strategies here vary in the degree of governmental control in the process of achieving large-scale interoperability of EHR and related systems (see also Chapter 1). They range from implementing centrally procured systems characterised by rigorous standardisation (as in England), to centrally setting standards for “meaningful use” facilitated by government funded incentives (as in the US).(9;305-309) Some countries have also employed a mixture of these approaches (such as Australia) where government support is combined with local choice and responsibility.(9;310-312)

As outlined in Chapter 1, there were clear reasons for the “top-down” approach taken by England, with major anticipated benefits emerging from the rigorous standardisation of systems. Cost savings were expected by large-scale procurement of systems, and the

strategy emerged from an identified need that central guidance was necessary to coherently lead the increasingly fragmented NHS into the 21st century (at least in relation to IT). Nonetheless, my findings have shown that, in the English context, the balance between achieving potential long-term benefits by seamless large-scale systems integration without compromising evolving individual user and organisational needs proved difficult to achieve. The anticipated benefits have remained elusive, with systems increasing individual workloads and in some instances compromising organisational functioning. In support of this, a range of international experiences also indicate that, even when investigating benefits in longer-term EHR implementations, direct net returns on these investments are unlikely to be realised, particularly not in the short-term.(244) This is likely to be exacerbated in a national context due to its complexity and scale. The main tension, which also characterised my study, is finding a balance of achieving local benefits and adoption typically offered by “home-grown” systems, with a more rapid and cheaper implementation of commercial EHR systems. This has so far still only been achieved on a relatively small scale characterised by extensive customisation of systems to suit local needs.(313)

8.2.4.2 Overall progress of Lorenzo implementations

Having outlined international developments and progress of the National Programme overall, I will now focus my attention back on Lorenzo. In relation to the English venture, my findings have indicated that many stakeholders were increasingly critical of the “top-down” implementation approach, possibly in light of an observed lack of progress experienced in relation to Lorenzo implementations. Overall, implementing Lorenzo was much slower than anticipated and implementations were characterised by often publicly debated problems, combined with the limited scale and functionality deployed.(314) As of December 2010, by which time the implementation should have been completed and my data collection period came to an end, eight out of 219 Trusts (4%) were live with limited clinical functionality. R1 was still used on a relatively small scale in one mental health Trust, two community Trusts, and three acute Trusts. R1.9 was implemented in two acute Trusts and one community Trust.

My findings can help to suggest potential reasons for this lack of progress. In doing so, I draw on the experiences at early implementer sites and their surrounding environment. The complex national arrangements and the nature of the software emerging from these arrangements meant that users and organisations found it difficult to accommodate the technology over time and therefore the implementation progress in terms of scale was limited (see also Chapter 7). Underlying mechanisms will be explored by drawing on the relevant theoretical frameworks in the following sections.

8.3 Integration with theoretical frameworks

The following paragraphs will tease out the contributions of my findings in more detail by drawing on the various theoretical frameworks, which informed my analysis and interpretation of results (Chapter 4). To provide structure, these deliberations are organised along the dimensions emerging from cross-case comparisons (see Chapter 7). In line with my overall aim, the overall focus was on exploring the views and experiences of users as well as organisational consequences of introducing Lorenzo and how these evolved over time in the complex environment of a national EHR implementation.

In line with ANT as the main theoretical framework, I paid particular attention to how users and Lorenzo were interrelated and how they “re-assembled” to form a new network over time. In doing so, the aim was to map-out network connections as far as possible as the new actor (Lorenzo) was integrated with existing practices. As these developments were situated in larger organisational and macro- environments, these were also viewed as part of the network.

In light of ANT’s limitations, mainly in relation to its lack of attention to wider social factors, the problem of going beyond description, the positioning of human and non-human actors, and the problem of defining the network, my analysis also drew on other relevant theoretical lenses (see Chapter 4). These included Strong Structuration Theory,

Greenhalgh and Stone's model, the Social Shaping of Technology, Social Psychology, Normalisation Process Theory, and the Theory of the Diffusion of Innovations.(92;113;138;141;146-152)

8.3.1 Macro-influences

As my findings have shown, in relation to the “top-down” implementation of Lorenzo,(9;224) macro-contexts such as political, cultural and economic factors clearly had significant consequences for how the technology was used and implemented over time. This also illustrated the value of collecting data beyond the immediate Trust environment from multi-sited ethnography informants. Strong Structuration Theory and the Social Shaping of Technology helped to understand these macro-issues.(138;141)

For example, Strong Structuration Theory conceptually separates social structures (such as NHS organisations, or the political environment) from individual agents (e.g. NHS staff using Lorenzo), assuming that the two have a mutually shaping relationship.(141) This, in turn helped to explain how the macro-environment was influenced by micro-factors (and vice versa) over time. The NPfIT is a nationally driven strategy, with organisations being strongly encouraged to implement centrally procured EHR software like Lorenzo.(26) However, it soon became clear that this entirely “top-down” approach would not work as originally envisaged.(315) Healthcare professionals across sites began to resist using software that was perceived as lacking fitness for purpose and organisations began to demand greater flexibility and more input in terms of systems choice and implementation strategy. As a result, the Programme's general direction changed to allow for more local choice and flexibility in relation to EHR implementation and use, supporting the existence of a mutually shaping relationship between micro- and macro-factors (as described in Chapter 7). However, many ongoing deliberations and political debates relating to large-scale IT implementations assume that these factors are relatively stable, neglecting this dynamic relationship between national and local developments.(27;31;38;39) In relation to Lorenzo, this was in turn reflected in strategic

planning where politically set implementation timelines were at odds with organisational readiness to implement.

Literature surrounding the Social Shaping of Technology has highlighted the significance of macro-factors in shaping the technology itself, and associated implementation and adoption activities.(138) From this perspective, technology is viewed as being influenced by choices made by key stakeholders throughout the design, implementation and adoption circle. Different choices are assumed to arise from particular interests and can have various consequences for the various stakeholder groups. Viewed in this light, the design of Lorenzo may be seen as having been shaped by both political and economic interests. For example, the large number of clicks and mandatory screens in the system may have been the result of a strategic focus on collecting standardised data across healthcare settings for secondary uses purposes (see Chapter 7). Similarly, the complex security arrangements associated with the use of SmartCards may have been the result of an increased national focus on the security and confidentiality of clinical information, possibly resulting from increased law suits and public discussions surrounding data security more generally. These “inscribed properties”¹⁶, resulted in additional workloads and significant changes in work practices for those on the ground as they tried to accommodate Lorenzo in their everyday work.

8.3.2 Developments over time

As outlined in Section 7.3, temporal developments have played an important part in my research, also highlighting the value of the longitudinal dimension in my data collection. In this context, contrasting changing experiences and perceptions of stakeholders within and across case study sites proved useful in illustrating the fluidity of the implementation and adoption process. Drawing on the Theory of the Diffusion of Innovations helped to conceptualise how individual behaviours fitted within a larger organisational context and how change spread (or failed to do so) over time.(150;151)

¹⁶ The term “inscribed properties” refers to assumptions made throughout the design and reflected in the software itself.

Normalisation Process Theory helped to take these developments a step further, by helping to explain the extent to which Lorenzo was embedded within individual practices and how the technology was routinely used (or not) within the organisational settings.^(92;152) Factors identified in these models to either inhibit or facilitate diffusion and/or normalisation were consistently found in my three case studies (Chapter 7), providing an explanation as to why the implementation and adoption of Lorenzo was slower and on a much more limited scale than originally anticipated.

For example, Lorenzo was, in most cases, viewed by users as having no (or in Site H limited) advantages over paper records, and was not perceived to improve the quality and efficiency of care. It was often seen as a “tick box” exercise reflecting the increasing control of management, and was perceived to affect the clinician-patient relationship adversely, so clashing with what was described as the essence of professional practice, delivering good patient care (also see Section 8.2.2). Lorenzo did not fit in easily with individual work practices and collaborative work from the perspectives of users, often radically changing these unfavourably. These perceptions were amplified by the fact that the system was still very much in development and could therefore not appropriately be demonstrated or trialled out, resulting in a lack of knowledge on how to work it. Tailoring to local contexts of use was, due to the national procurement (and despite the assumed configurational nature of the software), only possible to a limited extent, which in turn meant narrow potential for re-invention for both users and organisations and resulted in the software not fulfilling local needs in most cases. This rigidity did also not allow new practices to emerge locally, resulting in a lack of motivation amongst stakeholders to drive the change forward. Where the potential for re-invention was present (Site H), and where additional resources were made available to allow more effective embedding with individual and collective practices, the software was more readily adopted and seemed to have begun to be “normalised”.⁽⁹²⁾ In other case study sites, the diffusion of the technology in the organisations was slow, often not going beyond the early users. Normalisation did not occur, as on reflection most stakeholders concluded that the system simply “did not work”.

However, even in Site H, where perceived issues with the software were addressed over time and the use of Lorenzo was beginning to become routine, the diffusion of the innovation throughout the organisation was slowed down, as it had lost its innovation champion (i.e. the IT Manager). Here, “contextual integration” of the software was inhibited due to organisational practicalities surrounding the implementation i.e. the costs were outweighing the benefits.

When one organisation pushed for organisational diffusion due to political pressure (Site B) but lacked embedded use of the software locally, significant adverse consequences for overall organisational functioning were the result. This may have been due to the fact that this roll-out was building on a limited EA user base of often not very enthusiastic users without letting the innovation spread organically (i.e. go through stages of innovators, EAs, early majority, late majority, and laggards).

8.3.3 Software characteristics and their consequences

I explored the consequences of Lorenzo for both individual and collective work practices and relationships of organisational stakeholders. In doing so, it became increasingly apparent that the design of the technology had significant consequences for its everyday use. Drawing on the Social Shaping of Technology and Greenhalgh and Stone’s model helped to explain the relationship between the design of the implemented product and implications for its use in context.(138;141)

For example, the design of Lorenzo was heavily shaped by the developers, who had to make certain assumptions as to what they thought the users wanted and needed. This was complicated by the lack of insight on their part into the reality of clinical practice in an entirely different country (as they were based in India). The design of the software reflected this and problems were encountered accordingly when it was implemented into clinical settings, resulting in a perceived lack of fitness for purpose amongst users.

Similarly, technologies are clearly shaped by their historical backgrounds. Lorenzo software did not exist in its full form at the time it was commissioned. The intention was that this would result in increased input from staff on the ground, but the immaturity of the system resulted in a range of basic usability issues and knock-on effects for those on the ground. These included, for example, a lack of ability to plan implementation activities (as the product did not exist) and related issues with stakeholder engagement (as the software could not be demonstrated to users). As a result, some resisted use or used the application in ways other than intended, actively influencing their relative position in the network. They shifted their position from passive recipients of the technology to actively shaping how the technology was implemented by slowing down the ambitious implementation timelines (as mentioned above).(141)

8.3.4 How Lorenzo shaped individual and collective work practices

In investigating how exactly Lorenzo actively shaped both individual and collective work practices i.e. the micro-context, ANT proved particularly useful.(115;138) Conventional systems were replaced by the new software and this resulted in radical changes to the way the healthcare team operated. As outlined in Chapter 7, the introduction of Lorenzo not only resulted in increased workloads but was often also perceived as lacking usability. Users devised various ways to compensate for the increasing demands on their time and perceived shortcomings of the technology. These coping strategies had several direct and indirect knock-on effects. These are considered below, in turn, in relation to collaborative working, patients, paper records, managerial outputs and recording activity:

- Collaborative working – hierarchical structures and communication: The new technology impacted on the ways in which the healthcare team interacted. This was in some instances seen as a positive consequence, but in other situations as a negative development. In relation to the former, some users felt that using the system helped to make communication more effective over longer distances (e.g. in Site H). On the other hand, users also reported that the system changed the way the healthcare team interacted in negative ways. This was mainly expressed

in relation to changing professional roles and responsibilities with an increased emphasis on administrative tasks as was observed in Sites B and Q. It was seen as particularly problematic by clinical staff who expressed concern that the resulting displacement of administrative duties on to their shoulders was detracting from their more pressing clinical responsibilities.

- Time with patients: The introduction of the new system was perceived to reduce the time healthcare professionals could spend with patients, leaving clinical staff frustrated, as direct patient care was seen as more central to their role and professional identity (Site Q). In some instances, the technology also reduced the perceived quality of the interaction with patients. Using computers whilst consulting was, for example, felt to impact on the communication flow with the patient, rendering the consultation more formal and less engaging (Site H).
- Other systems such as paper: It also became apparent that the introduction of the new system not only impacted on individuals, but also had an effect on paper records (which were still used in parallel). Here, paper was often found to be more distributed across geographical locations within healthcare settings. For example, different users would take paper files to their desks at different times to file the electronic print-outs whereas before the introduction of the system all paper records were held centrally in the reception area. As a result, other users needed increasingly to “chase” paper records (Site Q).
- The medical record itself: Similarly, data entry itself was impacted upon, this in the main manifesting as delays in transcribing the record as it was often delayed with the introduction of the new system. This was due to the software being perceived as slow and as impacting on the communication flow with the patient. Notes were therefore often typed up at the end of the day or, in some instances, days after the consultation had taken place. Paper notes were used in the meantime as reminders. As a result of this delayed data entry, the new computer system was found to be less up to-date than systems that were previously in place.

- **Managerial reports:** Managerial outputs were also affected by the introduction of the new electronic system. When staff employed workarounds, this would in some cases result in inaccurate reports being generated by the system further down the line, impacting on managers' ability to track activity levels. An interesting example given in Site B was that users in outpatients would book appointments on the system using a route that was less laborious, but which meant that, although these appointments would show on their screens as booked, they would not show on the rest of the system as booked. As a result, the managerial outputs became unpredictable to the extent that these in a number of instances no longer reflected the reality of what actually happened.

These observed effects seemed to be due to the relative rigidity of electronic coordination introduced with Lorenzo. Here, specific individuals and tasks had to be categorised in some way to allow the electronic system to coordinate them. However, in reality both activities and individuals were often found to belong into more than one category, which made this categorisation difficult. For example, nurses without special training in Site B were not allowed to order x-rays with the new system, but they often filled out the forms for doctors to sign them later. This shared task did not fit in with the categorical nature of the system as it assumed that a task was either done by nurses or by doctors but not shared by both.

Technological representation clearly requires some level of abstraction, but somehow these abstractions needed to be meaningfully translated back into reality, which did not always happen.(228) For example, ticking certain boxes in the system asking if the patient was pregnant, may have been appropriate for some groups of patients but not for others such as children. It therefore seemed that the reality Lorenzo attempted to represent was not perceived as adequate as it was too detailed and directive (i.e. by making several parts of activity compulsory that were in reality often skipped). This resulted in demands on users that could simply be not always fulfilled and did not allow for flexible working and emergent practices.(228;316) It also did not allow for natural

collaborative groupings between human actors to emerge, but appeared to impose hierarchical structures and roles, which were not perceived to fit with the day-to-day work of users.(317)

It also seemed difficult for users to accommodate prioritisation in the electronic system. Here, priorities mainly focussed on providing adequate patient care, whilst from a systems perspective they tended to centre on recording data, and ensuring security and confidentiality. This seemed to result in a ‘clash of priorities’, which meant that users often decided to put patient care (often conceptualised in terms of time they spent with patients) before the demands of Lorenzo. This was exacerbated when the technology required them to complete tasks that were perceived as “*unnecessary*” and “*duplicative*”.

However, despite these helpful insights, ANT does not account for the internal structures of agents such as attitudes. Indeed, attitudes have played an important role in my case studies. They were often shaped by experiences of use (and not attitudes towards technology per se), which affected the intention to use the technology.(146;149;318) This may be explained by a perceived lack of usefulness and ease of use, but these varied amongst different user groups depending on their respective contexts. For example, different attitudes led to different levels of use. Those who thought the technology was helpful and those who could not resist use, used it; whilst those with more autonomy and negative attitudes tended not to.

8.4 Some critical reflections

Throughout my research, I felt increasingly drawn to the critical perspective, which is commonly used in information systems research.(100;319) The following sections will examine my results and interpretations drawing on critical theory. This will be done by critically reflecting on power relationships between stakeholders and the role of theoretical perspectives that have informed my study.

8.4.1 Power relationships between stakeholders

There is a range of ways to examine my findings from a critical perspective (e.g. in a more general sense of questioning stakeholder assumptions including my own), but one of the most pertinent pervading my results related to power relationships between stakeholders. In this context, the critical perspective can help to interpret the limiting conditions in relation to power and control that are thought to influence behaviour.(96;260;320-322) However, the critical perspective can be extreme, highlighting the need for a balanced approach. Here, I found it helpful not to be guided by a critical stance in terms of data collection, but to keep an open mind by drawing mainly on an interpretative approach informed by hermeneutics. In line with this, Doolin argues for a combination of interpretative and critical approaches in information systems research.(321) In relation to power, for example, Doolin argues that researchers should not assume that technology simply empowers some and disempowers others. Instead, it needs to be seen as both being shaped by and as shaping social relations located in a wider environment. This should involve trying to understand meanings, contexts and processes as perceived from different perspectives (the interpretative perspective); and a questioning of assumptions taking into account the role of power in the social and wider political environment (the critical perspective).

I believe it is worth reflecting on this retrospectively as imbalances of power became increasingly visible during my research (Chapter 7). These power imbalances appeared to be amplified by the implementation of Lorenzo as some stakeholder groups were more actively engaged in (or indeed more able to actively resist) activities when compared to others. There were differences, for example, between occupational groupings (e.g. administrative staff and consultants), but also between the government with its centrally negotiated contracts and local Trusts who lacked involvement in decision making. Perhaps I sympathised with this stance due to the “top-down” imposing nature of the Programme, but perhaps also due to my close involvement with those that had to cope with the consequences of the national implementation locally. By drawing on ethnographic principles my awareness of power imbalances seemed to be a

result of “going native” and seeking to understand perspectives of stakeholders on the ground.

Viewed in a critical light, Lorenzo itself may be viewed as having emerged out of particular governmental interests reflecting national attempts to influence social structures surrounding healthcare delivery, and as a means of exerting control.(227;228;321;323;324) These interests may have been mainly economic in nature, which was also evident in the promise of large-scale cost savings and the focus on benefits through secondary uses of data, often at the expense of individual, and in particular, pastoral care (as discussed above).(325) In light of my findings, the general validity of these implicit governmental assumptions behind quality improvement initiatives and standardised treatments may, however, be questioned as they have at times compromised rather than facilitated the efficiency and quality of care.(254;255)

As a result of this unequal distribution of power, many non-governmental stakeholders may be viewed as relatively powerless with little control over national developments. For example, although public concerns surrounding potential security issues with national EHR solutions have been ongoing since the conception of the Programme, the government pressed ahead with the roll-out, leaving the public in a marginal role and with little power over decision making in terms of strategic direction. This was further complicated by the use of both medical and technological jargon, as well as the continuous secrecy under the guise of commercial sensitivities (e.g. surrounding contracts). But it is not only the general public who may be viewed as relatively powerless. Individual behaviours that may be viewed as being controlled also include those of healthcare professionals (who are told to record information electronically and use a particular software to do so), patients (who are told to adopt health promoting behaviours and agree to have their information recorded electronically) and the medical institutions themselves, which often (and again due to contractual arrangements) had no decision making power in relation to implementation strategies and the product.

In line with the above argument, individual users may therefore be perceived as relatively powerless. However, as discussed above, the atypical hierarchical structure of the English NHS and the often significant professional power amongst some groupings in this sector meant that certain individuals could (and did) resist use. As a result, they became powerful as they could influence the national implementation strategy (see Chapter 7).

8.4.2 Theoretical considerations

The critical perspective can further help to reflect on the ways in which EHR implementations have been conceptualised and investigated to date. This includes my own attempts to conceptualise the theoretical space and follow appropriate methods (please also refer to Section 8.5). For example, drawing on multi-sited ethnography and case studies proved useful in my study as it helped to focus data collection activities without neglecting local contingencies and macro-environmental factors. In relation to theory, there are a number of relevant critical reflections which I will outline in turn.

In social research, theory plays an important role in building on existing knowledge by helping to describe and explain the complexity and dynamic nature of social reality.⁽³²⁶⁾ In my study, drawing on theory helped me to apply present knowledge in the field to the real world and then use this to build on existing frameworks. Theory also guided my data collection activities, particularly in relation to theoretical sampling (see Chapter 4).

More specifically, I utilised several existing theoretical and methodological frameworks, which informed my data collection, analysis and interpretation. Different frameworks have contributed to these different stages of my study in different ways. For example, whilst ANT was extremely helpful in conceptualising the space of my study and ensuring a theoretically informed focus of data collection activities, it was less helpful in analysing and interpreting my findings. Similarly, other frameworks (including Strong Structuration Theory, the Social Shaping of Technology, Social Psychology,

Normalisation Process Theory, and the Theory of the Diffusion of Innovations), were helpful in interpreting my findings and in drawing conclusions but less so in relation to theoretically informed sampling. This possibly also reflected the way I had approached theoretical considerations, namely by examining one framework in depth (ANT), distilling its contributions and limitations, and then beginning to think about how other frameworks may help to address these.

By drawing on a combination of theoretical considerations selectively, I developed a methodological framework that helped to guide both data collection and interpretation (Chapter 4). Throughout this process, I was careful in outlining how the different perspectives fitted together.⁽³²⁶⁾ Drawing exclusively on one framework may have left me prone to “force fitting” my findings into existing theories (which themselves have often emerged out of a particular context and may be restrictive). Instead, the approach I employed allowed for critical reflection (including that of the usefulness of theories themselves) and new findings to emerge that were not necessarily considered in each separate framework.^(326;327) This is particularly relevant when considering the subject of my study, namely a national implementation scenario, of which no theoretical frameworks existed as it had simply not been attempted to be implemented and evaluated anywhere else in the world. Based on my methodological framework and my emerging findings, I developed models proposing potential causal pathways involved, beginning to translate specific instances observed into more general theoretical concerns (e.g. Chapters 7, 8 and 9).⁽³²⁷⁾ Naturally, my propositions now need to be tested in other settings.

During this process, and entirely based on my own experiences, I found some theoretical frameworks more helpful than others. For example, ANT was useful in conceptualising the interrelated nature of social and technical dimensions and the active role of the technology in the micro-environment. It was less useful in considering macro-dimensions and in explaining how observed effects came about. Drawing on the other frameworks helped to place these micro-processes into context, explaining the role of

internal structures of human agents. They also helped to conceptualise the environment in which these sociotechnical processes were situated (i.e. organisational and macro-environmental).

In many ways, these other frameworks were, however, referring to similar additional dimensions that ANT had difficulty accounting for. For example, internal structures of agents were accounted for in a relatively similar way in Strong Structuration Theory, Greenhalgh and Stones' model, Social Psychology, and the Theory of the Diffusion of Innovations; whilst environmental factors were explained in Strong Structuration Theory, the Social Shaping of Technology, Normalisation Process Theory and the Theory of the Diffusion of Innovations. This begs the question whether some aspects of frameworks were actually needed in interpreting my data. For example, the more general considerations surrounding Social Psychology were often already implied in other theories. Similarly, part of Greenhalgh and Stones' model was concerned with a deeper emphasis on the technological dimension already included in Strong Structuration Theory and the Social Shaping of Technology. It did therefore not contribute much in the context of my study. On the other hand, drawing on both Social Psychology and Greenhalgh and Stones' model sensitised me to the importance of individual attitudes and a questioning of how the technology has emerged, which may not have been obvious when drawing on the more inclusive frameworks alone.

The argument outlined above also led me to reflect as to whether specific frameworks are needed for technology implementation as opposed to the more general frameworks focusing on innovation. Based on my experiences, frameworks focusing on technology are not inclusive enough (e.g. ANT and the Social Shaping of Technology focus on technology and may neglect the internal structures of agents), whilst the more inclusive models are not specific enough when considering technology implementation. The latter may include the Theory of the Diffusion of Innovations as technology does have inherent characteristics that may differ from other innovations (e.g. hardware and software components); and Normalisation Process Theory as attitudes of individual

agents in the healthcare setting seem to be important and do not necessarily result in coherent collective action (every person dealt with the system differently e.g. some resisted use altogether and some employed a range of different workarounds).

I also somewhat struggled with the descriptive nature of some of the theoretical frameworks. They certainly helped me to describe what was going on and also allowed me to conceptualise the space, but did they really help me to explain? On reflection, they facilitated specifying relationships by giving me potential starting points in terms of what to look at in the context of my study, which in turn helped to build explanatory models based on my findings. These explanations were necessarily reflecting my own values and the socio-political environment (see Section 8.2.4).⁽³²⁷⁾ For example, my background as a health services researcher, and the focus on outputs in the form of strategic recommendations that often characterises such research as opposed to theory building, in some ways presented me with tensions. I was in many ways simply not used to thinking in explicitly theoretical terms, drawing on such frameworks more implicitly. Here, I found one tension particular difficult to resolve: the simple dichotomy of “success” and “failure” and the often simplistic associated focus on facilitators and barriers (e.g. Normalisation Process Theory) as well as a linear view of the implementation process (e.g. the Theory of the Diffusion of Innovations). These dichotomies also permeated different theoretical frameworks with some emphasising complexity (e.g. ANT, Social Shaping of Technology), whilst others attempted to conceptualise implementation and adoption on a temporal basis (e.g. the Theory of the Diffusion of Innovations, Normalisation Process Theory). One might argue that this may in fact contribute to neglecting process-related issues. Nevertheless, most scholars (myself included) have found this dichotomy necessary to conceptualise the space, despite acknowledging that it is far too simplistic. A similar issue arises when considering the interrelated nature of social and technical dimensions, whilst still conceptualising these as two distinct entities (see Chapter 2 and Section 8.2 above). This illustrates the more general tension between simplification and the complexity of social

reality. After all, what use is a model if it is too complex and detailed? Lewis Carroll's paradox of the complete map illustrates this:(328)

"And then came the grandest idea of all! We actually made a map of the country, on the scale of a mile to the mile!"

"Have you used it much?" I enquired.

"It has never been spread out, yet," said mein Herr: "the farmers objected: they said it would cover the whole country, and shut out the sunlight! So we now use the country itself, as its own map, and I assure you it does nearly as well".

8.5 Reflections on strengths and limitations of my study

When considering the strengths and limitations of my study, it is important to highlight that it was conducted as part of a larger evaluation project investigating the implementation and adoption of the NHS CRS in secondary care.(33) This can be viewed as a strength as it helped me to contextualise my work and test my emerging findings through continuous discussion with colleagues. The wider project was looking at a range of software and outcome measures (including quantitative ones), whilst I focussed on the way Lorenzo was integrated within everyday work practices of users within the complex environment of the NPfIT. The time allocated for intensive analysis activity reflected the nature of my in-depth work with a focus on theorising of the complex relationships that shaped developments on the ground. The broader project was, on the other hand, more concerned with policy recommendations.

Arising from these arrangements were also some issues that I found relatively difficult to cope with during the conduct of my research. Primarily, this related to a feeling of having to separate the two projects conceptually. Despite attempts to capture my ideas and clearly label them as such, I have to acknowledge the role of the wider team in shaping my thinking. I am deeply grateful for this stimulating environment.

Another central issue I had to cope with was the definition of "success", which reflected my (and possibly a general human) tendency to categorise and thereby make potentially transferable inferences to other settings (see also Section 8.4.2). Despite my initial

attempt to focus on process issues¹⁷, I found myself implicitly judging the “success” or “failure” of implementations (which also became clear in the cross-case comparisons in Chapter 7). However, I attempted to keep a balance between the study of local processes (acknowledging that I focussed on early implementations), with the more practical concerns resulting in potentially transferable lessons to other settings (see Chapter 9). In doing so, employing qualitative methodology that was informed by relevant theory allowed me (at least to some extent) to go beyond the simple dichotomy of “success” and “failure”, helping me to explore the more subtle underlying tensions influencing implementation and adoption.

8.5.1 Strengths

My study allowed me to gain an insight into the first “top-down” implementation of nationally procured and built-as-implemented Lorenzo software in a range of English specialist healthcare settings. Throughout my work, I published a range of outputs, which were peer-reviewed. These were based on respective parts of this thesis and can be viewed in Appendix 9. The flexible and emergent qualitative approach informed by ethnographic principles was well suited to study the complex technological systems and surrounding contexts and processes.(329) It allowed me to try out and test emerging results by constantly ‘zooming’ in and out (e.g. from a certain pertinent point to the whole, from micro- to macro-contexts).(329) Accordingly, I achieved a comprehensive picture of implementation, without neglecting either, the more subtle micro-factors or the more overarching macro-factors, as well as relationships between these.

Other strengths of my study include its longitudinal nature and theoretical grounding. The longitudinal dimension contributed to obtaining a comprehensive multi-faceted and nuanced appreciation of the local consequences of implementation; whilst the

¹⁷ The following field notes that I have written early on in my research illustrate this: “*The definition of “success” is relatively irrelevant when studying process issues. I am expecting that every human actor defines success for themselves according to differing criteria. It is not up to me to judge whether the implementation was successful in line with specified criteria but in line with my aim, my analytical focus will be on sense making activities, negotiation and differing actor perspectives/behaviours.*”

theoretically driven approach to design, data generation and analysis should allow transferability of findings beyond the immediate context of the three Trusts studied. The theoretically-based methodology developed during the course of my research, may now also be applied to other settings.

My research was further strengthened through purposive sampling ensuring that case study sites varied in demographics (e.g. community, mental health, and acute), whilst being faced with the same phenomenon of interest (i.e. implementing the same software). Within case studies, data were obtained from a variety of sources covering a range of stakeholder perspectives. In attempting to cover the national context, whilst still retaining the importance of local factors in shaping the subtleties of reality, I drew on a combination of the case study approach and multi-sited ethnography to reflect the important dynamics within and across Trusts implementing Lorenzo. Once I had achieved an in-depth appreciation of context within cases, I compared findings across case studies allowing for transferable lessons to be drawn. Case study findings as well as wider transferable lessons were discussed at length with my supervisors, which helped to refine ideas and expand propositions. In relation to the main findings and given the timelines I had to adhere to, I believe that I reached saturation in relation to early implementation and adoption for the period of time I was in the field. This field is however extremely dynamic and the circumstances surrounding implementations have changed over time.

I was further able to provide formative feedback to Trusts on various fronts, for example relating to emerging concerns amongst staff on the ground and potential early barriers to local and national implementation of Lorenzo. This helped me to validate my findings by testing emerging ideas and discussing interpreted meanings with participants.

8.5.2 Limitations

The main issue for me was gatekeeper influence at all levels. This resulted in restricted access to some stakeholders including healthcare professionals (carefully and

appropriately 'guarded' by Service Leads and IT Managers), as well as Trusts themselves (where some of my contacts were understandably reluctant to pass on details of key individuals within the Trust who were already extremely busy with implementation activities). This was further complicated by a generally (and again understandably) low prioritisation of my study in participating Trusts, whose main concern was to run an organisation and provide appropriate patient care. My strategy to deal with these difficulties was to be persistent without being irritating. Whilst giving participants time to respond, I would follow up initial email contacts with phone calls.

The nature and depth of data collected at different case study sites varied due to these issues with access, time of data collection often influenced by politically set deadlines, and cooperation of gatekeepers, to name but a few. I not only had difficulties accessing participants in the Trusts themselves, but was also faced with a general lack of access to some wider stakeholder groups such as developers and governmental stakeholders, most likely due to the highly politically charged environment, commercial sensitivities and (again) different priorities. This environment also meant that once I did get hold of stakeholders, some seemed hesitant to give honest opinions, particularly in relation to sensitive commercial information. I addressed this by encouraging participants to speak 'off the record' and offering to switch off the recording equipment.

In addition to these practical issues, I also encountered some more conceptual challenges. Studying complex systems is difficult and necessitated some simplifications on my part (as also outline above).(187) As recommended by Law and Mol, I attempted to tell a story of my interpretations of the field as experienced by various participants (and of course influenced by my presence and methods).(330) In doing so, I focussed on particular issues that I found most pertinent and most interesting, whilst necessarily having neglected others. I therefore acknowledge that my picture is necessarily incomplete and presents a snapshot of a particular time and particular places. In relation to space, for example, my focus on specific organisations may mean that my findings lack transferability to other contexts as these organisations may not be reflective of sites

in the wider NHS.(187;330) Nevertheless, my findings are consistent with previous literature on technology adoption, as well as emerging findings from other organisations as part of the larger evaluation project, pointing to the likely transferability to other settings.(33)

Despite these challenges, I attempted to tell a coherent story, carefully questioning my own assumptions throughout the process and constantly testing emerging ideas against reality by feeding back emerging findings to participants. This process, in combination with discussion of emerging findings with my supervisors, helped to ensure confirmability and credibility.(172;190)

Finally, it is important to keep in mind that my study focused on early implementation and adoption only, which is arguably the most turbulent time of any IT implementation. However, despite the ability to track processes during early implementation, the more embedded use of technologies and insight into longer term benefits were beyond the scope of my study. I told a story that is, unfortunately, only partially complete. My theoretical propositions need to be tested over time and in other organisations.(331)

8.6 Chapter summary

This chapter has integrated my findings (outlined in Chapters 6 and 7) with the more recent literature and the theoretical frameworks. Factors identified in my literature review (Chapter 2) continue to be important, yet often difficult to realise, particularly in relation to large-scale implementations of complex systems.

I outlined how drawing on my own methodological sociotechnically informed approach allowed exploring the experiences of users and the consequences of Lorenzo for their work practices as well as general organisational functioning in the complex environment of a national EHR implementation (see Chapter 4). By examining both micro-and macro-environments, my findings help to explain why the implementation and adoption of Lorenzo progressed more slowly than anticipated. There were particular challenges

associated with the national implementation of centrally procured software which had significant consequences for technological design, adoption and spread within and across organisations. I discussed these consequences for the shaping of the technology itself, as well as for local implementation and adoption activities (and vice versa). In doing so, the ways in which the technology affected the delivery of care, professional working and larger organisational functioning was explored.

Despite these insights, some important tensions have remained. These included the inscribed technological properties and power relationships characterising national implementations on a macro-scale, and the incompatibility of technology and 'caring' on a micro-scale. The chapter has concluded with a critical reflection on the theoretical and methodological framework outlining the strengths and limitations of my study.

Having discussed the theoretical contributions of my study, the next chapter will explore the implications for future research and how my findings may be practically applied to other contexts. In doing so, potentially transferable lessons for similar national and international ventures will be outlined.

Chapter 9: Implications and recommendations for further work

9.1 Introduction

I set out to explore and understand the views and experiences of users as well as organisational consequences of introducing Lorenzo and how these evolved over time in the complex environment of a national EHR implementation. I have, in the previous chapters, drawing on relevant theoretical frameworks, discussed the underlying mechanisms of why the implementation and adoption of Lorenzo proceeded much slower than originally anticipated paying attention to local, organisational and macro-environmental factors.

Chapter 8 had a theoretical focus in attempting to explain underlying mechanisms in line with existing frameworks and my emerging findings. The current chapter has a more practical focus drawing on these theoretical insights, namely to make recommendations as to what could be done next, relating to local and national strategic considerations surrounding the English venture but also in relation to potentially transferable lessons for similar international efforts. My focus on exploring the micro-processes between social and technical dimensions without neglecting the wider macro-environment helped me to construct a theoretical model to conceptualise this (Figure 9.1).

9.2 Practical implications for EHR implementations

Although my findings have shed light on many dimensions, it is impossible to be prescriptive in relation to maximising the chances of “successful” local and national EHR implementation (i.e. an implementation that most stakeholders are happy with). There are obvious tensions surrounding the definition of “successful” in itself, as it clearly depends on the viewpoint of the observer.⁽³⁴⁾ This is exacerbated by the complexity and advanced functionality of an EHR system such as Lorenzo.

Nevertheless, despite the inability to predict exactly which factors may apply to other settings and to what extent, my work suggests that some dimensions are more significant than others. These are illustrated with the help of a theoretical model derived from the insights obtained in my analysis outlined in Chapter 7 (Figure 7.1). In order to promote the practical applicability of my findings, I will attempt to distil the most important potentially transferable theoretical insights for national EHR implementations in the following sections. It is, however, important to keep in mind that these implications are based on my experiences from studying Lorenzo in selected sites only. They are also based on the English context with the particularities of its nationally funded health service and may therefore not be directly transferable to other settings.

9.2.1 Software characteristics and user involvement in shaping technology

Firstly, my findings show that the most important pre-requisite for implementing complex IT systems is the existence of software that is usable, or which can be ‘made usable’, and which can be adapted over time to suit the evolving needs of a variety of user groups. It also needs to be perceived by users and organisations as being ‘better’ than the system that was previously operational, or at least worth the extra effort by yielding tangible benefits to patients and organisational stakeholders. In my case studies, this was unfortunately not always the case, resulting in frustration and, in some instances, resistance of users.

One way to achieve this system usability is by consulting users and incorporating their suggestions in software design (as illustrated by the more satisfied users in Site H where this was present). Creating “token user involvement”, which may involve listening to concerns but not addressing these in technological and/or strategic developments, is unlikely to engage users (as demonstrated in Site B). Local clinical leads can be an effective means to achieving user involvement due to their increased contact with the target group (see Site H). If systems are resisted by users, there is a need to seek to understand why this is the case, as it may be due to users finding it difficult to cope with

change (as managers tended to suggest), but it may also be a result of inadequate technology, as was the case in Sites B and Q.

This essential consideration of user involvement in shaping technological developments is unfortunately far too often overlooked, particularly in the context of large-scale ventures such as the NPfIT in which the political, technical, economic and other considerations seem to crowd this dimension of planning. The results from my case studies, however, indicate that any technological development needs to begin, be shaped and be embedded with the user in constant focus. Other issues arising during the process of implementation are important, but secondary.

9.2.2 Realistic timelines, expectations and balancing the vision

Secondly, and intimately connected to the local, there is a need to manage expectations of a grand vision with what is realistically achievable. Here, ‘strategic optimism’ is suitable for getting an initiative ‘off the ground’, but can, if sustained and not matched with reality, lead to disillusioned stakeholders. In my study this was illustrated across case study sites by stakeholders’ perceptions that ambitious timelines have hampered local implementation progress, with expectations far exceeding what was realistically achievable. Again, managing this vision should begin with the user, before moving on to more general organisational and also national expectations (admittedly challenging in the context of a political implementation effort). For example, in line with findings from across my case studies, there is a need to communicate that benefits may take a long time to realise, and that using an electronic system is likely to slow down individual work practices.

Communicating consistent messages as to what exactly the functionality will consist of is important in this context, so that appropriate organisational plans can be made to accommodate the change. This has unfortunately not always been the case with Lorenzo as it was built whilst being implemented, leading to confusion amongst organisational stakeholders across case studies as to what to expect.

9.2.3 Relationship building on all levels

Thirdly, my findings have illustrated the importance of aligning efforts of various stakeholder groups in order to facilitate implementation and adoption. This should, again, begin by building relationships between users and their immediate (micro) environment, including for example managers and developers, who ideally incorporate suggested software changes quickly in order to prevent frustration. Once these relationships are stable, extra-organisational relationship building can begin. As illustrated across case studies, important parties here include governmental stakeholders, the media, LSPs, SHAs and local health communities.

However, in my case studies, local relationship building between suppliers, managers and users was often difficult and to some extent inhibited by central contracts. The increasing strategic move towards more local autonomy in decision making should help to address this, but relationship building between “different worlds” is of central importance. As my case studies show, this can be facilitated by designated support and close involvement of clinical leads.

9.2.4 Balancing overall progress with allowing local coping

In any national implementation, there is likely to be a tension between the need to show progress in terms of scale and an incremental implementation approach to allow for local coping with the technological change to occur. My findings indicate that in order to allow for this, a small-scale and incremental approach is necessary but this takes time. Pressure to show progress too quickly can result in unintended consequences at individual and organisational level (e.g. workarounds and disturbed organisational functioning). These, in turn, can inhibit progress at national level and threaten overall implementation by slowing down ambitious timelines (see Chapter 7). It is therefore important that appropriate time and resources are allocated to allow for this process of local coping.

9.2.5 Central guidance whilst retaining some degree of local autonomy

Once the new systems satisfy user and organisational needs, considerations can move towards standards for larger scale interoperability. Although my findings in case studies have not directly shed light on how this can be achieved, interoperability is an important issue to consider as it is the driver of many anticipated benefits expected from large-scale implementations of complex EHR systems (e.g. secondary uses).(332;333) However, my findings indicate that local technology adoption needs to occur first, as a primary focus on interoperability may compromise local software usability and hence adoption. Throughout this process, there is also a need to allow flexibility for customisation and adaptation to allow tailoring systems to local needs. In order to bring benefits to local stakeholders, the next step should focus on connecting local and natural groupings of healthcare organisations. This can help ironing-out early problems before attempting wider roll-outs. A certain amount of coherent political guidance is nevertheless important and, as my case studies indicate, desired by local organisations.

9.2.6 Potentially transferable lessons from my findings - what is important when considering national EHR implementations?

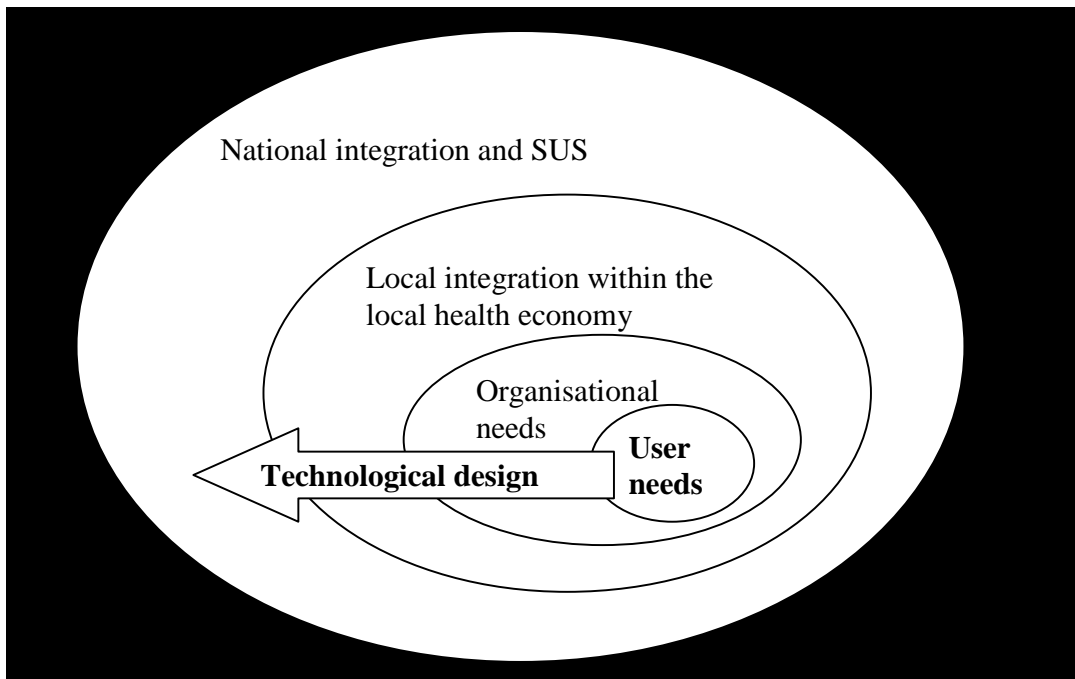
My findings have implications not only for the future direction of EHR implementations in England, but possibly also for other countries currently actively pursuing plans to implement national EHRs. Arguably, a balance needs to be struck between localised input and standardisation to achieve large-scale interoperability. My case studies indicate that despite nationally led strategies aiming to optimise technical integration and interoperability, there is a danger that these systems are not accepted and used by end-users as local motivations for use may be neglected. Conversely, and although untested in my study, it may be speculated that if the emphasis is solely on building systems arising from local need, these may be used, but major issues may arise when attempting to integrate systems on a larger scale. Nevertheless, in light of my findings, and the need to build on user informed system design to ensure use, integration of systems appears

secondary and local benefits may still be realised even if national systems integration is initially not achieved.

In line with the question in the heading of this section, the answer arising from my case studies is therefore probably the user and the technology. Only when these micro-factors are attended to, will a system be able to satisfy organisational (e.g. management and small-scale information sharing), local health economy (e.g. local information sharing) and national needs (e.g. interoperability and secondary uses). However, as evidenced in the English approach, there is a danger that an initial focus on interoperability in large-scale EHR initiatives may cloud this essential consideration of user involvement in shaping technological developments. This in turn should be reflected in the design of the technology building on user requirements first. Focusing principally on interoperability in the English approach by procuring national software with limited customisability illustrates a lack of appreciation of local factors and in particular the dynamic interplay between the local and the national context. I have attempted to illustrate my propositions graphically in Figure 9.1 below.

It is however important to consider the drivers for national ventures. The main danger here is that if efforts are too localised, there may be no coherent approach to implementation, resulting in potentially compromised interoperability. Achieving a balance between the two is therefore crucial and needs to be taken into account in any governmental strategic direction relating to national EHR implementations.

Figure 9.1: The outwards movement from local technology adoption to national integration



Note: A graphical representation of factors that seem to be most important when considering national EHR implementations derived from my findings. This illustrates the outward movement from user needs, which need to be reflected in the technological design before considering other requirements such as organisational needs and national interoperability.

9.3 Implications for English policy and local organisations

There are many potential implications for policy and practice arising from my research, but having outlined the more general implications for national EHR implementations above, I will now discuss some more specific potentially transferable issues for the broader English context. This will also involve discussing the role of and implications for local organisations. These deliberations are based on the theoretical model outlined above (Figure 9.1).

Overall, my findings have shown that in case study sites a significant cultural change was required to adopt Lorenzo and that local progress in software development and implementation scale was influenced by broader political and economic changes. The

assumption that EHRs improve the quality and efficiency of care (see chapter 1) has not been substantiated in the period of time I was in the field, with in some cases potentially adverse consequences for patients as the system was often not viewed as fit for purpose by its users. Ensuring continued national support and the development of internal organisational expertise that could be retained, was identified as an important facilitator for local progress. In doing so, engaging organisational stakeholders as they work to accommodate the new technology over time is extremely important.

More specifically, my findings indicate that efforts in the short-term should focus on making the software work optimally in selected pilot sites, as opposed to trying to achieve too much too quickly in terms of scale. As alluded to above, this is most likely best achieved by focusing on local health communities initially before paying attention to larger geographical clusters. Here, efforts need to be accompanied by the realisation that relationship building locally needs to occur beforehand so that the implementation of EHRs that can be shared between settings is characterised by teamwork as opposed to competition between healthcare organisations.

Commercially procured software systems such as Lorenzo can prove challenging to integrate into complex organisations as they need to be extensively customised to meet users' needs. Despite the original intention to address these often well-known issues with user engagement by developing Lorenzo software from scratch in collaboration with users, this approach did not seem to work due to the complex environment in which this "co-creation" was taking place. Implementations therefore need to be locally driven and organisations should not be asked to replace systems that work for them, but rather to change systems to meet an identified need. This does not mean that national implementations are redundant as some coherent strategy is needed to achieve system interoperability, but these should build on local developments. Trusts, on the other hand, need to realise that actively participating in centrally led strategies is important and may require some sacrifices locally for the benefit of wider system interoperability (e.g. replacing an existing system that does not allow exchanging data with other systems).

Despite these initial negative experiences of the “co-creational” model of Lorenzo in case study sites, an essential property of software should be flexibility and developability (characterised by user input in design), so that it can fit within local processes as well as having the potential to evolve in the future according to needs. Here, it is important to achieve a balance between managerial large-scale benefits (both within and across organisations) and clinical small-scale benefits as managerial benefits can only be realised if the system is used, whilst clinical benefits motivate users. A similar balance needs to be achieved between short-term and long-term benefits, as short-term benefits (for local organisations and users) are extremely important to get the software used initially. Conversely, local organisations and users also need to realise that in the short-term some dis-benefits (such as increased workloads) are to be expected. There is therefore a need for more realistic expectations in relation to progress amongst all stakeholders. It is particularly important to recognise that systems will need time to become embedded and that technological and social dimensions are likely to evolve together over time in sometimes unanticipated ways.

There is further a need to understand that different stakeholders have different objectives and values, some focusing on improving healthcare efficiency, some on improving the quality of care, and some surrounding commercial or political interests. The focus should not be on attempting to streamline these, but on seeking alignment where possible to realise a common vision. In doing so, building relationships and improving channels of communication between users, organisations and suppliers will become increasingly important. This will also require an active effort by local organisations and users, for example, allowing developers to shadow “real life” hospital work to help developers gaining a deeper insight into the reality of clinical care. A fundamental pre-requisite here is that software changes requested by organisations are incorporated in design as promptly as possible. In order to achieve this, local organisations need input in strategic decision making, which was in my case studies not possible due to restrictions imposed by national contracts. Alternatively, there therefore seems to be merit in

focusing on a larger range of software providers with smaller contracts (as was, at the time of writing, happening).

To ensure consistency and focus on the task at hand, constant changes in governmental stakeholders, policies, public sector reforms and structures surrounding the national IT strategy need to stop. As my findings indicate, this can detract from focusing local implementation efforts appropriately and result in frustration amongst those on the ground.

Overall and based on my findings, I would therefore advocate that local efforts focus on small-scale implementation of nationally approved systems, acknowledging that this may require hard work. This approach will ensure that systems are used with the potential to be customised locally, whilst keeping in mind interoperability considerations for later in the national implementation process.

9.4 Implications for future research

Having outlined the implications for similar national ventures, English policy and local organisations, I will now discuss the implications of my work for future research. In helping to theorise about potentially transferable lessons, empirical research investigating national EHR implementations, policies and local consequences is likely to become increasingly important.

Most importantly, the theoretical and methodological models developed during the course of my research need to be tested in other contexts in order to explore whether my findings are transferable and whether the models need to be modified. This is most likely to take the shape of qualitative enquiry as the focus of these models was on investigating process issues. It does, however, not preclude the inclusion of quantitative measurements, such as for example assessing system impact on proxies of quality and efficiency of care, or economic implications.

There is also still a need for more longitudinal work investigating EHR initiatives, following implementation efforts in changing contexts and over longer periods of time than was possible in my research.(334) This will require funding bodies to allocate the necessary resources to allow deeper insights to be obtained into the way technologies become embedded and are made to work within and across organisations.(42;92;95;138)

Research should also increasingly draw on international developments and lessons from other industries, both in relation to new software developments and implementation strategies. Despite different contexts, there may be value in pulling lessons learned together, applying them to EHR implementations and devising a risk mitigation strategy or toolkit for national large-scale ventures. This could then help to guide national strategic efforts through the stages of planning, implementation and maintenance. It might also include ways to build relationships between industry suppliers and healthcare providers. Internationally, this relationship has so far received limited attention and should be guided by efforts to align commercial and public sector interests through teamwork and collaboration.

More generally, although the overall NPfIT was guided by a grand vision, a lack of attention was paid to potential future scenarios if this vision was to be realised. Here, it is important to map potential risks and plan for mitigating action. A critical perspective, characterised by questioning of often deeply-engrained assumptions and paying attention to power dynamics can be extremely valuable in this respect.(96;260;320-322) This may include questioning the common view that technology is inherently “good” and considering what “success” would imply for a variety of stakeholders and their relationships. For example, holding all health information electronically on a national database may have implications for the national security of the country.(335) Similarly, the concern that technology will replace the ‘human touch’ is still prevalent and efforts should focus on how the two can be made to co-exist.

Some have argued that the true innovation is not going to be inherent to the technology itself but ways in which actors organise themselves to deliver care.(336) Detailed work process mapping in relation to new technologies, whilst exploring options for innovation in the way care is delivered should therefore be central to future efforts. This is strongly supported by the results of my study and should be accompanied by the realisation that automation without re-designing services will magnify existing problems. In this context, there is also an increasing need to map the changing needs of the NHS and to theorise about how emerging technologies can be designed to meet these. In the short-to-medium term, efforts should be coupled with the often neglected long period of transition from paper to electronic records. The hybrid stage where both physical and electronic records coexist (or different electronic systems), is often neglected in both research and implementation activities, but nevertheless often has significant consequences for those on the ground.

9.5 Chapter summary

My main aim was to explore the views and experiences of users as well as organisational consequences of introducing Lorenzo and how these evolved over time in the complex environment of a national EHR implementation. This chapter has, building on Chapter 8, been concerned with the more practical implications of my study. In doing so, I attempted to narrow the theory-practice gap by proposing a theoretical model based on my findings, which may be practically applied to similar international ventures.

Naturally a range of other factors are important, but I attempted to distil those that are most pertinent to large-scale national EHR implementation efforts. To date, no comparable model exists as these national ventures are still in their infancy, but the need to construct theory-informed frameworks will be of increasing importance in order to learn from experiences. Building on this model, I discussed the implications for English policy and local organisations, as well as future research.

The next chapter will summarise my findings and draw overall conclusions.

Chapter 10: Conclusions

I began this work in the context of the difficulties and opportunities surrounding the implementation of large-scale EHR systems in healthcare. These are often characterised by the complex social and technical processes involved in integrating EHRs within work practices of users and more general organisational functioning. The national “top-down” implementation of Lorenzo software in England provided a unique opportunity to study these processes, as the system was not only nationally procured but also developed from scratch in collaboration with the NHS. This “co-creational” approach was intended to address potential problems with user engagement. My focus was therefore on exploring the views and experiences of users as well as the organisational consequences of introducing Lorenzo and how these evolved over time in the complex environment of a national EHR implementation.

I developed a methodological framework based on a sociotechnical ANT-based approach to achieve my aims practically (as described in Chapter 4). Here, I searched for approaches that could address ANT’s shortcomings and found some more helpful than others. Drawing on multi-sited ethnography and case studies proved useful as it helped to focus data collection activities without neglecting local contingencies and macro-environmental factors. Other frameworks helped to place micro-processes into context, by explaining the role of internal structures of human agents, and conceptualising the environment in which sociotechnical processes were situated and unfolded over time (Strong Structuration Theory, the Social Shaping of Technology, and the Theory of the Diffusion of Innovations).

Based on my analysis, I developed models, identifying mechanisms that contributed to local and national developments over time (Chapters 7 and 8), taking into account the interrelated and situated nature of various model components.

Overall, my findings helped to explain, why the initially anticipated ‘full integration’ of NHS CRS software was far from being realised, with only a handful of Lorenzo implementations at the time I completed data collection.(337;338) These implementations have not only been on a more limited scale than originally planned but also with more limited functionality.

The technical design of the nationally procured software and the resulting negative local effects for users and organisations seemed to have shaped overall national implementation progress. In addition, and contrary to many inherent assumptions relating to the anticipated positive consequences of EHR systems for the quality and efficiency of care, my results suggest that Lorenzo may in fact have had a negative effect on such measures. Nevertheless, my focus on early implementation and adoption meant that I was not able to investigate the more embedded use of systems with full functionality. This may well have shown more positive results.

Developments over time played an important part in my research and contrasting experiences and perceptions of different stakeholders proved useful in illustrating the dynamic nature of implementation and adoption processes. I discussed how the interplay between social (macro-, individual and organisational) and technical factors was central to implementation progress. Developments were situated in and shaped by macro-environmental factors characterised by the vision to create nationally interoperable EHRs. These arrangements resulted in politically-driven and unrealistic implementation timelines as well as centrally managed contracts, which often prohibited local input in decision making. The consequences for users (who found it difficult to integrate Lorenzo within their work practices) and organisations (which were often not ready for externally imposed changes) were significant.

These theoretical insights, although based on Lorenzo implementations in selected English case study sites, allowed me to develop a model of potentially transferable lessons to other settings and in particular national EHR implementation efforts. In this

context, I argued that based on my findings the most important pre-requisite for EHR implementation seems to be use of the technology, no matter on what scale. Here, progress in software development (including resolving issues with system usability) needs to be realised first before tackling progress in terms of deployment scale. Otherwise there is a danger that local issues compromise national implementation progress. In order to achieve this, there is need to realise visible short-term and long-term benefits to users, organisations and patients. Such benefits had not materialised in any of the three Trusts studied during my data collection as Lorenzo was perceived to lack usability and significantly changed local work practices. Sufficient time and resources need to be allocated to allow users and organisations to cope with change and deal with emerging challenges and consequences resulting from technology introduction; before considering issues surrounding systems interoperability, scale and secondary uses of data. This needs to be combined with adequate training and support structures involving ongoing and two-way communication between system developers, implementers and users.

Overall, the national implementation of Lorenzo should be viewed as a valuable learning experience for all involved. It is now of central importance to share lessons learned. The approach of “co-creating” national software with strong user involvement initially seemed reasonable, but struggled to deliver due to the different requirements in the NHS and the restraining macro-environment. Interoperability and large-scale information sharing remain nevertheless desirable and a coherent national strategy is needed to achieve this. It is important to recognise that we are just at the beginning of a long journey to achieve this aim and experiences such as the Lorenzo venture are part of the course. After all, it was tried.

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Glossary

Acute Trust	A Trust that provides secondary care services
Adoption	The process of starting to use a new technology either on an individual or a group level
Accident and Emergency (A&E)	Part of the hospital that provides initial care for patients with acute problems
Ambulance Trust	A Trust providing emergency services
Approval to Proceed (ATP)	The formal approval to begin the go-live in the EA phase
Authenticated ¹	Confirmation following user authentication that the end user is actually the person he/she purports to be
Bandwidth ¹	An industry standard term to measure the amount of data that can be sent through a network or modem connection. The more bandwidth, the more information that can be transferred at one time.
Benefits realisation	The process of achieving benefits of a particular project as detailed in the business case
“Big-bang” implementation	The whole organisation moves to a new system at the same time
Business case	A document outlining the reasons for initiating a particular project in an organisation
Business change	Initiating organisational change that affects the way the organisation operates
Business Change Analyst	Person charged with identifying organisational needs and ways of addressing them
Business as usual	A state the organisation achieves after implementing change that is characterised by enabling the organisation to function as was the case before the change
“Bottom-up” change	This is localised change that originates from local stakeholders rather than change initiated by management
British Telecom (BT)	BT is the LSP for Cerner Millennium and also provides Spine and N3 functionality
NHS Care Records Service (NHS CRS)	The EHR planned to be introduced as part of the NPfIT, allowing access to health records

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	across care settings, consisting of the SCR (to be shared nationally) and the DCR (to be held locally)
Case/Site	An NHS institution in which was being implemented during my data collection. This refers to the Trust and may also include its immediate environment (e.g. management, implementation team members, other Trust staff including users of the technology), may have several sites (e.g. hospitals) within it
Cerner Millennium	EHR software produced by Cerner in the US and implemented through BT in the UK as part of the National Programme. It was originally an American billing system.
Change management	A managed approach to introducing change
Choose and Book (C&B) ¹	One of NPfIT's headline deliverables. An e-booking system operating across the NHS to give patients more choice and control over hospital appointments.
Clinical documentation (CDC)	Documenting of care procedures, treatments and future plans. NHS CRS software allowed this to be done electronically through Clinical Documentation forms.
Cluster	A grouping – in the context of the National Programme, this refers to a geographical grouping of areas that implemented different types of EHR software. They include London, the South and the NME region of the country. The term was initially used by NHS CFH but later replaced by 'geographical region'.
Coding	The process of structuring information for statistical analysis purposes. This is often not visible to the end-user.
Computerised (electronic) decision support systems (CDSS) ¹	Software applications that integrate patient data (input) with a knowledge-base and an inference mechanism to produce patient specific outputs in the form of care recommendations, assessments, alerts and reminders to actively support practitioners in clinical decision-making
Computerised medical record ¹	This involves transferring paper documents into a computer system. It is done either

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	through handwriting or transcription and is transferred into digital form with image scanning, optical character recognition scanning, or hybrid systems of these.
Computerised patient record ¹	A record, in electronic form, that is comprised of individual patient information that resides in a system capable of providing access to complete and accurate patient data, alerts, reminders, clinical decision support systems, links to medical knowledge, and other aids.
Computerised physician order entry (CPOE) ¹	Denotes the use of computers to enter, modify, review and output or communicate orders such as prescriptions, laboratory tests or radiological images, or referrals
Computer Sciences Corporation (CSC) ¹	The LSP for the North West and West Midlands Cluster and North East and Eastern Clusters, delivering software developed by its main subcontractor iSOFT
Continuity of care record ¹	An evolving standard for a core (summary) electronic record that can be accessed by and added to by multiple health professionals caring for a patient, so as to support integrated and current care
Customisation	The ability of a user or organisation to tailor a system to their needs.
Data cleansing	Going through data and removing incorrect data
Data migration	Transfer of data between two systems e.g. from iPM to Lorenzo
Data quality	Refers the data's fitness for purpose including completeness, validity, consistency, timeliness and accuracy.
Department of Health (DH)	A central governmental body managing the NHS in relation to both funding and strategic direction
Deployment verification	A minimum of 45 day deployment verification period throughout which the software, management and the impact on the organisation is assessed against a set of pre-defined verification criteria (both technical and non-technical). This stage represents the transition of support from the project team to the data centre support and help desk

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	teams.
Developer	Those that produce the software and as part of this write and manage the code including iSOFT (Lorenzo), CSE Healthcare (RiO) and Cerner (Millennium)
Detailed care record (DCR) ¹	All notes taken from a patient by healthcare professionals can be considered as the patient's DCR. The degree to which this record is accessible by a healthcare professional depends on whether they are providing the patient with care, their role in the treatment given and the patient's own wishes.
Digital medical record ¹	A less-known term that stands for a vision of web-based medical records
Early Adopter (EA)	Trusts that pilot Lorenzo in a clinical environment and work with the developers (iSOFT) and the LSP (CSC) to make it fit for clinical use by feeding back any arising problems.
eHealth ¹	A relatively recent term for healthcare practice which is supported by electronic processes and communication. The term is inconsistently used: some would argue it is interchangeable with healthcare informatics, while others use it in the narrower sense of healthcare practice using the Internet. The term can encompass a range of services that are at the edge of medicine, healthcare and IT.
Electronic discharge summary	Electronic system that produces a hospital discharge summary that can be sent to other care settings
Electronic health record (EHR)	Also referred to as Electronic Patient Record. This is a compilation of patient information in digital format that can be shared between care settings. May also have additional functionality.
Electronic medical record ¹	An electronic healthcare information system regarding one patient
Electronic patient record ¹	The concept grew out of the computerised patient record concept and, for a while, was the main term used. Now, some consider this term synonymous to the computerised

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	patient record term; however, an increasing number of individuals state that the electronic patient record vision differs from the computerised patient record.
Electronic prescription service (EPS)	One of the NPfIT headline deliverables allowing electronic transfer of prescriptions from prescribers to dispensers
Floorwalker	A person with technical expertise supporting settings that have implemented new functionality by being present in the setting
Foundation Trust	Currently there are 129. These Trusts have increased responsibility and are accountable directly to the DH.
Handhelds	Portable devices with the capability to hold EHR software
Healthcare professional	Refers to clinical staff only such as doctors, nurses, allied health professions etc.
Hospital information system ¹	Integrated, computer-assisted systems designed to store, manipulate, and retrieve information concerned with the administrative and clinical aspects of providing medical services within the hospital. Used to store and retrieve patient information. This integrated computer-based system may include or be linked to laboratory and radiology information systems.
Implementation	The process of introducing a new system within an organisation (from planning through to routine use)
Implementation team	Those individuals within a Trust that manage the implementation of a new system locally
Information technology (IT) ¹	Defined by the Information Technology Association of America as “the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware.”
Integrated clinical pathway (ICP)	Used in different contexts with different meanings. From a technical perspective, in the context of the NHS CRS, it was used to refer to automated workflows along a patient’s journey of care, that integrate

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	clinical and administrative work.
Interface ¹	The connection between two devices; applies to both hardware and software. May also refer to what is visualised on a screen – what the user will see and use to interact with the software.
Interim system/solution	An electronic system with basic functionality designed to deliver some early benefits to Trusts but planned to be substituted by the final solution eventually. Includes iPM.
Infrastructure	The existing organisational systems present on top of which a new system is introduced. This may include hardware or existing software systems.
Integrated care record ¹	A record that contains information from multiple providers of the patient's care. Varies in how the information is integrated (e.g. centralised data storage versus linkage to federated data stores), how much information is integrated (detailed or summary), and the scope and providers of the information (e.g. an integrated diabetes care record versus a more generic shared care record)
Interoperability	A system's ability to work along side each other in an integrated way
iPM	The interim PAS supplied by CSC. This eventually gets replaced with the Lorenzo PAS.
iSOFT	The developer of Lorenzo, managed through CSC.
Legacy system	An old software system that is still used
Role-based access	Security of accessing EHRs in England is based on legitimate relationships. This means that only users who have legitimate relationships with particular patients have the authority to access their records.
Local Service Provider (LSP)	These hold contracts with NHS CFH and are responsible for delivering software solutions on the ground
Longitudinal health record ¹	Occasionally used to describe the EHR
Lorenzo Regional Care	EHR software produced by iSOFT and implemented through CSC as part of the

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	National Programme. It was intended to be an integrated system designed by the NHS.
Mental health Trust	A Trust that provides mental health services
National Health Service (NHS)	The NHS in the UK was established in 1948 with the aim to provide “free” national care for all. Funding is obtained from the taxpayer and managed by the DH.
National Programme for IT (NPfIT) ¹	Is responsible for procurement and delivery of the multi-billion pound investment in new information and technology systems in the NHS
NHS Connecting for Health (NHS CFH) ¹	Supported the NHS to deliver better, safer care to patients, via new computer systems and services, that link GPs and community services to hospitals
Order communications	Tool in Lorenzo that allows the electronic ordering of tests (e.g. from pathology)
Patient administration system (PAS)	A basic electronic system in a hospital that holds patient demographic details and can manage admissions
Patient lists	Tool in Lorenzo that allows the user to create and manage patient lists
Personal demographics service (PDS)	Holds demographic patient information and patients’ NHS number. It is a component of the Spine, which means that this information is planned to be shared nationally.
Personal digital assistants (PDAs) ¹	Handheld computers also known as pocket computers or palmtop computers
Personal health record	Recording of pertinent information concerning patient’s illness or illnesses
Picture archiving and communications system (PACS) ¹	One of NPfIT’s headline deliverables. A system capable of acquiring, transmitting, storing, retrieving, and displaying digital images and relevant patient data from various imaging sources.
Pilot	A small-scale preliminary test to see if something works, before rolling it out on a larger scale
Primary Care Trust (PCT)	A Trust that provides primary care services
Process mapping	Analysis and outline (typically in a flow chart) of a business process resulting in a visual concept of the steps involved to accomplish a particular task
Progress/activity notes	Tool in Lorenzo that allows the user to input

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	clinical and non-clinical activity
Product Specialist	Those with intimate knowledge of the product (e.g. software)
Project Initiation Document (PID)	A written plan of an organisational project. Typically follows a structured format outlining present and future states, anticipated benefits, anticipated resources and an approximate timeline.
Requests and results (R&R)	Functionality that allows electronic requests and receiving of results in hospitals. Typically these include radiology, endoscopy and pathology.
Roll-out ¹	The period and activities of progressively going live with the software system (i.e. switching it on) in each geographical cluster starting with the EAs
Secondary uses (service)	Collection of data held in EHRs on a national level and use of this data for reporting of national trends and statistical analysis
SmartCard	An identity authentication chip card that is inserted into a piece of hardware so that the user is able to see relevant parts of the record
Soft-landing	Deploying systems on a small scale, running the clinical process in parallel with existing systems and paper initially
Software build	Different versions of the software are released by the developer. These typically present an improvement on the previous version.
Software fixes	Minor changes are made to the solution by the developer to respond to emerging local issues.
Software releases	Different components of the software with increasing capabilities. These are designed to be implemented sequentially in order to promote stepwise change.
Spine ¹	The name given to the national database of key information about a patient's health and care and forms the core of the NHS CRS. It will include patient information like NHS number, date of birth, name and address, and clinical information such as allergies,

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	adverse drug reactions and major treatments.
Standardisation	Complying with a certain standard (i.e. software requirements necessary for achieving interoperability between systems)
Strategic Health Authority (SHA)	At a local level the English NHS is managed through 10 SHAs, whose responsibility it is to ensure that national plans are implemented locally and that local needs are reflected in policy developments.
Summary care record (SCR) ¹	A key element of the NHS CRS. The GP summary will be the main or only active part of the SCR. Over time, a SCR will be built up from selected information in a patient's DCR. The SCR can be seen by authorised healthcare professionals treating patients anywhere in England, if patients consent.
System upgrades	Software typically performs better after an upgrade than it did before an upgrade
Task management functionality	Tool in Lorenzo that helps the user to manage tasks (both clinical and non-clinical)
“Top-down” change	This is hierarchically imposed change initiated by management
Trust	A semi-autonomous public sector organisation providing services for the NHS within a certain geographical area. It can encompass a range of healthcare organisations.
Trust board	A committee in a Trust that has decision-making powers
Trust staff	Refers to all Trust staff including IT, administrative, and all other staff. It also includes healthcare staff
Virtual private network ¹	A communications network connecting different systems
‘Workaround’	Behaviour employed by users to overcome a perceived limitation in a technical system
Workflow	A chain of steps/activities involved to accomplish a particular task

¹ These definitions have been adopted from the NHS CFHEP 001 report available from: <http://www1.imperial.ac.uk/resources/1636368E-DDEE-42A0-85AC-BDE9EC3B9EA1/>

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Appendix 1: Detailed search histories from the literature review

Search history Medline

#	Searches	Results
1	*Medical Records Systems, Computerized/og [Organization & Administration]	1621
2	*Hospital Information Systems/og [Organization & Administration]	1570
3	"Electronic Health Record".mp.	517
4	"Electronic patient record".mp.	479
5	"Computerised medical record".mp.	11
6	"Computerized medical record".mp.	185
7	"Electronic medical record".mp.	1143
8	"Computer-based medical record".mp.	45
9	"Digital medical record".mp.	3
10	"Integrated care record".mp.	0
11	"Longitudinal health record".mp.	5
12	"Continuity of care record".mp.	11
13	"Personal health record".mp.	85
14	Implementation.mp.	59625
15	*"Diffusion of Innovation"/	4195
16	Initiation.mp.	118776
17	Adoption.mp.	15871
18	Adaptation.mp.	157470
19	Acceptance.mp.	48292
20	Routinisation.mp.	6
21	Routinization.mp.	86
22	Infusion.mp.	159378
23	6 or 11 or 3 or 7 or 9 or 12 or 2 or 8 or 1 or 4 or 13 or 10 or 5	5144
24	21 or 17 or 20 or 15 or 14 or 22 or 18 or 16 or 19	550454
25	24 and 23	1036

Search history Embase

#	Searches	Results
1	*Electronic Medical Record/	1268
2	*Medical Information System/	2756
3	*Hospital Information System/	391
4	"Electronic Health Record".mp.	270
5	"Electronic patient record".mp.	271
6	"Computerised medical record".mp.	10
7	"Computerized medical record".mp.	118

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8	"Computer-based medical record".mp.	21
9	"Digital medical record".mp.	3
10	"Integrated care record".mp.	1
11	"Longitudinal health record".mp.	2
12	"Continuity of care record".mp.	2
13	"Personal health record".mp.	52
14	Implementation.mp.	46254
15	Diffusion.mp.	75970
16	Initiation.mp.	111929
17	Adoption.mp.	11187
18	Adaptation.mp.	69096
19	Acceptance.mp.	23475
20	Routinisation.mp.	3
21	Routinization.mp.	55
22	Infusion.mp.	154943
23	6 or 11 or 3 or 7 or 9 or 12 or 2 or 8 or 1 or 4 or 13 or 10 or 5	4714
24	21 or 17 or 20 or 15 or 14 or 22 or 18 or 16 or 19	481800
25	24 and 23	703

Appendix 2: Summary of papers included in the literature review

Author	Year	Setting	Design	Findings	Quality considerations¹⁸
Adler	2007	Primary care (US paper)	Discussion paper	Argues that successful IT implementation in healthcare needs what he calls the “three T’s” – team, tactics and technology	Difficult to judge quality as discussion paper, although US paper may be applicable to UK
Dagroso et al	2007	US secondary care	Reflections on the implementation of an obstetrics system, conclude with a range of recommendations for successful implementation	Key to success was user involvement, persistence and leadership	Difficult to judge quality as reflections on single implementation, although US paper may be applicable to UK
Dave	2004	General (US paper)	Discussion paper	Barriers to EHR adoption: people do not like change	Difficult to judge quality as discussion paper,

¹⁸ Please note that this contains an indication of the quality considerations of studies that constitute original research. The others were reflections of single implementations or discussion papers and it is relatively difficult to judge the quality of these as they were narratives and often based on speculation.

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				(therefore need intuitive designs), EHRs do cost money initially, transferring information from paper records is difficult	although US paper may be applicable to UK
Delany	2004	New Zealand secondary care	Reflections on EHR implementation	Identifies factors that have made the implementation successful: Senior management commitment to the introduction of the system and active involvement, effective communication between clinicians and management, change needs to be incremental	Difficult to judge quality as reflections on single implementation, although paper from New Zealand this may be applicable to UK
De Mul et al	2004	Dutch intensive care unit system	Reflections on successful implementation	Identify success factors: implementation team had both clinical and technical representatives, implementation	Difficult to judge quality as reflections on single implementation, although Dutch paper may be applicable to UK

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				took more than double the time than originally planned, user input and extensive testing, training, project was viewed as “an organisational change process” rather than an IT project, thorough analysis of individual work practices before the system was introduced and a recognition that these vary across individuals and wards, only then can the system be adapted to fit into existing work practices, iterative implementation, evaluation	
Duggan	2006	US healthcare	Describes experiences of IT Managers	Success factors: buy-in from stakeholders, focus, user-led, phased	Difficult to judge quality as reflections on experiences of

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				implementation, management, resources, training, evaluation, relationship building between users and service providers, regular clinical input, incremental changes	IT Managers, although US paper may be applicable to UK
Fenton et al	2006	General (US paper)	Summary of issues critical for EHR implementation success in addition to technological factors	Leadership, users, communication, training, “readiness for change”, evaluation	Difficult to judge quality as discussion paper, although US paper may be applicable to UK
Granlien et al	2008	Danish hospitals	Reflect on the implementation of an EHR	Outline barriers to adoption: even managers seem to be unclear what exactly barriers to use are, systems were reported to be slow and not very user-friendly, lack of support and training identified amongst users	Difficult to judge quality as reflections on single implementation, although Danish paper may be applicable to UK
Hendy et al	2005	UK, focus on NHS CRS	Interviews with secondary care managers and clinicians about barriers to	Some Trusts are still “recovering”	23 semi-structured

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			implement the NPfIT	from merging, concern about lack of communication of goals of the NPfIT, financial and staffing resources were a major concern, fear the loss of existing IT systems, lack of tangible benefits for staff on the ground, concerns about timelines set by NHS CFH	interviews with managers and clinicians from four acute Trusts, small sample, constituted the first phase of a longitudinal study but no follow-up data reported
Jones	2005	EHRs in UK acute hospitals	Reflections on the introduction of EHRs and outline of lessons learned	Lack of dissemination and sharing of lessons learned over the years, secondary care lagging behind primary care, IT investments in hospitals are variable and do not necessarily correlate with performance, lack of consistent governmental approach to	Difficult to judge quality as reflections on EHR implementations

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				introducing EHRs, technical factors are only a small part of successful implementation, need more realistic targets for people to regain belief in the Programme, need stable vision and consistent political leadership	
Mehta and Partin	2007	General (US paper)	Discussion paper outlining barriers to EHR use	Initial cost of the system, difficulties importing existing records into the new system, concerns surrounding privacy and security	Difficult to judge quality as discussion paper, although US paper may be applicable to UK
Ammenwerth et al	2006	General (Austrian/German paper), retrospective analysis of technology implementation in German hospital	Develop a sociotechnical model ("Fit between Individuals, Task and Technology") that can be used to analyse adoption of technology in clinical settings, re-analyse three case studies with this model	Outline interventions that can facilitate fit: users/individuals (can be facilitated through increased involvement, support, training), technology (changes to the technology itself), task/organisational	This is a retrospective analysis of three cases applying the new framework, may be applicable to the UK

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				processes (changes to work/organisational working)	
Austin et al	2000	Healthcare IT implementations in US	Analyses of successful management activities across several organisations	Careful planning (this needs to be regularly updated and in line with the overall business strategy of the organisation), user focus (active involvement in all parts of the implementation process by different user groups – from design to evaluation), recruitment of competent staff to manage the introduction of the system, integration of the system (develop standards for interfacing and integration), attention to security and confidentiality, management in	Management conducted audits at ten healthcare organisations, varying evaluation methods in different institutions, some used surveys, some used interviews, authors analysed audits along seven executive management principles assigning scores on a Likert scale, not very robust, convenience sample, no indication of sample sizes

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				system development (implementation teams need to include individuals that represent users, technical and managerial staff), evaluation activities	
Bali and Wickramasinghe	2008	Primary care EHR implementations in US and UK	Describe a model developed from qualitative analysis of observations and interviews	Stages for successful IT implementation in healthcare: recognition of the current state of affairs, training, cultural and organisational change, acceptance, stability	Observations of and semi-structured interviews with key personnel (does not state numbers) in three UK and three US practices, no detailed methods outlined
Beuscart-Zephir et al	2001	Describe case of EHR adoption by anaesthesiologists in France	Analyse and model anaesthetists' work practices with the help of observations and interviews before the EHR was introduced, they use the findings of this to make recommendations of how the technology needs to support work practices, authors then apply the recommendations to an existing anaesthesiology system	Detailed analysis of existing work practices can be used to adapt systems, improve usability and lead to increased adoption, only if systems support user activity will they be readily	Interviews, video and audio recording of 13 anaesthesiologists in 50 consultations (either with real patients or trained actors), no information

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				adopted	on the length of observations and interviews, authors examined dialogues/paper files and resulting written notes, may be applicable to UK context
Bates et al	2003	EHRs in US primary care	Discussion paper	Facilitators for EHR use include incentives and training Barriers include: initial cost and time it takes to obtain visible benefits, variability in vendors and lack of shared standards across systems, user resistance, concerns surrounding security and confidentiality	Difficult to judge quality as discussion paper, although US paper may be applicable to UK
Bossen	2007	Describes pilot implementation of electronic medication	Case study, data on adoption collected through observations and interviews with key stakeholders	Barriers: technological issues/issues with usability, issues	Researcher attended 10 Steering Committee

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		plan (part of a national EHR implementation) in three Danish hospitals		with security, difficult to integrate use of the system into existing work practices, involves re-negotiating of roles and responsibilities, workload Facilitators: end-users were involved in whole process, strong management support, vision, cooperation between all stakeholders is important	meetings, seven clinician meetings, 39 hours of participant observation of clinicians working with the new system, semi-structured interviews with three clinicians and six nurses after the pilot, may be applicable to UK
Callen et al	2008	Describes the contextual implementation model of IT in healthcare, Australian teaching hospitals	Observations and interviews with key stakeholders in Australian teaching hospitals that had implemented a compulsory CPOE system	Factors for successful CPOE implementation include: technology related factors, individual related factors, organisational factors, and environmental factors, all interrelated and need to be	Non-participatory observations (55 sessions totalling 89 hours) and 28 interviews from four clinical units (two Emergency Departments and two Haematology

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				considered together	wards) over a period of two years, may be applicable to UK
Aarts et al	2004	CPOE implementation in a Dutch hospital	Describe in-depth qualitative study of a CPOE implementation in a Dutch hospital, data collected through interviews/observations/meeting notes/documents	Interrelated nature of social and technical aspects during implementation, implementation is unpredictable and does not follow a pre-determined plan, notion of success and failure as being relative to the degree of “fit” between the technology and the environment	15 semi-structured interviews with different stakeholders including implementation team and users, notes from all staff meetings and strategic meetings during the pilot, analysis of documents (about the selection, specification, and implementation of the information system, and the evaluation of the CPOE pilots), may be

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					applicable to UK
Ash et al	2003	CPOE implementation (US study)	Developed principles to guide CPOE implementation with the help of an expert consensus study combined with interviews and observations in four successful CPOE implementation sites	12 principles along the following four dimensions: technical, personal, organisational, and environmental	Notes from two-day meeting of multiple stakeholders (including clinicians, social scientists, IT implementers, and vendors), notes sorted into categories by researchers and consensus reached over email Observations and interviews in the four sites, no indication of numbers, may be applicable to UK
Clemmer	2004	EHR adoption in Intensive Care Unit (US paper)	Discussion paper on EHR adoption	Systems often viewed as too slow and not intuitive, training and education can facilitate acceptance, systems need to meet user needs, cultural	Difficult to judge quality as discussion paper, although US paper may be applicable to UK

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				change is part of technology introduction, most successful implementations have been with systems that are created “in house” and those where there is a close relationship with suppliers	
Crosson et al	2005	Describes implementation of an EHR in a general practice in the US	Case study, data collected through combination of interviews with stakeholders and observations	Communication patterns: different perceptions amongst staff in relation to the perceived usefulness of the system, lack of goals, lack of communication between practice staff which led to not using the system to its full potential and slower work practices, lack of collaborative approach and teamwork, lack of	Practice observations during nine working days Interviews with physicians, the office manager, two nurses, a medical assistant, receptionists, a referral specialist, medical assistants, the front office supervisor Researcher

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				<p>effective leadership Decision making: lack of involvement of team in decision making (“top- down”), lack of effective training</p>	<p>returned one year later but it is unclear what data was collected then, may be applicable to UK, no information on exact length and methods of observations and interviews</p>
Davidson and Heineke	2007	General (US paper)	Describe a framework of factors influencing diffusion of IT in US healthcare	<p>Recommend where to focus research efforts: real benefits can only be realised if systems can communicate across healthcare organisations The adoption of systems: for an innovation to spread quickly it may have to be supported by a national strategy, immediate benefits are often not visible to users, leadership and incentives are</p>	<p>Difficult to judge quality as discussion paper, although US paper may be applicable to UK</p>

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				<p>important</p> <p>Individual use: systems are often not used or not used to full potential, facilitators for use can include the influence of respected peers, technology needs to be adapted to the context of use</p> <p>Changes in work practices</p> <p>Benefits arising from implementation</p>	
Doebbeling et al	2006	US healthcare	Review of IT implementation in US healthcare	IT implementation in healthcare needs to address concerns of different stakeholders: clinicians, patients, organisations, human factors, management and implementation strategies	Difficult to judge quality as discussion paper, although US paper may be applicable to UK
Goroll et al	2009	US primary care	Describes the efforts of the Massachusetts eHealth Collaborative to implement EHRs in US with aim to	Facilitators for adoption included: financial support,	Difficult to judge quality as reflective

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			<p>work towards a state-wide EHR Included representatives from government, patients, hospitals, industry, and professional organisations Three communities were chosen as early implementers</p>	<p>IT support, active collaboration, clinical leadership, governmental backing, community involvement Barriers to adoption included: lack of coherent standards and interoperability across different systems, changing business environment and resulting likely changes in systems, limitations in system performance, concerns surrounding security and confidentiality, negotiating contracts</p>	<p>discussion paper, although US paper may be applicable to UK</p>
Halamka et al	2006	Describe three pilot e-Prescribing implementations in the US	Data collected through interviews and focus groups with key stakeholders	Training is crucial – especially one-to-one training Strong vision, incentives and	There is no information on the participants, length and content of the

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				<p>market sponsorship are important Close collaboration between suppliers and users is crucial Workload implications and re-organising of existing workflows Community-wide approach with all stakeholders working together is most effective</p>	<p>interviews/focus groups in the paper Although US paper may be applicable to UK</p>
Erdley et al	2003	IT in US prenatal care	Reflections on the introduction of IT system in US prenatal care, users were nurses	<p>Notion of “social informatics” – if one wants to implement technology successfully one needs to pay attention to the context of use and involve users in design and implementation</p> <p>User involvement in design can close the “design reality gap”, close and</p>	<p>Difficult to judge quality as reflection on an IT implementation, may be applicable to UK</p>

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				effective collaboration between designers and users is fundamentally important to achieve this	
Greenhalgh et al	2008	Looked at introduction of SCR (in UK primary care)	Case study of four EA sites, combination of interviews/observations/surveys/documentary analysis, informed by sociotechnical perspective	Facilitators for implementation: the change model needs to be appropriate (doubt that NHS CFH's one is as it is "top-down" and may not leave sufficient space for natural emergence of change), effective management (realistic and efficient), a degree of autonomy for users, skilled staff, good training (especially hands-on and one-to-one), new routines as a result of introducing the technology need to fit in with	Mixed-methods case study evaluation, collected large amounts of data including field notes, documents, interviews, informal stories, questionnaires, and monitoring statistics 250 interviews with different stakeholders, 1500 hours of observation, 2500 pages of documents, 103 patient interviews and focus groups

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				existing routines and roles of users, efficient sharing of information between users and designers and between other participating organisations, a supportive socio-political environment	with 67 patients, surveys and questionnaires Over a period of one year Good quality study as range of data from different sources collected longitudinally
Giuse and Kuhn	2003	General (German paper)	Report findings from an IT Working Group conference 2002	Need to pay more attention to social factors: interoperability means that systems have to a certain degree to be standardised but standardised systems often do not fit in with individual work practices in healthcare, systems need to facilitate communication, designers need to design systems that	Difficult to judge quality as reflective discussion paper, although German may be applicable to UK

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				support work practices, technology needs to work for a variety of users with different needs, implementation needs to be iterative and emergent (tailored to emergent patterns of working and communication), system needs to be flexible by tailoring design/communication to a specific activity rather than the profile of a specific user, commitment and support are important	
James et al	2007	General (US paper)	Report on successful implementation of several hospital IT projects in US	Developed an implementation framework: implementation team worked with the users to plan for changes in work practices that would	Difficult to judge quality as reflections on IT implementations, may be applicable to UK

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				<p>come with the introduction of the system, aligned organisational and project goals, used both formal and informal leaders in decision making, developed a process to capture progress, addressed gaps in knowledge and understanding among users, IT team aimed at understanding the clinical context of use, collaborative working between all key stakeholders, clear responsibilities and project milestones, clear definition of success, effective risk management, clear measurement of success with both quantitative and qualitative means</p>	
Jaspers et al	2008	Secondary	Evaluation of the usability of a new and	Adoption of EHRs	Two

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		care, Netherlands	an old EHR system in the Netherlands through standardised questionnaires given to clinicians	is influenced to a large degree by perceived usability	<p>standardised questionnaires to measure user satisfaction with the EHR system before and after its redesign, questionnaires mailed to 150 clinicians</p> <p>Questionnaires may not be appropriate to measure complex usability issues</p> <p>May be applicable to UK</p>
Johnson and Turley	2006	US healthcare	Study in US to explore how cognitive needs of clinicians and nurses differ and how this should inform the design of an EHRs, cognitive task analysis (where participants had to look at different cases on the EHR and were instructed to think aloud)	Nurses tended to view the patient in observational terms (e.g. in relation to monitoring and documenting changes), whilst clinicians tended to view the patient in causal terms (e.g. in	Purposeful sample of 24 nurses and 24 physicians, participants asked to think out loud when interpreting medical cases they viewed on a

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				<p>relation to diagnosis, treatment) Clinicians and nurses have different practice models, IT design needs to take these differences into account by designing different interfaces tailored to the needs of the professions</p>	<p>laptop, each participant reviewed two cases for a total of 96 case reviews, given one training case and two gastrointestinal test cases to review and summarise</p> <p>Narrow focus as only looking at two professions, but innovative design</p> <p>May be applicable to UK</p>
Karsten and Laine	2007	Finish secondary care	Interviews with healthcare staff (administrative, clinical and project team) in Finish hospital	<p>“Technological frames” across user groups seem to be relatively similar with some minor differences, each user has his/her own perspective of the system in the context of his/her</p>	<p>24 interviews with key stakeholders, no detailed information on methods</p> <p>May be applicable to UK</p>

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				own work, these frames develop over time and should be evaluated as they change during implementation	
Keddie and Jones	2005	UK primary care	Questionnaire examining IT use	Barriers to implementation and adoption were: cost, lack of training time and technical support, attitudes of colleagues, view that systems do not easily integrate with secondary care and other practices, lack of support from the PCT, concerns about impact on work practices and patient relationships, medico-legal concerns and lack of competence of using computers	Cross-sectional design, questionnaire sent to a random sample of GPs across all 32 PCTs in London, conducted a non-response follow-up of 40 non-responding practices using a telephone interview with Practice Managers, 520 (52%) of the questionnaires could be analysed Quantitative, may fail to capture full complexity of IT

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					use
Kelly	1999	US perinatal computerised patient records	Advice for organisations on how to select/introduce an IT system	Barrier to implementation is lack of universally agreed standards and lack of interfacing, acceptance can be facilitated by the system meeting users' needs, training needs to build on existing computer skills, phased implementation, champions, need to listen to concerns and incorporate users' suggestions for improvement to facilitate ownership, goals need to be reasonable and deadlines adhered to, can run paper and computer parallel initially to allow staff to get used to new system, staff need to	Difficult to judge quality as reflective discussion paper, although US paper may be applicable to UK

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				understand what benefits the new system is likely to bring	
Tonnesen et al	1999	US primary and secondary care	Emerging issues and lessons learned from an EHR implementation	Software did not perform to expected standards, organisation was dependent on the supplier to resolve any problems, additional staffing resource needed should not be underestimated, clinical input was crucial but as clinicians were busy difficult to obtain, IT support and training important, system needs to be tailored to individual needs, user frustration due to technical problems, users need to be clear about the value of the system to them and the organisation	Difficult to judge quality as reflections on single implementation, although US paper may be applicable to UK

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				as a whole, users were concerned about privacy and security	
Rose et al	2005	EHR in US primary care	Qualitative study to inform the usability of an EHR, combination of task analysis and focus groups with clinicians and some nurses, formative and summative	Users found the EHR difficult to use and navigation was too complicated and not in line with existing workflows, felt that EHR access needed to be quicker, problems resulted in feelings of frustration, users had developed 'workarounds' that were in some instances stated to have adverse effects on patient safety	Five physicians and two nurses were observed individually in their clinical workplace using the system for 30 to 40 minutes each (participants were encouraged to think aloud), five focus groups with 26 physicians lasting 90 minutes each, small sample May be applicable to UK
Snyder et al	2006	CPOE system in three US hospitals	Investigated environmental factors that influenced evaluation of a CPOE system in three US hospitals, interviewed research team members as to what contextual factors impacted on study	Factors identified by interviewees: implementation of the system and associated timelines and processes were	Parallel to this qualitative study the authors had distributed a questionnaire assessing pre-

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				<p>unpredictable and did not follow pre-determined patterns, changes in work practices of users, differences in the organisational context of the hospital itself or different wards (e.g. personnel, technology, existing and parallel technology implementations, different cultures and levels of user experience, resources), internal factors (e.g. initiatives and priorities), external factors</p>	<p>implementation perceptions and they were also planning to assess the impact of the system on medication errors pre- and post-implementation, these results are not reported here</p> <p>Conducted interviews with five members of the core research team including the Principal Investigator, two Co-investigators, the Project Director and a Research Associate Interviews lasted approximately one hour and were conducted over the phone and face-to-face</p>
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					May be applicable to UK but close focus on evaluation as opposed to implementation
Sprague	2004	General (US paper)	Discussion paper on EHR implementation	Barriers to adoption of EHRs: initial cost of the system, disruption to user workflows, changes in established practice, other concerns (EHRs are still immature and constantly developing, supplier support may be inevitable long-term, concerns surrounding confidentiality and interoperability of systems, negative previous experiences of IT implementation, technology cannot prevent error – garbage in garbage	Difficult to judge quality as reflective discussion paper, although US paper may be applicable to UK

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				out, failure if technology and workflows do not align), legal issues (e.g. data protection may complicate interoperable EHRs)	
Townes et al	2000	US ambulatory care	Case study of EHR implementation in US ambulatory care	Everyone needs to have a clear understanding of what the expected benefits of introducing an EHR are, realistic expectations and effective communication between users/suppliers/local leaders, leadership and management commitment, user buy-in, commitment from support staff, need to be clear that implementation will involve learning, should try to limit free text entry and maximise	Difficult to judge quality as reflections on single implementation, although US paper may be applicable to UK

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				standardisation, realistic expectations of supplier, need supplier expertise on site for support, training needs to be thorough and should try to allow for practice by installing the system before go-live	
Van der Meijden et al	2001	EHR in Dutch teaching hospital	Investigated attitudes of future users of an EHR for stroke patients before it was implemented in a teaching hospital through a combination of questionnaires and interviews (nurses, residents and specialists)	More negative attitudes amongst inexperienced computer users, overall satisfaction with paper records but some problems identified, all thought that EHR would improve the cited negative aspects of paper records, inexperienced users more positive than experienced participants Usability, speed and	Mixed-methods study, two different questionnaires and two sets of in-depth interviews, questionnaire to measure attitudes to computers administered to 63 future users, unstructured interviews with two nurses, two residents and the nurses' team

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				<p>reliability were high on participants' list</p> <p>No expectations of any negative effects of introduction of system, cited many positive expectations of new system including legibility and more efficient data entry</p> <p>Did anticipate new system to have large impact on communication and reporting</p> <p>Did not expect that work practices and patient care would change significantly with the new system</p>	<p>leader to complement the questionnaire results</p> <p>Second questionnaire was sent to 65 potential users a year later, slightly different population (nine specialists, 14 residents and 42 nurses)</p> <p>Three months prior to the implementation, nine semi-structured in-depth interviews were held with two residents, four nurses, the Head of the department, the lead nurse and the IT Manager of the</p>
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					department May be applicable to UK, small sample but longitudinal component and mixed-methods
Keshavjee et al	2006	Canadian review of what makes EHR implementation successful	Developed a framework based on review of qualitative implementation literature, followed principles of systematic review, 125 included articles	<p>People/processes and technology are involved in implementation, strong leadership is important, stakeholder communication and engagement is important, implementation is a dynamic and evolving learning process, usability is important</p> <p>Divide implementation into three time periods: pre-implementation, implementation and post-</p>	<p>Search of the English language articles in MEDLINE, HealthStar, EMBASE and DARE from January 1985 to May 2006 searching for key terms that included EHRs and implementation</p> <p>Developed a framework from reading 125 EHR implementation articles from a list of over 1500.</p>

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				implementation	Over 50 of these passed the inclusion/exclusion criteria and were included in the assessment framework development May be applicable to UK, based on qualitative studies only
Leu et al	2008	US study examining adoption of ambulatory EHR	Qualitative study examining how adoption of an ambulatory EHR can be facilitated through integration of the system into clinical work practices Interviews with implementation leaders, suppliers and users	Adoption is difficult to measure, lack of agreed definition of what EHRs are Understanding how the system fits in with existing work practices is critical for facilitating adoption	20 in-depth, semi-structured interviews with organisational executives at eight sites Visits lasted between two and four hours, and included product demonstrations Small sample, qualitative only, may be applicable to UK
Lium et al	2008	EHR	Qualitative study (interviews with	Success factors:	18 semi-

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		<p>implementation in two Norwegian hospitals</p>	<p>physicians) looking at changes in workflow following EHR introduction in two Norwegian hospitals</p>	<p>ownership, support, leadership, training, user engagement There is still a risk of unintended consequences, the success of the implementations was due to attention to local contexts rather than rigid critical success factors Management and users need to be committed to change, for this both administrative and clinical leadership is needed, enthusiasm and communication is important, as well as preparation Clinical engagement is crucial, vision important, users need to understand the need for and benefits of change</p>	<p>structured interviews with physicians lasting between 25 and 45 minutes, topic guides based on previously administered questionnaire At the first hospital: 11 physicians were interviewed, four interns, four residents and three seniors At the second hospital: one intern, three residents and three senior physicians were interviewed May be applicable to UK, no longitudinal</p>
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					element, small sample
Lorenzi et al	2004	EHR implementation in a US medical centre and hospital	Describe an EHR implementation “success factor profile” based on experiences of EHR implementation in a US medical centre and hospital	Factors for facilitating “success likelihood”: History of successful innovations, the extent to which locally developed processes can be transferred to the larger organisational environment “Innovation personality” (enthusiasm, resources strength of leadership) Learning (feedback to implementation team) Likelihood of success Realistic expectations need to be balanced with vision	Difficult to judge quality as reflections on single implementation, although US paper may be applicable to UK
Walker	2006	Canadian hospital	Case study discussing the introduction of a documentation system	Strong nursing leadership was a critical success factor, training,	Difficult to judge quality as reflections on single

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				<p>awareness, leadership and senior management support were crucial, resources, shared vision, ownership of the new system by users was important Recommend that leaders show increased presence throughout the implementation Coaches were successful as they were peers of users (nurses) and understood existing work practices Recommend increasing staffing resources initially to support the implementation and give nurses the opportunity to get used to the system Trial or pilots may be useful</p>	<p>implementation, although Canadian paper may be applicable to UK</p>
Lu et al	2005	General (US	Literature review on PDA use	Increase in PDA	Medline and

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		study)		<p>adoption due to perceived benefits</p> <p>Barriers to adoption: individual factors (e.g. comfort, demographic factors), ineffectiveness of device, PDA not integrated with the hospital EHR, non intuitive data entry, design (e.g. portability), maintenance (e.g. repair), devices too delicate (fear of breaking), security and speed, technical issues, negative patient perception of the device, usability issues, lack of organisational support, features needed but not available in the device, preference of users to use</p>	<p>several internet searches for articles published between 1998 and 2004</p> <p>Identified 200 articles on Medline. Ninety-five of them were reviewed</p> <p>Short time period, literature review relating to PDAs only</p> <p>May be applicable to UK</p>
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				paper, lack of established need to use device, not enough training	
Ludwick and Doucette	2009	EHR adoption in primary care, Canadian paper	Canadian review of EHR adoption in primary care looking at articles from a range of countries with a view to identify lessons learned from EHR implementations	<p>Found that sociotechnical factors were most important for successful implementation, important that the new system fits in with existing organisational goals and practices</p> <p>Barriers were identified to be: perceived negative impact on patient safety, privacy, impact on healthcare professional-patient relationship, reservations from users, implementation time needed, cost issues</p>	<p>Conducted searches in CINAHL, MEDLINE, PUBMED, EMBASE, The Cochrane Library, and IEEE Xplore. Thses were complemented by internet searches.</p> <p>The searches returned almost 3700 article titles and 86 articles met the inclusion criteria</p> <p>Not empirical work, may be applicable to UK</p>

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				Mitigating factors: good project management and leadership, training, standardisation	
Mannan et al	2006	Primary care staff in England	Interviews and observations of primary care staff in England in relation to eHealth initiatives, interviews to explore attitudes to NHS CFH and organisational readiness	<p>Found that participants generally believed that technology has the potential to improve care, some concerns e.g. regarding data loss</p> <p>Concerns that the introduction of technology will adversely impact on work practices and workload, felt that training was crucial</p> <p>Felt that cost of the Programme may be a barrier to implementation, felt they needed more information on NHS CFH, felt that real use of computers would</p>	<p>30 minute interviews with IT staff used to inform the topic guide of interviews with healthcare staff</p> <p>A doctor, nurse, practice manager and receptionist from each of the four recruited practices were interviewed, interviews were complemented by 30 minutes observations of computer use in each practice</p> <p>Small sample</p>

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				come as the old generation of users would retire and the younger generation would become more prominent	
McGowan et al	2008	General (US paper)	Discussion paper on EHR adoption	Formative evaluation activities that assess the achievement of implementation goals periodically throughout the implementation period are crucial for successful EHR implementation, formative evaluation activities can reduce the risk of failure as problems are identified early	Difficult to judge quality as discussion paper, although US paper may be applicable to UK
Miranda et al	2001	Nursing IT system in US secondary care	Describe implementation of a Nursing IT system in US secondary care	Lessons learned: need to involve a variety of stakeholders in implementation and selection decisions, if possible achieve consensus and	Difficult to judge quality as reflections on single implementation, although US paper may be applicable to UK

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				<p>address concerns as early as possible</p> <p>Realistic expectations – otherwise there will be a discrepancy between expectations and system performance, this can result in frustration, acknowledge that change is difficult</p> <p>Relationship with vendor, agreed goals and milestones</p> <p>Staged implementation better as changes are incremental and it is easier for users to get used to them</p> <p>Work practices need to be redesigned and not mirrored on paper systems</p> <p>Project management is</p>	
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				important, suggested system changes need to be incorporated Project leader needs to have excellent communication and team leading skills	
Moen	2003	General (Norwegian paper)	Describes EHR implementations from a nursing perspective	Nurses handle large amounts of information and present a large group of EHR users, important to assess existing nursing work practices before system design so that the system can meet nursing needs in terms of context and individual work practices Nursing leadership is important when implementing an EHR, this should begin with input in system design and continue throughout implementation	Difficult to judge quality as discussion paper, although Norwegian paper may be applicable to UK

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Morrison et al	2008	Intensive care EHR in the UK	Investigated impact of intensive care EHR on multi-disciplinary healthcare team with a qualitative study consisting of interviews, observations and video tapes of ward rounds	Found that group formation during the ward round and communication and interaction patterns changed with the introduction of the EHR, Findings from the study were fed back and facilitated local implementation	<p>Video-based interaction analysis, observation, interviews</p> <p>Video recordings at three time points during the observation period over 13 months: prior to deployment of the EHR, four months after, and one year after deployment</p> <p>Each time, six separate, randomly selected patient discussions were filmed</p> <p>Recordings were discussed in the implementation steering group</p> <p>Observations and</p>
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					<p>interviews with seven staff present were also carried out at the three periods</p> <p>Longitudinal design and in-depth study</p>
Nagle	2007	EHR use in Canada	<p>Reports on a Canadian government initiative to promote EHR use and to promote healthcare professional engagement, conducted focus groups with nurses/physicians/pharmacists</p>	<p>Nurses stated that: there was a lack of engagement activities, usability issues and systems not aligned with needs, lack of educational focus, privacy concerns, other priorities for money allocated to EHR initiatives, the need to promote an understanding of the value of EHRs amongst nurses</p> <p>Local efforts to increase stakeholder engagement included: bringing different groups of</p>	<p>There is no information on the actual methods in this paper</p> <p>May be applicable to UK</p>

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				healthcare professionals together, establishment of national and international peer networks with a view to discuss lessons learned, the development of online toolkits to guide implementation efforts	
Nikula	2001	EHR implementation in two Swedish hospitals	Qualitative study at two Swedish hospitals with EHRs, interviews with Chief Executive Officers, nurses and physicians	Overall: successful implementation as physicians satisfied and use the system Managers viewed EHR from organisational perspective (as facilitating organisational processes) whilst clinicians viewed it as facilitating clinical processes Vision for the	Conducted 18 interviews altogether Lack of methods May be applicable to UK

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				<p>future seems to be mainly present in managers and not clinicians, authors argue that vision needs to be communicated to clinicians</p> <p>Clinicians had little involvement in the implementation process</p>	
Ovretveit et al	2007	EHR implementation in a Swedish teaching hospital	Interviews with doctors, nurses, managers and documentary analysis, interviews during and three months after implementation	Argue that successful implementation may be facilitated by: involvement of users in system selection, established need for introduction of system, implementation viewed as priority by management, effective leadership (initial decisions were participatory but then implementation was	<p>Case study</p> <p>Semi-structured interviews with 30 stakeholders (including the project leader, four part-time project leaders, three participants from a supervisory group, four heads of division, seven heads of clinics, one instructor, five nurses, four</p>

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				<p>driven by management), usability of system and consequently little training needed, departments could adapt/modify the system to some extent (but still need to pay attention to standardisation), phased implementation</p> <p>New system needs to meet different user needs and increase productivity and quality of care, needs to be supported by staff and in line with organisational goals, needs to have more advantages than disadvantages, need adequate time and resources for</p>	<p>doctors and one secretary), half way through and three months after implementation</p> <p>Hospital documentation was also gathered and complemented by observation visits</p> <p>There are no detailed methods in relation to the documents and the observations</p> <p>May be applicable to UK</p>
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				implementation	
Pagliari	2005	General (UK paper)	Recommendations for successful implementation of NPfIT drawing on the evaluation of the implementation of the Scottish Electronic Clinical Communications Implementation Programme	Author argues that it is in the very nature of IT programmes that they take longer and cost more than anticipated, complexity of IT programmes should not be underestimated, realistic expectations in relation to project outcomes are crucial, stakeholder engagement and involvement in decision making is important throughout the implementation, effective communication between different programme components, effective communication between	Difficult to judge quality as reflections on single implementation

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				implementation teams and suppliers, evaluation and measuring outcomes of complex IT programmes is difficult, willingness to receive and incorporate feedback as well as openness about processes is needed, politics/non-sufficient planning and a lack of agreement on objectives can impede successful implementation	
Pare	2002	Three IT systems in a Canadian hospital (an EHR, a computer-based nursing system and an electronic patient	Case study of the introduction of three IT systems in hospital, interviews with users and implementation teams, supplemented by observations and collection of documents	All cases had a vision and a desired end-state, activities were carried out to achieve this state Goals are more likely to be achieved if actors are competent and	95 semi-structured interviews were conducted with implementation team members and users over a period of six months, lasted

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		charting system)		<p>motivated: this was addressed by utilising training that was tailored to user needs, user opinions were incorporated, lack of motivation can be a barrier to implementation, implementation team needs to be competent</p> <p>Actors are heavily influenced by context: organisational context can either facilitate or inhibit implementation and functioning of the system as well as individual behaviours</p> <p>Every organisation and every project is different: this makes prediction impossible, requires</p>	<p>between 30 and 60 minutes</p> <p>Other data collected consisted of organisational charts, annual reports, newsletters and other internal publications, user manuals and/or training material, and software vendor's marketing documentation</p> <p>Other data consisted of notes from observations of training sessions, meetings of implementation team members and nurses using the</p>
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				flexibility to deal with unexpected situations	system Large number of interviews, no detailed methods in relation to observations and documentary analyses May be applicable to UK
Pare et al	2008	IT implementation in Canada	Literature review and Delphi study with project managers in Canada examining the risks of IT implementation in healthcare	From literature review the authors identified the following dimensions of risk factors: technology related, human risk factors, usability, implementation team, project related, organisational, political/strategic factors In addition, the panel identified another two risk factors: attitudes of	Ranking-type Delphi survey over a three month period, 21 experienced Project Managers in Québec, 1st phase was brainstorming session to get as many risk factors as possible, the resulting list was circulated to all participants and they were asked to rank factors by relative

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				<p>implementation team members and external factors such as policy changes</p> <p>Panel ranked lack of project champion as the most important risk factor, technological factors tended to be ranked at the bottom of the list</p>	<p>importance on a seven point Likert scale, two ranking rounds followed to establish consensus</p> <p>May be applicable to UK</p>
Pendergast and Buchda	2003	Nursing EHR implementation in US hospital	Descriptive case study of the opening of a new US hospital, this included a nursing EHR implementation, focus groups with patients and nurses	<p>Lessons learned: flow diagrams are useful to map processes, implementation activities take longer than anticipated, should not make assumptions that people understand, need to note down all assumptions, a clear vision is crucial, micro-managing will not</p>	<p>Difficult to judge quality as reflections on single implementation, although US paper may be applicable to UK, despite stating that they have done interviews and focus groups the methods are not described</p>

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				work and people need to be empowered, need to understand workloads and not underestimate them, motivation is extremely important	
Puffer et al	2007	Implementation of EHR in US hospital	Observations and interviews with physicians to improve acceptance of EHR amongst healthcare staff and improve integration of EHR into work practices to better meet user needs	Themes identified: training, existing work practices need to be changed to accommodate the new system, should avoid using parallel paper-based and electronic systems, interviewees valued if information was easily viewed with a minimum number of screens, participants felt that integration of systems could make the record more efficient, need management commitment to address user concerns,	Two phases (one focusing on outpatients and the other on inpatients), direct observation of 101 physicians and hospital service teams, supplemented with informal interviews and follow-up correspondence, feedback from several meetings, two physician focus groups (with 20 participants in each) were also conducted to

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				evaluation is necessary for identifying barriers to implementation and areas for improvement (e.g. training and design) throughout implementation	validate and rank the results, formative evaluation helped to shape delivery May be applicable to UK
Quinzio et al	2003	Anaesthesia information management System in a German hospital	Survey about user acceptance of an anaesthesia information management system in a German hospital after the system had been used for a period of five years	Users were satisfied with system and felt that it was better than paper Perceived lack of adequate training amongst some, “well-trained” users were more satisfied with and more accepting of the new system Some users stated that the positioning of computers had an impact on the consultation System needs to address different needs of administrators and	A 75 item questionnaire (five-point Likert scale items) was returned by 44 anaesthesiologists and 24 (response rate of 60%) May be applicable to UK, but retrospective and lacking rigour

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				<p>clinicians Lack of interoperability between systems increased workload</p>	
Van Ginneken	2002	General (Dutch paper)	<p>Discussion paper: in relation to EHR implementation one needs to consider the alignment of relative efforts and benefits, efforts will only be invested if resulting benefits are motivation enough</p>	<p>Important that the relationship of benefits and efforts is relatively equal for all stakeholders Interfaces and design of the system are crucial factors for facilitating adoption Parallel paper and electronic systems should not be used as this compromises the potential benefits of both and introduces extra workload for staff Data entry is challenging as it involves most time and has effect on relationship with patient System needs to be flexible enough to</p>	<p>Difficult to judge quality as discussion paper, although Dutch context may be applicable to UK</p>

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				<p>cope with changes Successful implementation needs commitment from users Evaluation is important to track progress and sustain commitment Need collaboration and teamwork with suppliers Need financial incentives from government Training is important and needs to be supported by organisation User involvement in decision making</p>	
Vishwanath and Scamurra	2007	General (US paper)	Developed a model of EHR adoption barriers based on quantitative evidence, started with brainstorming of barriers which were then rated by physicians and IT staff, analysed with cluster analysis	<p>Barriers identified: financial, psychosocial, technical</p> <p>Psychosocial barriers received most attention in literature but authors argue that</p>	Initially 11 physicians were asked to brainstorm barriers and 16 physicians participated in sorting these barriers

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				<p>this category is much broader than initially thought Argue that not one single barrier is responsible for failure but often a combination of many, therefore barriers need to be addressed in combination Standards are important for security and interoperability Argue that psychosocial issues are secondary to cost and technology issues</p>	<p>Then a seminar with 58 physicians was organised and participants were asked to perform a rating exercise</p> <p>Then another seminar with 17 other staff members was organised (including a variety of support staff such as security officers, network engineers and IT Directors)</p> <p>Analysed with concept mapping</p> <p>May be applicable to UK</p>
Saigh et al	2006	EHR in US hospital	Case study of failed implementation of electronic pain assessment as part of an EHR in US hospital, survey of healthcare staff (six months before and six months after the introduction of the	System use was mandatory, no training received, lack of awareness that it would be	Cross-sectional survey and a pre- and post historically controlled

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			system), chart review and observations	<p>introduced</p> <p>Almost half of the users viewed the system as difficult to use and the majority believed it did not result in changes to practice or improvements of care</p> <p>Users did not like the interface, took too long to enter data</p> <p>Conclude that users' needs need to be evaluated before new system is introduced</p>	<p>observational study, clinical notes were selected by evaluating all clinic visits on two consecutive days (pre-intervention group, n=392 post-intervention group, n=395), chart review conducted by two reviewers</p> <p>Mailed survey sent to all staff, response rate of 47%</p> <p>May be applicable to UK</p>
Scott et al	2005	EHR introduction in US	Interviews with primary and secondary care clinicians and managers in US just before a new EHR was introduced, Kaiser Permanente	System selection: almost all interviewees were unhappy with the choice of the new system (cost, lack of support from clinicians), found	Semi structured, recorded interviews with 12 clinicians, five managers, nine project team members over a two month

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				<p>that negative experiences with current EHR system were influencing attitudes to new system</p> <p>Participants felt that feedback was not sought by management which resulted in limited user input, acknowledged that hierarchical leadership is needed for implementation</p> <p>Some resistance to system emerged and resulted in change to new system</p>	<p>period</p> <p>May be applicable to UK, small sample</p>
Sicotte et al	2006	IT implementation in Canada	<p>Developed a model that identifies risk factors to successful implementation of “interorganisational clinical information systems” and applied this to two longitudinal case studies (over 2-3 years) in Canada, combination of interviews/ questionnaires/measurement of system usage/observations/meetings/documents</p>	<p>Propose the existence of the following risk factors based on the literature: technological risk, human risk, usability risk, managerial risk, strategic/political risk</p>	<p>Review of the literature to identify risk factors, conducted two longitudinal case studies on the basis of this (one over a two year and one over a three year</p>

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				<p>In one case study use of the system was relatively high, whilst in the other use was relatively low, authors analyse the results in light of each of the risk factors</p>	<p>period)</p> <p>In both cases semi-structured interviews were carried out with users and project team members (a total of 52 in both cases), questionnaires to measure individual attitudes to the new system were administered before and after its introduction, system usage was measured with the help of the log history of the systems, observations of steering and user committee meetings, relevant documents were also collected</p>
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Appendices

					<p>Cases were compared and contrasted</p> <p>May be applicable to UK</p>
Smaltz et al	2005	US secondary care core clinical systems (including CPOE, results management etc.)	Descriptive case study of implementation planning of US secondary care clinical IT systems	Important factors: Need to focus efforts on user involvement and implementation needs to be guided by consensus, management approach to implementation, shared vision, communication, benefits realisation	Difficult to judge quality as reflections on single implementation, although US paper may be applicable to UK
Yarbrough and Smith	2007	General (US paper)	Systematic literature review on technology acceptance by physicians	Barriers to acceptance: disruption of existing work practices, lack of empirical evidence supporting the effectiveness of systems in relation to cost and quality of care,	Papers published from 1996-2006 were searched for physician technology acceptance searching PubMed and ABI Inform/Complete , after applying

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				organisational issues, system issues	exclusion criteria the authors reviewed 18 articles May be applicable to UK, but concerned with acceptance only
Yasnoff et al	2004	General (US paper)	Present results of a consensus meeting of the US National Health Information Infrastructure Coordination Group (consisting of IT and healthcare representatives), group concerned with introducing technology that connects different areas of healthcare electronically (such as EHRs), identified facilitators for implementation	<p>Management: government and the private sector need to work together to achieve goals and agree on common standards</p> <p>Enablers: financial incentives needed for both the initial implementation, purchase of the system and for sustaining it</p> <p>Strategy: most recommended starting with local projects to demonstrate</p>	<p>Split 580 participants into eight groups to have facilitated discussions, each produced a series of recommendations that were then examined and assigned to categories by the authors</p> <p>May be applicable to UK, but not based on primary users and retrospective</p>

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				<p>potential benefits and to test out strategies of implementation</p> <p>Ongoing evaluation and use of national information for research purposes important</p>	
Yusof et al	2008	Imaging system in UK primary care	Review of evaluation methods for IT systems in healthcare, propose new evaluation framework and use model to evaluate introduction of imaging system in UK primary care setting, qualitative case study with formative evaluation, interviews with staff and patients, observations and documentary analysis	<p>Model includes organisational factors and fit between technology human and organisational factors</p> <p>Facilitators: willingness to learn most important, rest can be achieved with training, workload is an issue, leadership, existing IT infrastructure, alignment of system with organisational goals important, effective</p>	<p>Data was collected over a period of five months, 15 participants including clinicians/patients and other healthcare and IT staff, some collection of documents but not clear which ones</p> <p>Observations of clinical routines, meetings, discussions</p> <p>No detailed</p>

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				<p>communication, management support, attitude, organisational readiness</p> <p>Barriers: usability, response time, integration with work practices, time needs to be allocated for sufficient training, support, existing skills, communication</p> <p>Government policy can influence implementation</p>	<p>outline of methods, small sample</p>
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Appendix 3: Information sheets

Interview information sheet

I am a PhD student at the University of Edinburgh and would like to invite you to take part in my research. Please take time to read this information sheet before deciding whether to take part. This describes the goals of the study and what I will be asking you to do. This information sheet also indicates how I will collect, store and use the data collected. I appreciate you are busy and would like to thank you in advance for taking the time to read this leaflet and consider this request.

Purpose of the study

The way patient information in hospitals is stored is changing with the introduction of Lorenzo. The purpose of the study is to explore the experiences, attitudes and organisational consequences of implementation.

Why have I been chosen?

You have been chosen because you are a member of healthcare staff working at a setting that has introduced Lorenzo. I would like to investigate the acceptability of the new system and invite you to be interviewed in order to gain insights into your views/opinions and experiences surrounding Lorenzo.

Do I have to take part?

It is up to you whether you wish to take part in an interview. If you decide to take part you are still free to withdraw at any time and without giving a reason. If you do decide to take part you will need to complete the consent form and should also keep this information sheet.

What will happen if I decide to take part?

I would like to invite you to be interviewed a maximum of two times throughout the implementation period of Lorenzo (over approximately one year). However, if you prefer to be interviewed only once I will be very happy to arrange this. Interviews will take around 30 minutes each. For convenience, I will also give you the opportunity to conduct these interviews over the phone.

The interviews will be audio-taped, with your permission, and a written account of the interview will be produced for analysis purposes. This will have a unique participant number on it, but will not have your name or telephone number on it. All data obtained from the interviews will be used only for this study. You will be free to stop the interview at any time, should you wish and I will destroy the audiotape if you ask us to do so.

What are the possible disadvantages or risks of taking part?

Taking part in an interview will take up some of your time. There are no risks involved in participating.

What are the possible benefits of taking part?

The implementation of Lorenzo is a reality, with considerable time and resources devoted to its development. My PhD research aims at discovering how the system is received and adopted on the ground, and also to discover how best to support its use in hospitals. Your participation in this research will help me to assess how usable Lorenzo is, what the challenges associated with introducing it are, and help me to determine whether it meets your needs. I am planning to disseminate my findings through my professional connections with the NHS CFH Evaluation Programme and this will ultimately inform the implementation strategy of national electronic health records in England.

Will my participation in the research remain confidential?

Yes. Transcripts from the interviews will be anonymised, and anything you say during an interview will be confidential.

What will happen to the results of this research?

The results of this research will be written up in a thesis and may help to inform health policy on implementing electronic health records in hospitals. The results of this study will be published in relevant journals and presented at conferences. No individual participant or hospital will be identifiable in any of the published material.

Who is organising and funding this research?

The research is organised by the University of Edinburgh. My PhD is funded by the Medical Research Council.

What can I do if I have a complaint about the study?

If you have any concerns or questions about this study, please raise these with me. My supervisors are Professor Aziz Sheikh and Dr Allison Worth at the University of Edinburgh. They can also be contacted, should you have a complaint about my research.

Who do I contact for further information?

For further information about this study please contact me or my supervisors in the first instance:

Kathrin Cresswell (nee Beyer), PhD student, Centre for Population Health Sciences, The University of Edinburgh, Room 115, Medical School, Teviot Place, Edinburgh, EH8 9AG. Tel: (0131) 650 9241, email: Kathrin.Beyer@ed.ac.uk

Contact details of my first PhD supervisor: Professor Aziz Sheikh, Centre for Population Health Sciences, The University of Edinburgh, Medical School, Teviot Place,

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Edinburgh, EH8 9AG. Tel: 0131 651 4151; Fax: 0131 650 9119; email: aziz.sheikh@ed.ac.uk

Contact details of my second PhD supervisor: Dr Allison Worth, Centre for Population Health Sciences, The University of Edinburgh, Medical School, Teviot Place, Edinburgh, EH8 9AG. Tel: 0131 650 9463; Fax: 0131 650 9119; email: Allison.Worth@ed.ac.uk

If you wish to contact an independent person, please contact:

Dr Ann Robertson, Centre for Population Health Sciences, The University of Edinburgh, Medical School, Teviot Place, Edinburgh, EH8 9AG. Tel: 0131 650 9459; Fax: 0131 650 9119; email: A.R.R.Robertson@ed.ac.uk

Thank you for taking the time to read this information sheet and for considering this request.

Observation information sheet

I am a PhD student at the University of Edinburgh and would like to invite you to take part in my research. Please take time to read this information sheet before deciding whether to take part. This describes the goals of the study and what I will be asking you to do. This information sheet also indicates how I will collect, store and use the data collected. I appreciate you are busy and would like to thank you in advance for taking the time to read this leaflet and consider this request.

Purpose of the study

The way patient information in hospitals is stored is changing with the introduction of the NHS Care Records Service (NHS CRS). The purpose of the study is to explore the adoption of Lorenzo among healthcare professionals and its integration with existing work practices.

Why have I been chosen?

You have been chosen because you are a healthcare professional working at a setting that has introduced Lorenzo.

Do I have to take part?

It is up to you whether you wish to take part. If you decide to take part you are still free to withdraw at any time and without giving a reason. If you do decide to take part you will need to complete the consent form and should also keep this information sheet.

What will happen if I decide to take part?

I wish to observe the setting you are working in for a total of 15 hours (over a period of three to four days). My focus will be on how Lorenzo (or components of it) is used and

in particular how healthcare professionals are working with it. I also want to explore any problems that may arise during use (e.g. how it facilitates or inhibits your work).

During my observations, I will watch Lorenzo related activities and will make notes. These notes will later be typed up and used for analysis. I will aim at observing as unobtrusively as possible in order not to interfere with your care activities and do have experience of conducting observations at busy hospital wards.

What are the possible risks of taking part?

Taking part in this research does not carry any risks.

What are the possible benefits of taking part?

The implementation of Lorenzo is a reality, with considerable time and resources devoted to its development. My PhD research aims at discovering how the system is received and adopted on the ground, and also to discover how best to support its use in hospitals. Your participation in this research will help me to assess how usable Lorenzo is, what the challenges associated with introducing it are, and help me to determine whether it meets your needs. I am planning to disseminate my findings through my professional connections with the NHS CFH Evaluation Programme and this will ultimately inform the implementation strategy of national electronic health records in England.

Will my participation in the study remain confidential?

Yes. Notes from the observations will be anonymised, and anything you say during the observation will be confidential.

What will happen to the results of this research?

The results of this research will be written up in a thesis and may help to inform health policy on implementing electronic health records in hospitals. The results of this study will be published in relevant journals and presented at conferences. No individual participant or hospital will be identifiable in any of the published material.

Who is organising and funding this research?

The research is organised by the University of Edinburgh. My PhD is funded by the Medical Research Council.

What can I do if I have a complaint about the study?

If you have any concerns or questions about this study, please raise these with me. My supervisors are Professor Aziz Sheikh and Dr Allison Worth at the University of Edinburgh. They can also be contacted, should you have a complaint about my research.

Who do I contact for further information?

For further information about this study please contact me or my supervisors in the first instance:

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Kathrin Cresswell (nee Beyer), PhD student, Centre for Population Health Sciences, The University of Edinburgh, Room 115, Medical School, Teviot Place, Edinburgh, EH8 9AG. Tel: (0131) 650 9241, email: Kathrin.Beyer@ed.ac.uk

Contact details of my first PhD supervisor: Professor Aziz Sheikh, Centre for Population Health Sciences, The University of Edinburgh, Medical School, Teviot Place, Edinburgh, EH8 9AG. Tel: 0131 651 4151; Fax: 0131 650 9119; email: aziz.sheikh@ed.ac.uk

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If you wish to contact an independent person, please contact:

Dr Ann Robertson, Centre for Population Health Sciences, The University of Edinburgh, Medical School, Teviot Place, Edinburgh, EH8 9AG. Tel: 0131 650 9459; Fax: 0131 650 9119; email: A.R.R.Robertson@ed.ac.uk

Thank you for taking the time to read this information sheet and for considering this request.

Brief information sheet for patients, visitors and other staff (non-healthcare e.g. cleaners)

I am a PhD student at the University of Edinburgh and would like to let you know you about some research that is happening in this hospital. I am observing healthcare staff as they use computers in their work. Permission to undertake this work has been granted by the Chief Executive at this hospital.

Why is the research being done?

The way hospitals store notes about you and your care is changing with the introduction of a computer system called the NHS Care Records Service (NHS CRS). This is an electronic system that can hold information about patients such as test results, notes from consultations and hospital stays, x-rays and medications you are taking. At the moment a lot of this information is stored either on local computer systems in individual hospitals or on paper records. This makes sharing between different settings (such as between different hospitals) very difficult. The introduction of the NHS CRS means that patient records, which hold information about patients, will soon be electronic and centrally stored. This should make access and sharing of information between different care settings easier. For example, if you (as a patient) are admitted to a hospital that you have never been to before, doctors will be able to check your electronic records for any allergies to drugs (such as for example penicillin) and any existing illnesses that may

affect the way you need to be treated. I am investigating how this new system is included into the day-to-day work of healthcare staff.

What will this research mean for you?

I will be based on the here for either half or a whole day. I will watch how healthcare staff uses the new computer system and I will make notes about their behaviour. If I am watching your care or related activities, I will ask for your permission (verbally) at the time. You are free to refuse, without giving a reason. Any information that I collect while observing will be related to healthcare workers only – I will not take notes of any personal information relating to you as a patient, visitor or member of other staff working in this setting.

What will happen if you don't want to be observed?

If you do not want to be involved in this study at all please either tell the doctor, nurse or the reception staff. Alternatively you may tell me directly if you wish. Your decision will be treated with respect and entirely without prejudice and no notes will be made about you or your care as part of this study.

Who can you contact for further information?

For further information about this study please contact me or my supervisors in the first instance:

Kathrin Cresswell (nee Beyer), PhD student, Centre for Population Health Sciences, The University of Edinburgh, Room 115, Medical School, Teviot Place, Edinburgh, EH8 9AG. Tel: (0131) 650 9241, email: Kathrin.Beyer@ed.ac.uk

Contact details of my first PhD supervisor: Professor Aziz Sheikh, Centre for Population Health Sciences, The University of Edinburgh, Medical School, Teviot Place, Edinburgh, EH8 9AG. Tel: 0131 651 4151; Fax: 0131 650 9119; email: aziz.sheikh@ed.ac.uk

Contact details of my second PhD supervisor: Dr Allison Worth, Centre for Population Health Sciences, The University of Edinburgh, Medical School, Teviot Place, Edinburgh, EH8 9AG. Tel: 0131 650 9463; Fax: 0131 650 9119; email: Allison.Worth@ed.ac.uk

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Dr Ann Robertson, Centre for Population Health Sciences, The University of Edinburgh, Medical School, Teviot Place, Edinburgh, EH8 9AG. Tel: 0131 650 9459; Fax: 0131 650 9119; email: A.R.R.Robertson@ed.ac.uk

Thank you for taking the time to read this information.

Appendix 4: Consent forms

Interview consent form

Please tick all the boxes if you agree with the statement. If you don't feel able to tick all the boxes, or if you change your mind at any point, I will not include you in the research.

	Tick
I have read the information sheet and asked any questions I want, which were answered to my satisfaction (Please note that the information sheet gives the names of people you can contact to discuss the study)	
I have been informed of the objectives of the study, my role within it, and the tasks I am expected to undertake	
I understand that I will be participating in a study to investigate my perceptions and experiences of Lorenzo	
I understand that I am free to withdraw from the study at any time and without giving a reason for withdrawing	
I have been reassured that the procedures adopted by the researcher to ensure my anonymity as a participant will be maintained	
I understand that the researcher will agree to erase my contribution to the audiotape of the interview should I request this	
I have been provided with the contact details of the research team and have details of the complaints procedure that I can use if I wish to	
I am happy to be quoted (for example, when the research is published) so long as my name isn't mentioned. <i>[if not happy to be quoted, leave blank]</i>	
I agree to participate in the study	

Name of participant (capitals):

Signed: Date:

I would prefer a face-to-face/telephone interview *[please delete as appropriate]*

I agree to be contacted again for a follow-up interview (please tick)

Observation consent form

Please tick all the boxes if you agree with the statement. If you don't feel able to tick all the boxes, or if you change your mind at any point, I will not include you in the research.

	Tick
I have read the information sheet and asked any questions I want, which were answered to my satisfaction (Please note that the information sheet gives the names of people you can contact to discuss the study)	
I have been informed of the objectives of the study, my role within it, and the tasks I am expected to undertake	
I understand that I will be participating in a study to investigate the adoption of Lorenzo and its integration into work practices	
I understand that I do not have to take part. If I do take part I may withdraw at any time, without giving a reason and without affecting me in any way.	
I understand that a researcher will observe everyday working practice in the setting I work in. I understand that the researcher may make notes during the observation period which will be anonymised and typed up. I give permission for the researchers to have access to this information for analysis. I agree to be observed.	
I understand that my taking part in the study and the content of the observation will be kept confidential and data resulting from the observation will be anonymised.	
I understand that the researcher will agree to erase any notes about me, should I request this.	
I have been provided with the contact details of the researcher and have details of the complaints procedure that I can use if I wish to.	
I am happy to be quoted (for example, when the research is published) so long as my name isn't mentioned. <i>[if not happy to be quoted, leave blank]</i>	
I agree to participate in the study.	

Name of participant (capitals):

Signed:Date:

Appendix 5: Ethical, research and development approval

Approval letter from research ethics committee

East London and the City Research Ethics Committee 1

Room 24, 2nd Floor
Burdett House
Mile End Hospital
Bancroft Road
London
E1 4DG

Telephone: 020 8223 8602

Mrs Kathrin Cresswell (nee Beyer)
Centre for Population Health Science
The University of Edinburgh
20 West Richmond Street
EH8 9DX

02 April 2009

Dear Mrs Cresswell (nee Beyer)

Full title of study:	The NHS Care Records Service (NHS CRS) - Exploring the healthcare professional adoption and integration into work practices
REC reference number:	09/H0703/24

Thank you for your letter of 27 March 2009, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

The Committee has designated this study as exempt from site-specific assessment (SSA). The favourable opinion for the study applies to all sites involved in the research. There is no requirement for other Local Research Ethics Committees to be informed or SSA to be carried out at each site.

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Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission at NHS sites (“R&D approval”) should be obtained from the relevant care organisation(s) in accordance with NHS research governance arrangements. Guidance on applying for NHS permission is available in the Integrated Research Application System or at <http://www.rdforum.nhs.uk>.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

<i>Document</i>	<i>Version</i>	<i>Date</i>
Letter from Sponsor		29 January 2009
Covering Letter		04 February 2009
Protocol	2	02 February 2009
Application	5	
Brief Information Sheet for Patients, Visitors and other Staff (non-healthcare e.g. cleaners)	2	02 February 2009
Applicant's checklist		02 February 2009
CV - Prof Aziz Sheikh		
Participant Consent Form: Healthcare Staff Observation Consent Form		02 February 2009
Participant Information Sheet: In-depth Information Sheet for Healthcare Staff	2	02 February 2009
Investigator CV		
Observation Recording Sheet		
Peer Review - Dr B Williams		27 March 2009
Research Proposal	3	27 March 2009
Response to Request for Further Information		27 March 2009
Peer Review - Prof Aziz Sheikh		13 February 2009

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Now that you have completed the application process please visit the National Research Ethics Website > After Review

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

The attached document “After ethical review –guidance for researchers” gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

We would also like to inform you that we consult regularly with stakeholders to improve our service. If you would like to join our Reference Group please email referencegroup@nres.npsa.nhs.uk.

09/H0703/24	Please quote this number on all correspondence
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With the Committee’s best wishes for the success of this project

Yours sincerely

Chairman
East London and The City Research Ethics Committee 1

Enclosures:	“After ethical review – guidance for researchers”
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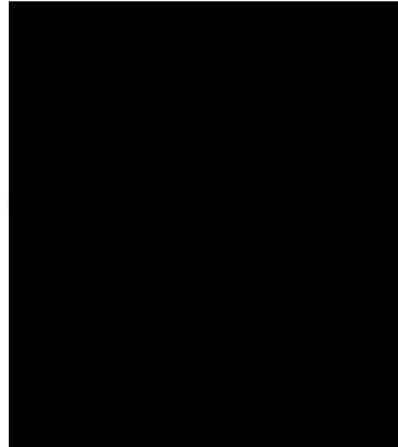
Copy to:	Mrs Elspeth Currie
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Research and development approvals at case study sites



Mrs Kathrin Cresswell
 The University of Edinburgh
 Community Health Sciences: GP
 University of Edinburgh
 20 West Richmond Street
 EH8 9DX

10 December 2009



LETTER OF NHS RESEARCH MANAGEMENT AND GOVERNANCE (RM&G) PERMISSION

NHS RM&G Permission has been granted by the BBC CLRN RM&G Consortium Office on behalf of the BBC CLRN RM&G Consortium Trusts. The Chief Investigator named in this letter has permission to undertake the following research activity in the NHS Trust(s) identified below.

Chief Investigator Name: Mrs Kathrin Cresswell (nee Beyer)

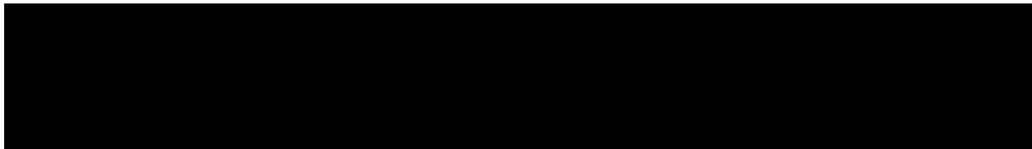
Date of Issue: 10-12-2009

Project Title:	The NHS Care Record Service (NHS CRS) Exploring the healthcare professional adoption and integration into work practices		
Consortium RM&G Ref ID:	1302	UKCRN ID: 6913	IRAS Code: 14067
Start/End Dates:	Start Date: 10-12-2009	End date: 30-12-2010	
Chief Investigator:	Mrs Kathrin Cresswell		
Chief Investigator Employer:	University of Edinburgh		
Funding & Funding amount:	MRC Clinical Sciences Centre, Faculty of Medicine PhD studentship - £42,720		
Sponsor:	University of Edinburgh		
Trust Registered:	Principal Investigator	Research Site	
Community Health NHS Trust	Mrs Kathrin Cresswell	Podiatry Clinic	
Trust Service/Directorate:	Adults and Communities Division		
Letter of Access (LoA) / Honorary Research Contract (HRC) Issued:	NO		Total: 00
To Be Issued to:	NHS Trust:	Date of Issue:	
Kathrin Cresswell	Community Health NHS Trust	NOT ISSUED	
<i>Researcher(s) must abide by the RM&G Arrangements as described by the NHS Manager / Local Research Manager within their LoA / HRC</i>			

Thank you for informing the BBC CLRN RM&G Consortium of the above research.

Confirmation of RM&G Permission

On behalf of the BBC CLRN RM&G Consortium, I am pleased to confirm RM&G Permission has been granted for the Consortium Trust(s) and Research Site(s)



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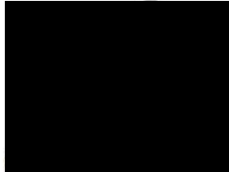
Conditions of RM&G Permission

This permission is given provided that you comply with the conditions as set out in the attached. You are advised to study the conditions carefully.

If you require any further assistance, please call the CLRN RM&G Consortium Office stating your **RM&G Reference Number 1302**.

We wish you success on completing your research.

Yours Sincerely,



CLRN RM&G Operational Manager (Consortium)
[Redacted] CLRN RM&G Consortium

Documents Enclosed:

- (1) RM&G Permission Letter
- (2) Standard Conditions of RM&G Permission for the [Redacted] CLRN RM&G Consortium & RM&G Reporting Form for Research Incidents

Scanned copy of Documents sent to:

Mrs Kathrin Cresswell - Chief Investigator

Mrs Elspeth Currie – Sponsor's Representative, Edinburgh Clinical Trials Unit

Prof Aziz Sheikh – Academic Supervisor

[Redacted] – R&D Lead for [Redacted] Community Health NHS Trust [Redacted]

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Our Ref: ID 161

Mrs K Creswell (nee Beyer)
Centre for Population Health Science
The University of Edinburgh
20 West Richmond Street
EH8 9DX

16 July 2010

Information for ID Badge if required:

Research Project Ref No:

Expiry Date: 28/02/2011

You must take this letter with you.

Dear Kathrin

Re: Research Governance Decision Letter

Project Reference: ID 161 CSP 14067

Project Title: The NHS Care Record Service (NHS CRS) – Exploring the healthcare professional adoption and integration into work practices.

I would like to thank you for attending the meeting held on 6 July 2010 and further to your request for research governance approval, we are pleased to inform you that this Trust has approved the study. Please note when contacting the R&D office about your study you must always provide the project reference numbers provided above.

Trust R&D approval covers all locations within the Trust, however, you should ensure you have liaised with and obtained the agreement of individual service/ward managers before commencing your research.

Please take the time to read the attached 'Information for Researchers – Conditions of Research Governance Approval' leaflet, which give the conditions that apply when research governance approval has been granted. Please contact the R&D Office should you require any further information. You may need this letter as proof of your approval.

We would like to point out that hosting research studies incurs costs for the Trust such as: staff time, usage of rooms, arrangements for governance of research. We

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can confirm that in this instance we will not charge for these. However we would like to remind you that Trust costs should be considered and costed at the earliest stage in the development of any future proposals.

May I wish you every success with your research.

Yours sincerely

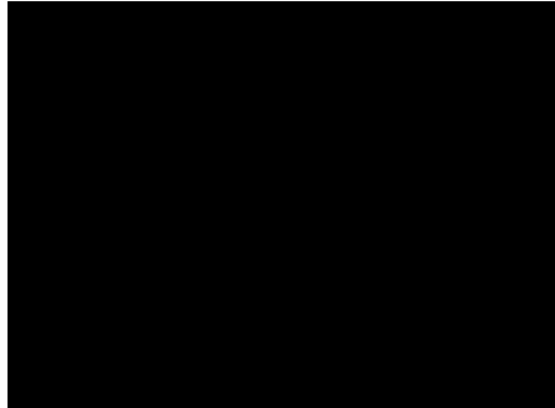


Head of Research & Audit

cc : Research Governance Sponsor
Employing Organisation
Principal Investigator (if applicable)

Enc: Approval Conditions Leaflet
Induction & ID Badge Information, TrustTECH Leaflet

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Mrs Kathrin Cresswell
Community Health Sciences:GP
The University of Edinburgh
20 West Richmond Street
EH8 9DX

20 October 2009

Dear Mrs Cresswell

Letter of access for study: NHS Care Record Service (NHS CRS) – Exploring the healthcare professional adoption and integration into work practices.

This letter confirms your right of access to conduct research through University Hospitals of [REDACTED] NHS Trust [REDACTED] for the purpose and on the terms and conditions set out below. This right of access commences on 2 November 2009 and ends on 1 November 2010 unless terminated earlier in accordance with the clauses below.

You have a right of access to conduct such research as confirmed in writing in the letter of permission for research from this NHS organisation. Please note that you cannot start the research until the Principal Investigator for the research project has received a letter from us giving permission to conduct the project.

The information supplied about your role in research at [REDACTED] has been reviewed and you do not require an honorary research contract with this NHS organisation. We are satisfied that such pre-engagement checks as we consider necessary have been carried out.

You are considered to be a legal visitor to [REDACTED] premises. You are not entitled to any form of payment or access to other benefits provided by this NHS organisation to employees and this letter does not give rise to any other relationship between you and this NHS organisation, in particular that of an employee.

While undertaking research through [REDACTED], you will remain accountable to the trust with which you hold an honorary contract, NHS Lothian – University Hospitals Division, but you are required to follow the reasonable instructions of [REDACTED], Head of Research and Development in this NHS organisation or those given on her behalf in relation to the terms of this right of access.

Where any third party claim is made, whether or not legal proceedings are issued, arising out of or in connection with your right of access, you are required to co-operate fully with any

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investigation by this NHS organisation in connection with any such claim and to give all such assistance as may reasonably be required regarding the conduct of any legal proceedings.

You must act in accordance with [REDACTED] policies and procedures, which are available to you upon request, and the Research Governance Framework.

You are required to co-operate with [REDACTED] in discharging its duties under the Health and Safety at Work etc Act 1974 and other health and safety legislation and to take reasonable care for the health and safety of yourself and others while on [REDACTED] premises. You must observe the same standards of care and propriety in dealing with patients, staff, visitors, equipment and premises as is expected of any other contract holder and you must act appropriately, responsibly and professionally at all times.

You are required to ensure that all information regarding patients or staff remains secure and *strictly confidential* at all times. You must ensure that you understand and comply with the requirements of the NHS Confidentiality Code of Practice (<http://www.dh.gov.uk/assetRoot/04/06/92/54/04069254.pdf>) and the Data Protection Act 1998. Furthermore you should be aware that under the Act, unauthorised disclosure of information is an offence and such disclosures may lead to prosecution.

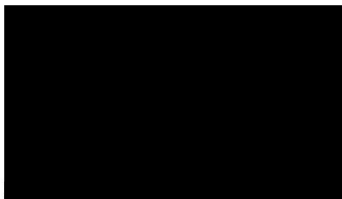
You should ensure that, where you are issued with an identity or security card, a bleep number, email or library account, keys or protective clothing, these are returned upon termination of this arrangement. Please also ensure that while on the premises you wear your ID badge at all times, or are able to prove your identity if challenged. Please note that this NHS organisation accepts no responsibility for damage to or loss of personal property.

We may terminate your right to attend at any time either by giving seven days written notice to you or immediately without any notice if you are in breach of any of the terms or conditions described in this letter or if you commit any act that we reasonably consider to amount to serious misconduct or to be disruptive and/or prejudicial to the interests and/or business of this NHS organisation or if you are convicted of any criminal offence. Your substantive employer is responsible for your conduct during this research project and may in the circumstances described above instigate disciplinary action against you.

[REDACTED] will not indemnify you against any liability incurred as a result of any breach of confidentiality or breach of the Data Protection Act 1998. Any breach of the Data Protection Act 1998 may result in legal action against you and/or your substantive employer.

If your current role or involvement in research changes you must inform your employer through their normal procedures. You must also inform your nominated manager in this NHS organisation.

Yours sincerely



Head of Research and Development
University Hospitals [REDACTED]

cc: HR department [REDACTED]

Appendices



Our ref: TH/SFRC413

15 October 2009

Mrs Kathrin Cresswell
Centre for Population Health Science
The University of Edinburgh
20 West Richmond Street
EH8 9DX

Dear Mrs Cresswell

Project Title: The NHS Care Record Service (NHS CRS) – Exploring the healthcare professional adoption and integration into work practices.

REC Reference Number: 09/H0703/24


Trust Reference Number: SFRC413

This project has been reviewed and approved by the trust's research approval committee and relevant Ethics Committee.

I therefore write to confirm permission for the project to take place as described in your application.

Conditions of approval:

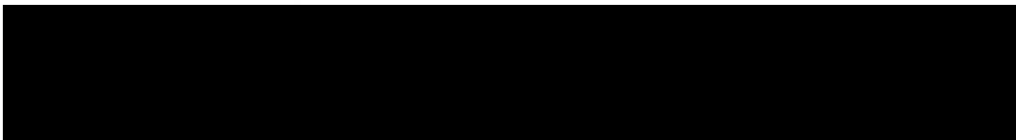
- All researchers involved in clinical trials must have up to date GCP training.
- You must provide the trust with a copy of the annual ethics update on the progress of the study.
- Please note that the trust audits 10% of all projects it approves on an annual basis. If your project is selected the trust expects your cooperation.
- Please note that should an adverse event or complaint arise from this research, the research & development department should be informed.
- The project is subject to the Research Governance Framework for Health and Social Care (DoH 2005).

If you need further assistance, please do not hesitate to contact the Research and Development Department Contact: 

Yours sincerely


Chief Executive

Copy to: Research and Development Department, 



Appendix 6: Interview guide

QUESTIONS ABOUT NHS CRS IN GENERAL

1. How have you heard about the NHS CRS and how do you feel about its introduction into secondary care?
2. Have you been in contact with any parts of the NHS CRS Programme? In what capacity?
3. Do you believe that the NHS CRS is an appropriate goal for the NHS?
4. What are your views on the national implementation strategy?
5. What do you believe would most help to speed up the roll-out of the NHS CRS nationwide (facilitators and barriers)?

QUESTIONS ABOUT USING LORENZO

6. Can you tell me what you use Lorenzo for and how it contributes to patient care?
7. What were your expectations before Lorenzo was put into use and were they fulfilled?
8. What are your overall views on the way the implementation of Lorenzo has been managed in this setting? (Probe: is it being rushed, or too drawn out? Do you receive enough information, too much, too little? Is the day-to-day support adequate and appropriate?)
9. How disruptive is the associated organisational change, for example in terms of learning new routines, new staff recruited, and needing to familiarise yourself with new practices?
10. Has your behaviour/practice changed as a result of the introduction of Lorenzo? If so, in what way? Are there any unexpected changes to how you do things now?
11. How are your professional interests as a [doctor/nurse/whatever] represented/supported in Lorenzo (i.e. does it mainly support or focus on one profession versus any other)?
12. Do you see Lorenzo influencing your working style as part of a team or as a professional? (Prompt: e.g. in the way you communicate and collaborate with other health professionals and communicate with patients)?
13. From your perspective, how does the introduction of Lorenzo affect patient care (e.g. in relation to efficiency, safety and convenience)?
14. Can you tell me what, if any, might be the main benefits to you in your role from using Lorenzo? Do you see these benefits now? Are there any clear drawbacks in performing your role?
15. What are, or will be, the hospital wide benefits (i.e. beyond your role and your work)?
16. Do you have any concerns about the introduction of Lorenzo? Can you tell me what these are?
17. Are there any tasks or aspects of care that you feel will become more difficult or worse with the introduction of Lorenzo?

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18. Are there any changes that you would like to see made in how Lorenzo works? How could it be improved to be more acceptable and more effective in supporting care?
19. What, if anything, would you miss most about Lorenzo if it were withdrawn?
20. Are there any benefits you do not see now, but would expect in the future from using Lorenzo?
21. How much time have you spent/or do you expect to spend learning about using Lorenzo? If you have received any training could you tell me what type this has been and how useful or relevant you have found it?
22. Did you have any problems when you first started using the system? How were these resolved?
23. Do you have sufficient skills now to use Lorenzo to the maximum benefit?
24. In what ways do you think Lorenzo will be/is a) better and b) worse than the system(s) it replaces? Why? (Probe for how did the 'old' one look – paper or mix of paper and electronic)?
25. How do you feel about the soft-landing (gradual introduction) of Lorenzo – is this approach appropriate?
26. How could Lorenzo and the implementation approaches being used in this hospital be improved to be more acceptable to you and/or more effective in supporting care delivery?
27. Are there any other comments you would like to make?

In order to make the interview guide more user friendly (for both me and the interviewee), I experimented with drafting a loose structure interview card. Although the aim was to conduct interviews without looking at paper (to keep the natural communication flow), I took these loose structures to the interview with me as a backup. The following table outlines a loose structure card based on the topic guide above:

Main structure	Specific topics and issues
Confidentiality, aims, thanks	Commercial sensitivity of topic, recorded
Any questions?	
About yourself	Role, involvement, do you use the system (how, what aspect?)
Views about the NHS CRS/Lorenzo	
Views about the implementation and management of the project	Main challenges? Adequately addressed? Soft-landing appropriate?
Any problems in the use/implementation of the system	Main concerns?
Training	How useful was it? What could have been done better?
Key stakeholders and how they have been communicating and collaborating	LSP, SHA, Trusts, NHS CFH, and DH
Influence of Lorenzo on your work	Have new tasks and practices been added?

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practices (activities that you do on your daily basis) How do you feel about changes?	Have old practices and tasks been eliminated?
Any changes in your attitudes over time and why?	
Any changes in the way in which you communicate and work with others	Colleagues Patients/carers Superiors/inferiors
Impact of Lorenzo on hospital, healthcare, society	
Would you consider the project to be a success?	Why (not)?
If given the autonomy what would you do differently?	In Trust and Programme in general
Any benefits you do not see now, but would expect in the future from using Lorenzo?	
Anything else?	
Thanks, any questions?	

At T2 interviews, the topic guide had changed slightly and included the following questions:

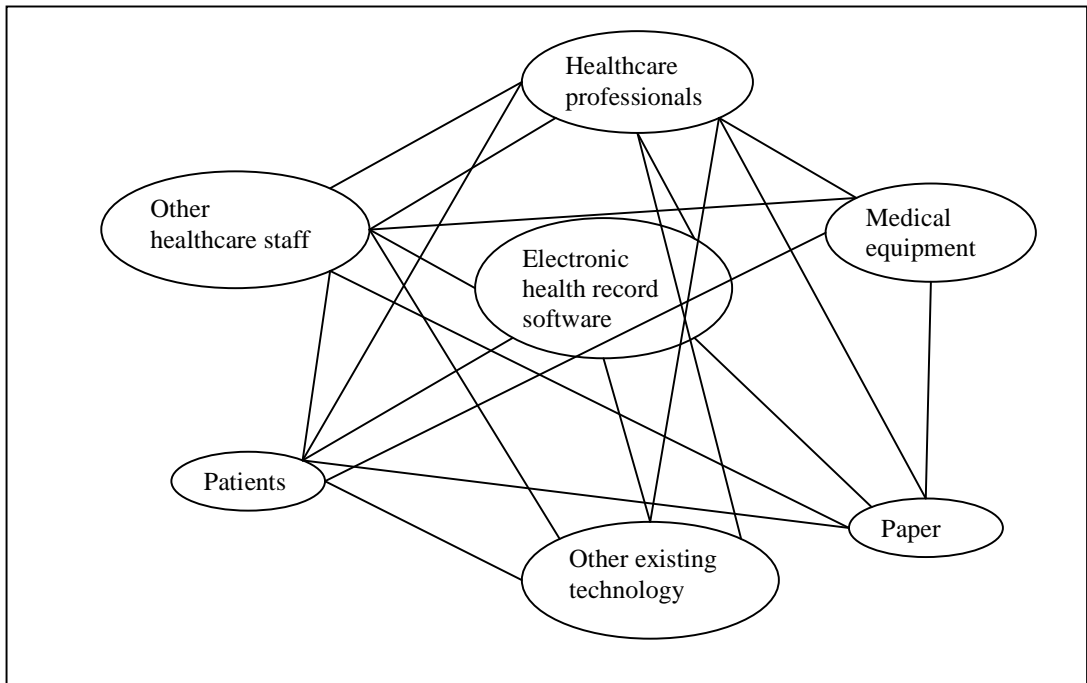
Main structure	Specific topics and issues
Confidentiality, aims, thanks	Commercial sensitivity of topic, recorded
Any questions?	
What has changed since the last time we spoke?	Increased functionality? Benefits?
Remind of and discuss key issues discussed at last interview	
Views about the implementation and management of the project	Have these changed over time, why/why not?
Views on the system	Has anything changed? Why/why not?
Views on the general governmental strategy	
Retrospective reflections	What are the three main lessons learned? Recommendations for improvement and suggestions on how to take it from here
Anything else?	
Thanks, any questions?	

Appendix 7: Observation recording sheet

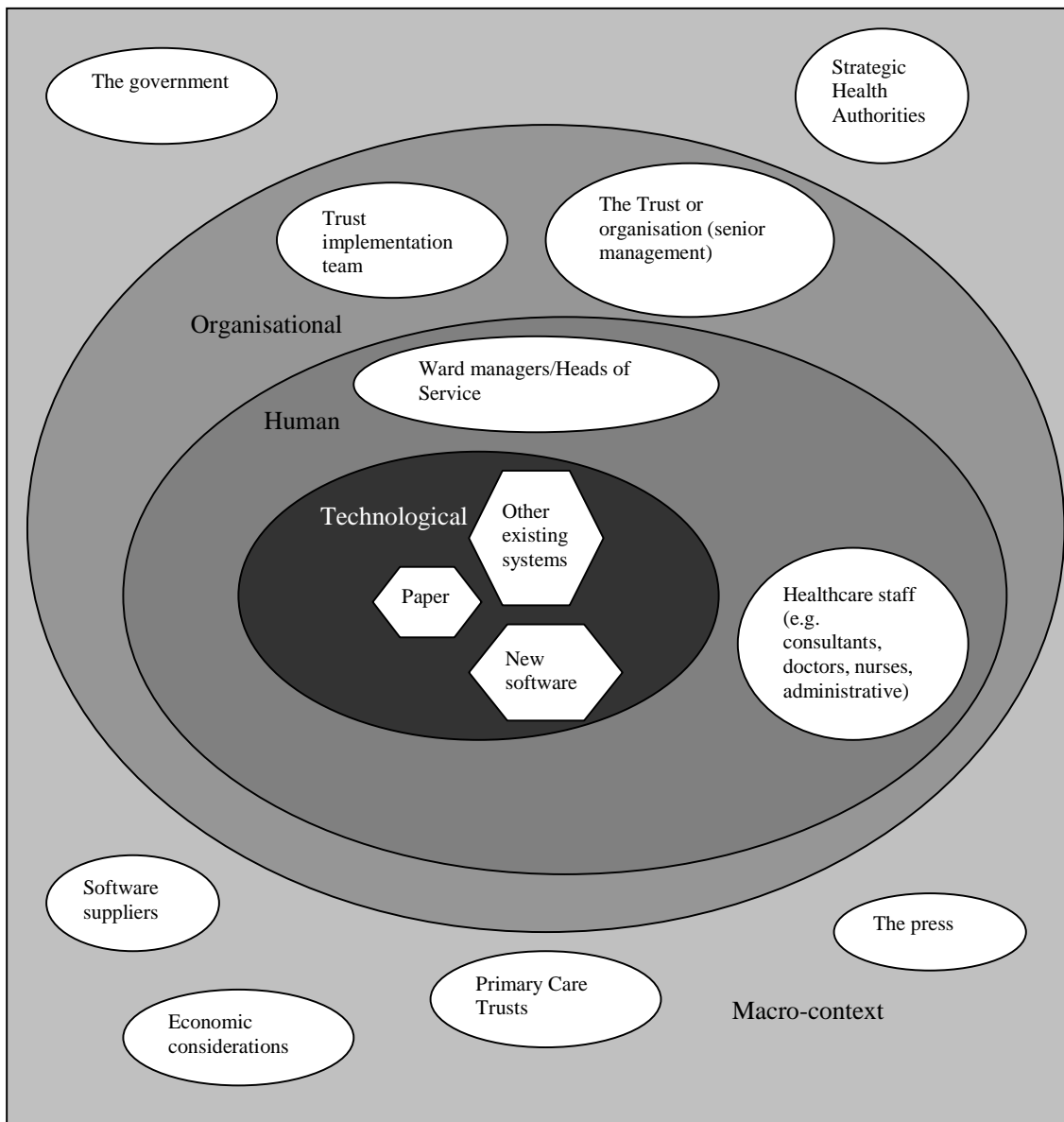
During observations, I recorded descriptive elements including the following:

- Description of the setting – layout: positioning of computers, beds etc.
- Description of the actors – the roles of individuals (I will not record names but focus on roles)
- Activities – focus on healthcare professionals and what they were doing during the observation (with a focus on activities surrounding the use of computers), if they referred to particular activities in interviews I explored these further (if applicable), if they felt something was particularly important I explored this in detail in follow-up observations (if applicable)
- Events – recording of particular events e.g. speaking to a patient, recording information, speaking to other healthcare professionals
- Time – recording the sequence of events
- Goals – recording what the actors wanted to accomplish
- Feelings – my own impressions/feelings in relation to the observation

Appendix 8: Mapping relationships



Appendices



Appendix 9: Contributions to science

Throughout my work, I published a range of outputs, which have been peer-reviewed. These were based on respective parts of this thesis and included the following (full versions of selected papers are appended):

- Literature review
 - Car J, Black A, Anandan C, **Cresswell K**, Majeed A, McKinstry B, Pagliari C, Procter R, Sheikh A (2008). The impact of e-Health on the quality & safety of healthcare. A systematic overview & synthesis of the literature, May 2011. Available from: http://www.haps.bham.ac.uk/publichealth/cfhcp/001_Extension.shtml (*In collaboration with my supervisor Professor Aziz Sheikh, I wrote chapter 14: Case study: design, implementation and adoption of the NHS Care Record Service in secondary care*)
 - Black AD, Car J, Pagliari C, Anandan C, **Cresswell K**, et al. The Impact of eHealth on the Quality and Safety of Health Care: A Systematic Overview. *PLoS Medicine* 2011; 8(1).
 - **Cresswell K**, Sheikh A. The NHS Care Record Service: recommendations from the literature on successful implementation and adoption. *Informatics in Primary Care* 2009; 17: pp.153-60.
 - Sheikh A, McLean S, **Cresswell K**, Pagliari C, Pappas Y, Car J, Black A, Hemmi A, Nurmatov U, Mukherjee M, Anandan C, McKinstry B, Procter R, Majeed A (2011). The Impact of eHealth on the Quality and Safety of Healthcare. An updated systematic overview & synthesis of the literature. *In collaboration with my supervisor Professor Aziz Sheikh, I wrote Chapter 18: Case study: Lessons in relation to the design, implementation and adoption of the NHS Care Record Service in secondary care. I also contributed to Chapter 17: Importance of organisational issues in the implementation and adoption of eHealth innovations.*
 - Morrison Z, Robertson A, **Cresswell K**, Crowe S, Sheikh A. Understanding contrasting approaches to nationwide implementations of electronic health record systems: England, the USA and Australia. *Journal of Healthcare Engineering* 2011; 2(1):25–41.
- Methodology
 - **Cresswell K**, Worth A, Sheikh A. Actor-Network Theory and its role in understanding the implementation of information technology developments in healthcare. *BMC Medical Informatics and Decision Making* 2010; 10:67. [The Royal Australian College of General Practitioners and has drawn on this article to inform the Australian e-health environment and the government's implementation of the personally controlled electronic health record]
 - **Cresswell K**, Worth A, Sheikh A. Implementing and Adopting Electronic Health Record Systems: how Actor Network Theory can support a robust

evaluation study (in press). *Clinical Governance: an International Journal* 2011.

- Crowe S, **Cresswell K**, Robertson A, Huby G, Avery A, Sheikh A. The Case Study Approach. *BMC Medical Research Methodology* 2011; 11:100.
- Results
 - Robertson A, **Cresswell K**, Takian A, Petrakaki D, Crowe S, Cornford T, Barber N, Avery A, Fernando B, Jacklin A, Prescott R, Klecun E, Paton J, Lichtner V, Quinn C, Ali M, Morrison Z, Jani Y, Waring J, Marsden K, Sheikh A. 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* 2010; 341.
 - **Cresswell K**, Worth A, Sheikh A. Comparative Case Study Investigating Sociotechnical Processes of Change from a National Electronic Health Record Implementation. Submitted to *PLoS ONE* 2011.
 - Robertson A, **Cresswell K**, Sheikh A (2011). Findings from an independent evaluation of England's national implementation of electronic health records in hospitals. Oral presentation at ARM in Seattle.
 - Morrison Z, **Cresswell K**, Marsden K, Fernando B, Sheikh A (2011). Utilising a Multi-Level Discourse-Based Theory of Organisational Change to Explore the Introduction of Electronic Health Records. The 27th EGOS Colloquium, 2011: Reassembling Organizations. Sub-theme 28: Translating Discourses: Text, Change and Organization.
 - **Cresswell K**, Ali M, Avery A, Barber N, Cornford T, Crowe S, Fernando B, Jacklin A, Jani Y, Klecun E, Lichtner V, Marsden K, Morrison Z, Paton J, Petrakaki D, Prescott R, Quinn C, Robertson A, Takian A, Voutsina K, Waring J, Sheikh A. The Long and Winding Road...An Independent Evaluation of the Implementation and Adoption of the National Health Service Care Records Service (NHS CRS) in Secondary Care in England, May 2011. Available from: <http://www.haps.bham.ac.uk/publichealth/cfhcp/005.shtml>
 - Sheikh A, Cornford T, Barber N, Avery A, Takian A, Lichtner V, Petrakaki D, Crowe S, Marsden K, Robertson A, Morrison Z, Klecun E, Prescott R, Quinn C, Jani Y, Ficociello M, Voutsina K, Paton J, Fernando B, Jacklin A, **Cresswell K**. Implementation and adoption of nationwide electronic health records in secondary care in England: final qualitative results from a prospective national evaluation in "early adopter" hospitals (in press). *British Medical Journal* 2011.
 - **Cresswell K**, Robertson A, Sheikh A. Lessons learned from England's national electronic health record implementation: implications for the international community. Short paper for oral presentation, IHI 2012. Miami, FL, USA.