

Reassembling Electronic Patient
Records after the National Programme
for IT: contested visions and multiple
enactments

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Abstract

This thesis is concerned with understanding how Electronic Patient Record systems (EPRs) are being problematised and enacted in NHS acute hospital Trusts following the dismantling of the National Programme for IT (NPfIT). The term EPR is widely used but has no uniform definition and has been applied to a wide range of systems. In policy, EPRs have often been envisaged as integrated, large-scale systems capable of transforming how healthcare is delivered. However, in practice such systems have proved difficult to achieve and many of the EPRs to be found in hospitals are much smaller standalone specialist departmental systems. Working with Actor-Network Theory (ANT), this thesis takes a sociotechnical approach in which differences in EPRs are understood as matters of ontology (variations in their enactment by multiple heterogeneous actors producing multiple, sometimes conflicting, realities) rather than matters of epistemology (differences in the interpretation of a single underlying reality).

A qualitative case study was undertaken of three EPR systems which have been, or were in the process of being, implemented at a single NHS secondary care Trust: the Somerset Cancer Register; Clinical Vision 5, a specialist renal system; and Alert an integrated, hospital-wide EPR. By working with ANT and using a research design which is not restricted to a single EPR or professional grouping, this thesis is able to make empirical and theoretical contributions to understanding how EPRs are problematised and enacted.

The empirical contribution is to identify five sites of controversy: the replacement of paper; the balance between audit and operational functionality; creating a single patient record; access to the record; and EPRs role in changing working practices. Threaded through these are two further sources of controversy: balancing the benefits EPRs can bring with the work required to realise them and the technical configuration of the EPRs themselves. At these sites different 'modes of ordering' are enrolled in negotiating outcomes. The key theoretical contribution is to take examples of EPRs as they are imagined, but not instantiated, and examples of instantiated IT systems, which contain patient data but are not necessarily considered to be EPRs, and consider where and how these objects overlap to create what I refer to as *EPR in effect*. I argue that the capacity of instantiated IT systems to produce EPR in effect depends on the practices through which EPR are imagined as well as the practices through which the instantiated IT systems are enacted.

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List of Acronyms

AHP – Allied Health Professional

ALG – Action Learning Group

ANT – Actor-Network Theory

ASP – Active Server Pages

BSUH – Brighton and Sussex University Hospitals NHS Trust

CAB – Change Advisory Board

CCL – Clinical Computing Ltd

CQUIN – Commissioning for Quality and Innovation

CV5 – Clinical Vision 5

DAHNO - Data for Head and Neck Oncology

DoH – Department of Health

EHR – Electronic Health Record

EPR – Electronic Patient Record

MDT – Multi-Disciplinary Team

NBOCAP -National Bowel Cancer Audit Programme

NPfIT – National Programme for IT

NOGCA - National Oesophago-Gastric Cancer Audit

PAS – Patient Administration System

RCT – Randomised Controlled Trial

RIXG - Renal Information Exchange Group

RPUG – Renal Patients Users Group

RPV – Renal Patient View

SCN – Sussex Cancer Network

SCR – Somerset Cancer Register

SKU – Sussex Kidney Unit

SRIP – Sussex Renal Innovation Programme

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Declaration

I declare that the research contained in this thesis, unless otherwise formally indicated within the text, is the original work of the author. The thesis has not been previously submitted to this or any other university for a degree, and does not incorporate any material already submitted for a degree.

Signed

Dated

1 Introduction

Despite the term EPR being widely used it has no uniform definition and has been applied to a wide range of systems. In policy, EPRs have often been envisaged as integrated, large-scale systems capable of transforming how healthcare is delivered. However, in practice such systems have proved difficult to achieve and many of the EPRs to be found in hospitals are much smaller standalone specialist departmental systems. This thesis takes a sociotechnical approach in which differences in EPRs are understood as matters of ontology (variations in their enactment by multiple heterogeneous actors producing multiple sometimes conflicting realities) rather than matters of epistemology (differences in the interpretation of a single underlying reality).

Fieldwork was conducted from March to December 2013, a period when NHS institutions had to adjust to significant changes which affect how EPR systems are envisioned and enacted. These included the announcement in 2011 of the dismantling of the National Programme for IT (NPFIT), which had dominated NHS IT policy since 2002 but had failed to deliver to hospital Trusts the new EPR systems they had been anticipating, and the abolition of the regional cancer networks in 2013 as part of the *Health and Social Care Act 2012*. The study contrasts two established standalone departmental EPR systems (one in cancer services and the other in renal services) and a third yet to be implement Trust-wide EPR system.

1.1 Topic and Significance

This thesis is concerned with understanding how Electronic Patient Records are problematised and enacted in NHS acute hospital Trusts. It is significant because despite historical evidence suggesting that the benefits often attributed to large-scale integrated generic EPRs by policy makers are very difficult to realise in practice, not least with the National Programme for IT, some Trusts in the UK are currently embarking on major new programmes aimed at implementing generic Trust-wide EPRs. It is argued here that to avoid repeating the difficulties experienced in the past which often resulted in these systems being labelled as failures, it is necessary to fundamentally rethink how EPRs are understood at an ontological level.

Despite repeat policy initiatives from the 1960s onwards which have aimed to get hospitals to replace their paper patient records with electronic ones, variously labelled electronic patient records and electronic health records¹, patient records in hospitals are still commonly held on paper (Keen, 2010; Takian and Cornford, 2012). The policy vision of large-scale integrated electronic records reached its

¹ These terms are often used interchangeably however a distinction is sometimes made (DoH 1998) in which Electronic Patient Record is used to describe the record of periodic episodes of care provided to a patient by one institution such as an acute hospital whereas Electronic Health Record is used to describe a longitudinal record of a patient's health and healthcare which combines information from multiple care providers.

zenith in the UK with the National Programme for IT which was launched in 2002 and ran for 9 years before its official dismantling was announced in 2011 (DoH 2011). The programme was said to be the largest civil IT programme in the world (Connecting for Health, 2005 cited in Currie and Finnegan, 2011). It was highly ambitious in scope and was intended to deliver a range of different information technologies of which electronic health records² were considered to be the 'Jewel in the Crown' (Sheikh et al., 2011). Together these technologies were envisioned as having the power to transform the delivery of healthcare, making it safer, more efficient, more patient-centred, and more accountable.

Whilst the NPfIT was on an altogether different scale to previous electronic record policy initiatives in the UK there is some continuity in terms of the way such systems had been envisioned prior to the NPfIT. In particular Keen (2010) writes that "it is possible to trace a growing commitment that it is possible and desirable to integrate all of a patient's personal data in single electronic health records" (2010: 139). In policy initiatives such as the Hospital Information Support Systems initiative 1988 and *Information for Health* (DoH, 1998), technological solutions for the integration of disparate sources of patient data were linked to potential benefits in terms of cost and efficiency savings and improved quality of care. A similar policy focus on the benefits of large-scale integrated electronic patient records can be seen in other countries such as Norway and Denmark. Fitzpatrick and Ellingsen (2012), in a paper which reviews 25 years of computer supported collaborative work research in the healthcare field note that "currently Western healthcare is moving towards large-scale integrated systems and new ways for delivery of healthcare services" (2012: 2).

In the UK there is another continuity between the NPfIT and previous policy initiatives aimed at the introduction of integrated EPRs in acute hospital Trusts. Jones (2004), in a review of electronic records in UK hospitals between 1988 and 2002, notes that with a few exceptions the ambitions of policy makers have largely remained unrealised and their initiatives branded expensive failures. Despite a total spend of some £6.4bn (DoH 2011³) on the NPfIT as a whole there was little to show in the way of electronic records as a result. As of December 2010 only 6 of 32 acute hospital Trusts in London, 9 of 40 acute hospital Trusts in the south of England and 3 acute hospital Trusts in the North/Midlands/East of England received their designated Care Records software and this was implemented with much less functionality than originally planned (Sheikh et al., 2011). The programme was severely criticised in the media and by the National Audit Office in 2008 (Keen, 2010). A period of hiatus followed before the acceleration of the dismantling of the programme was announced in 2011 (DoH, 2011) following a change of government and a review by the Cabinet Office's Major Projects Authority.

² The Programme called for two types of electronic records, a Summary Care Record and a Detailed Care Record.

³ Of this sum around two thirds was spent on the Spine, N3 Network, NHSmail, Choose and Book, Secondary Uses Service and Picture Archiving and Communication Service rather than the electronic records component of the programme however this partly reflects the nature of contracts in which some payments were not made until software had been implemented.

Much of the criticism of the NPfIT was focussed on its structure and conduct rather than the overall ambition of introducing electronic records. In particular there was criticism of the top down, one size fits all approach and policy of ruthless standardisation in which contracts were centrally negotiated with a handful of very large IT suppliers. An evaluation of the detailed care record component of the programme by Sheikh et al. (2011) found that contractual arrangements had excluded the Trusts themselves. This combined with a complex supply chain meant that the Trusts and their staff, who were intended as the ultimate users of the new systems, had little say in or control over what was happening, contributing to hospital staff becoming disengaged with the programme. The evaluation also identified tensions between standardisation; the top down, one size fits all approach and disregard for localisation resulting in a system which Sheikh et al. (2011) found:

...was often perceived by hospital staff to reflect developers' lack of understanding of their clinical processes, resulting in systems that were often seen as linear and homogeneous, and unable to fit to the actual complexities of clinical practice. (2011: 5)

The dismantling of the NPfIT signalled a change in approach to the delivery of electronic records systems to acute hospital Trusts, with the Department of Health announcing that "we need to move on from a top down approach and instead provide information systems driven by local decision-making" (DoH, 2011). This change has coincided with a number of other important changes of relevance to electronic patient record deployment in hospitals. Reforms to the way the NHS is organized as a result of the Health and Social Care Act (2012) have made hospital Trusts more independent removing a number of NHS bodies such as the Strategic Health Authorities, Primary Care Trusts and the regional cancer networks which played a role in co-ordinating the provision of services across multiple Trusts. The global financial crisis of 2008, followed by the election of a government committed to a programme of austerity, has also meant that the financial climate in which NHS informatics has to operate is very different to that when the NPfIT was started in 2002. One of the motivating factors which lead to the initiation of the NPfIT was a belief that the NHS as a whole did not spend enough of its budget on IT (Keen, 2010). The programme therefore was partly perceived as a means of ensuring that extra money was spent on IT.

Despite these changes, commitment to electronic patient record systems has remained strong in a number of acute hospital Trusts. Keen (2010) notes how, even before the announcement of the dismantling of the NPfIT, many Trusts which had initially waited for the promised NPfIT solutions had begun to pursue their own plans outside of the programme. Brighton and Sussex University Hospitals NHS Trust (BSUH) which forms the focus of empirical work in this thesis stated in its 2010 *Information Strategy* that:

The Trust recognised the value and need for an electronic patient record and was an early candidate for the NPfIT Care Record Service. The case for the electronic patient record was strong then. It is much stronger now. (2010: 15)

Subsequently in 2012 the Trust signed a contract to implement a new Trust-wide EPR (ehealth INSIDER, 2012a). Other Trusts such as Lewisham Healthcare NHS Trust (ehealth INSIDER, 2012b) signed contracts at roughly the same time whilst other regional Trusts including The Princess Alexandra Hospital NHS Foundation Trust (ehealth INSIDER, 2013a) and East Kent Hospitals University NHS Foundation Trust (ehealth INSIDER, 2013b) were also in the process of acquiring new EPR systems.

At the time of writing it is not yet clear how this new wave of locally procured acute hospital EPR systems will unfold. Lessons learned from the problems encountered during the NPfIT, such as the new contractual arrangements, will possibly enable Trusts and policy makers to better realise their ambitions for integrated electronic patient records. However, as Keen (2010) has noted “shared electronic records have been a graveyard for the ambitions of policy makers” (2010: 145). There were problems in the NHS with attempts to introduce hospital-wide EPRs before the NPfIT and there have been problems in other countries which have not adopted the top-down, centrally controlled, one size fits all approach of the NPfIT.

The literature on EPRs suggests the possibility that it is the ambition of large-scale, integrated EPRs itself, rather than the means adopted to implement them, which may be at the root of the problem. Whilst relatively large-scale integrated systems have tended to dominate policy thinking on EPRs these only represent one particular problematisation of what an electronic patient record should be. As Van Der Ploeg (2003) has observed the common use of the term electronic patient record disguises the fact that there is little agreement as to exactly what constitutes an electronic patient record beyond the obvious fact that they involve recording some level of data about patients on an electronic media. Although the term electronic health record is now often used as an alternative her point remains valid that:

The nearly standard use of the term EPR suggests a stability of an object that the huge variation in scope, form, configuration, structure, and use of EPRs today hardly warrants. (2003: 477)

In practice in the NHS to date many of the IT systems which electronically record patients' clinical details are much smaller in scale than those often envisioned by policy makers. In general practice in the UK NHS from the late 1980s onwards paper-based patient records have largely been replaced with EPRs such that nowadays electronic, rather than paper, records are the norm in GP's surgeries (Greenhalgh and Stones, 2010; Keen, 2010). A similar situation exists in some other countries such as Denmark and Holland (Berg and Winthereik, 2004). There are also many standalone specialist and/or departmental systems EPRs to be found in acute hospital trusts. For example documentation from Brighton and Sussex University Hospitals NHS Trust lists 12 departmental systems which electronically record clinical data about patients. Some of these, such as the Somerset Cancer Register are widely used throughout the NHS. In 2013 the Somerset system was operational in around 80-90 acute hospital trusts in the UK.

These smaller systems are a much cheaper alternative to the policy vision of larger more integrated systems and their relative abundance suggests they are much easier to implement. Some of them pre-date the NPfIT and others were implemented as 'interim' solutions whilst Trusts waited for the NPfIT to deliver an integrated EPR (BSUH, 2010). Building on and leveraging existing specialist/departmental EPR systems might therefore represent one way of answering the call made by Takian and Cornford (2012) who argue that:

...to serve the interests of patients and clinical staff, early introduction of clinical functionality is pivotal and should be prioritized over comprehensive EHR systems or (unrealistic) expectations of administrative cost savings or short term returns on investment. (2012: 196)

These systems are now comparatively well-established which has given suppliers and customers the opportunity to establish better working relationships with each other, something which was identified as an issue during evaluation of the NPfIT. By now they have also had time to start to build up a history of clinical data about patients, which new systems will not have without costly data migrations which may well be impractical where existing data is held on paper. There is also the obvious advantage over more generic large-scale systems that their functionality is much more tailored to specific specialties. Additionally, by conforming to existing specialty boundaries, they potentially involve less of a challenge to existing working practices and professional boundaries; something which existing research suggests is often a major hurdle for larger scale systems. They also represent a considerable historical investment by their vendors who have an interest in preserving their share in the EPR market and, perhaps most importantly, they may already be delivering benefits to patients in terms of better quality care and improved outcomes.

However, these smaller specialist/departmental systems do not necessarily conform to the EPR vision of policy makers, nor bring with them all of the potential benefits often attributed to larger more integrated EPR systems. For example, they are not necessarily accessible across all specialties and professions within a Trust and partly for that reason often co-exist alongside paper records rather than replace them. Neither do they necessarily represent the cutting edge of technology. If viewed from the perspective of policy visions where the dominant themes are integration and transformation, then the very legitimacy of these smaller specialist/departmental systems as EPRs is called into question. There therefore appears to be diversity in the ways EPRs are being envisioned and enacted within NHS acute hospitals. At one end of the spectrum are ambitious but as yet largely unrealised visions of EPRs as comparatively large-scale, integrated and transformative, although relatively generic systems, whilst, at the other end, are systems which electronically record clinical data about patients in a more pragmatic, smaller and more specialist way.

There follows the possibility that the differences outlined above may be the source of tension. Some of the claimed benefits of hospital-wide generic EPRs, especially around efficiency savings and the sharing of information across specialties within a Trust, appear to be predicated on a single system being universally used throughout that Trust. To fully realise these benefits therefore the introduction of a new Trust-

wide generic EPR would appear to threaten the continued presence of smaller specialist/departmental EPRs within that Trust, something which Jones (2003) observed when a new hospital-wide EPR replaced existing departmental specialists systems. Conversely, the continuing presence of these smaller systems would appear to threaten the ability of a new system to fulfil its potential.

The variation in EPR objects referred to by Van der Ploeg (2003) arguably applies not just to different EPR systems - some of which are relatively big and generic others which are relatively small and specialist - but also to the way individual EPR systems are experienced by different heterogeneous actors. Jones (2003) noted how different groups of people such as clinicians, the IT department and senior managers expressed different opinions about a new EPR. To the IT department the new system was seen as a success because it was operational throughout the hospital whereas to some clinicians it was a failure as they considered it didn't work well. Jones (2003) also observed how the former users of effective departmental specialist systems, who had seen these replaced by the new hospital-wide EPR, greeted the new system with dismay, describing it as 'a lot of a disaster' and 'a huge white elephant' (2003: 412), whereas former users of an aging legacy system were generally positive about the new EPR. In doing so he recognises another tension, that between success and failure, noting that:

Given that the system was operational and in constant use throughout the hospital, it would be difficult to consider it a failure. At the same time, the dissatisfaction of some clinicians suggests that neither was it a clear success. (2003: 412)

Jones (2003) writes about these differences as opinions and differing perspectives. Ontologically this is important for, although the use of the word perspectives denotes a plurality of views, it still implies that these views gaze upon a singular object or reality (Mol 1999). Mol and other academics who are associated with Actor-Network Theory suggest another possibility, that objects and realities have to be performed in order to exist and that differences in the ways they are performed produces multiple realities. Performance and multiplicity offer a way to understand differences in EPRs which bypasses the tension between success and failure which is created if such objects are treated as having a singular reality.

The topic of this thesis is differences in EPRs in NHS acute hospitals and the relationships between these differences. This is broken down in a number of ways. Firstly, there are differences between the ways EPRs are envisioned, often as large, generic systems which are integrated across all departments and specialties in a Trust and which are seen as having the power to transform the delivery of healthcare, and how they are enacted, often as small specialist departmental systems. Then there are differences in the way individual EPRs are experienced by different actors. This raises important ontological questions as to whether different actors experience an EPR as a single reality or whether, as is argued in this thesis, multiple enactments of that EPR mean that the EPR has multiple realities. Stemming from this are important questions about how between different EPR systems and their multiple realities relate to each other.

This topic is significant because historically attempts to implement large-scale, integrated EPRs across whole hospital Trusts have often been seen as resulting in expensive failure. This was especially the case in the UK with the National Programme for IT. Although the means by which the NPfIT set out to implement large-scale integrated EPRs in hospitals is now largely discredited and the programme is being dismantled many, Trusts still retain a desire to implement these kinds of EPR systems and an increasing number are now going ahead with new EPR programmes. The context in which these systems are to be implemented has changed since the inception of the NPfIT, in particular the financial climate and contractual arrangements between Trusts and EPR vendors, but it is possible that many of the problems which bedevilled the NPfIT and other large-scale integrated EPR projects may remain. This calls into question whether other approaches to EPR, such as building on a legacy of smaller specialist departmental systems, which may be under threat from new larger more integrated but more generic EPRs, may be better.

1.2 Overview of Research Design

As discussed above the topic of this research concerns differences in how EPRs are envisioned and enacted in NHS acute hospital Trusts in the immediate aftermath of the NPfIT. The approach taken to studying this topic is based on the premise that EPRs are complex sociotechnical objects, consisting not just of computer hardware and software, but also of people, processes, rules and norms which are situated in a specific time and place. Their boundaries and contents are dynamic rather than static and may change over time and place. This makes it difficult to isolate or control for single variables and means that meaning is lost if they are not studied in context. It is therefore necessary to have a research design which enables this to happen. In doing so there were several important design choices which had to be made concerning the direction of the research, whether to study up from data or down from an hypothesis, the overall design, a theoretical framework, the research questions and methods of data collection and analysis.

Because the topic is essentially exploratory in nature it was decided to adopt a research design in which empirical data was gathered within an overall case study. Case study is a flexible method which can take many different forms depending on the overall purpose of the research. It allows for the detailed and situated study of specific objects and events both historically and contemporaneously as they unfold. Case studies can consist of multiple sites thus allowing cross-site comparisons although for practical reasons concerning resources and gaining access permission it was decided to restrict this study to a single site.

The site chosen was a large local NHS acute teaching trust, Brighton and Sussex University Hospitals NHS Trust (BSUH). It was chosen as it was in the process of implementing a new hospital-wide EPR supplied by a Portuguese company, Alert Life Sciences Computing, whilst at the same time having several existing specialist departmental systems. It was decided to include two of these, the Somerset Cancer Register (generally referred to in this thesis as simply 'Somerset') and Clinical Vision 5 (CV5) a specialist renal system, in the study. This design allowed for comparison of three EPR systems which differ in implementation status, coverage,

functionality and origin. CV5 and Somerset were already implemented and in use whilst Alert was in the process of being implemented. Alert is eventually intended to be used across all specialties and professions in the Trust. Somerset is used across multiple specialties involved in caring for cancer patients within the Trust and is sometimes used by healthcare professionals from other local organisations participating in shared care arrangements. CV5 is solely used in renal care at the Trust's Sussex Kidney Unit and at some satellite clinics throughout the county. Somerset was developed within the NHS whereas CV5 and Alert are both commercial products.

The research design had to be located within an overall theoretical framework thereby adding ontological and epistemological consistency to the design and enabling the findings to be easily located within and related to the existing body of scholarly research in the general subject area. There are several different theoretical approaches which have been taken by scholars conducting broadly sociotechnical studies into IT systems in healthcare, these include New Institutionalism, Structuration Theory, Critical Theory and Critical Realism, however for this study it was decided to work with Actor-Network Theory.

The adoption of a particular theoretical framework together with the decision to use a single case study design has a bearing on the nature of the questions a piece of research can seek to answer. In particular working with Actor-Network Theory places the emphasis on understanding how rather than why and the use of a single case study on the specific rather than the general. The questions in turn serve as a guide which focusses data collection and analysis although in an exploratory piece of research such as this, these questions may gradually evolve as the research progresses. The starting point for this research concerns differences in how EPRs are being envisioned in NHS acute Trusts post the NPfIT. It follows on from this that these differences are both related to and interfere with how such systems are being enacted in practice in these Trusts. Finally, the radical ontology of ANT invites the possibility that by changing the ways in which EPRs are thought about it may be possible to change how they are enacted in practice. In the context of the single case study site the research questions thus became.

Question 1

How are EPRs being problematised in an NHS secondary care Trust post NPfIT?

Question 2

How do differences in the problematisation of EPRs relate to and interfere with the sociotechnical enactment of these systems in the Trust?

Question 3

How might changing the way EPRs are problematised effect how they are enacted?

The exploratory nature of the research topic together with the use of Actor-Network Theory as a theoretical framework made the use of qualitative rather than quantitative methods the pertinent choice for collecting and analysing data. The

methods used for data collection in this study were semi-structured interviews, the observation of various meetings and the gathering of documentary material such as business cases and project initiation documents. In order to capture as much diversity as possible interviewees were recruited who had an association with each of the three EPR systems in the study and who came from as wide range of backgrounds as possible: including healthcare professionals, service managers, patients, implementation team members, IT professionals and EPR vendors. The meetings were mostly concerned with the ongoing progress of the Alert EPR implementation programme and a post-implementation CV5 Action Learning Group in the Kidney Unit. Additionally a site visit was arranged to the offices of the SCR vendors.

Actor-Network Theory is not proscriptive about the methods which should be used for data analysis and few guidelines exist specifically concerning data analysis in ANT. For this reason the decision was taken to analyse data thematically which is a flexible method and can be tailored to fit a variety of theoretical frameworks. However, this very flexibility can leave this approach open to accusations, which are sometimes levelled at qualitative methods in general, that findings may be anecdotal and unreliable and that 'anything goes' (Braun and Clarke, 2006). To guard against this the researcher needs to be very clear as to exactly how they performed the various tasks involved in the analysis process. This involved transcribing interview recordings, coding these transcripts and meeting notes with codes semantically generated from the data (as opposed to applying a pre-determined set of codes), iteratively grouping themes together and engaging with existing literature to help draw and verify conclusions. A more detailed description of this process is provided in Chapter 3.

1.3 Contribution

As a case study, this research contributes a detailed empirical account of a specific subject, in this case differences in how electronic patient records are envisioned and enacted at one particular NHS acute Trust, at a specific point in time. This is valuable in its own right because in this respect it is a unique contribution to knowledge, no one else has studied this exact same subject at the same place, Brighton and Sussex University Hospitals NHS Trust, and at the same time, fieldwork being conducted during 2013. The design of the research, contrasting three different EPRs in the same hospital setting is also unusual, possibly unique. But as a study of a single case it cannot be claimed that the findings of this study are universally generalizable to other locations and other times.

However, single case studies can contribute to knowledge in a more general sense. Greenhalgh et al. (2009) argue that when placed in the public domain, reflection, discussion and debate about a detailed study of a single case leads to greater understanding which can be applied more widely. Mol states that "Good case studies inspire theory, shape ideas and shift conceptions" (2008: 10) and goes on to add "A case study is of wider interest as becomes a part of a trajectory. It offers points of contrast, comparison or reference for other sites and situations" (2008: 11).

This study contributes to several trajectories or debates. Firstly, it contributes to studies concerning EPR policy and practice within NHS acute hospitals which it moves forward in time to a significant new era, the immediate aftermath of the NPfIT, of which to date there are few if any other case studies. This associates it with a wider research trajectory concerning NHS IT policy and practices generally, as well as EPR policy and practices globally. Secondly, it adds to debates about the ontological nature of EPRs, the sorts of objects they are and how they behave. Lastly, it adds to the trajectory of studies within the broad school of Actor-Network Theory. Mol (2010) has written of how it is impossible to 'use ANT' but rather one has to 'link up' with it and that:

In "linking up with ANT" the art is not to repeat and confirm, but to seek out cases that contrast with those that came earlier. A contribution to ANT gently shifts the existing theoretical repertoire. (2010: 261)

This study does so by contrasting the behaviour of EPRs with a variety of other complex objects as diverse as scallops, sailing ships, water pumps and diseases.

1.4 Structure of Thesis

Follow the introduction, Chapter 2 is a review of academic literature that adopts a broadly sociotechnical approach to the study of Electronic Patient Records together with a review of some of the sociotechnical theories that have been used in these studies. It begins with a brief discussion on how the majority of EPR research has historically been conducted within the positivist research paradigm familiar to the medical professions but notes that there is now a growing body of non-positivist sociotechnical research on the subject. It then moves on to examine the many different potential benefits which policy makers have attributed to EPRs, particularly concerning improvements in care and efficiency, and the historical difficulty there has been in realising these benefits with many information systems within a healthcare environment being labelled as failures.

The next three sections then address some of the possible reasons why failure appears to be so common: the political nature of EPRs; the wide range of groups which have an interest in them; the lack of clarity as to exactly what an EPR is or should be and the many different configurations of systems which have been labelled as EPRs. Following this there is a brief look at how these different configurations relate to one group with a unique interest in EPRs, the patients themselves. The first part of the chapter then finishes by revisiting the notion of success and failure and examines why sociotechnical enquiries may be better suited than positivist methodologies, such as randomised control trials, for studying EPRs. These methodologies aim specifically to reduce the complexity of the object of study and negate the impact of context. Complexity and context are therefore disregarded leaving a gap in understanding that sociotechnical studies have sought to address. For this reason, the second part of the chapter then examines some of the different theories that have been used in sociotechnical studies of EPRs. After briefly discussing the possible contribution of two areas of social theory to EPR research, Critical Theory and New Institutional Theory, there follows a more in-depth discussion of a third theory, Actor-Network Theory.

A methodology chapter (Chapter 3) follows on from the discussion of sociotechnical theory in the previous chapter, examining the role of theory in research, what theory brings to a piece of research and the implications of theory for research design and claims about knowledge. This is followed by a look at the epistemological implications of the ontological assumptions underpinning Actor-Network Theory which is the theoretical paradigm within which this study has been conducted. The chapter then moves on to look at case study as a research method which has frequently been adopted in ANT research to study controversies. The chapter then gives a detailed account of how the idea of controversies was used in the research design for this study, a case study of three contrasting EPRs within the setting of a single NHS secondary care Trust. This includes an account of how an initial set of research questions were formulated, how these questions gradually evolved in the light of the study findings and why this is consistent with the empirically grounded nature of the study. The remainder of the chapter is taken up with a detailed discussion of the qualitative methods of data collection and analysis used in the study.

The next chapter (Chapter 4) describes the case study undertaken in this research. Its purpose is to provide the reader with sufficient background knowledge of the case to make sense of the more analytical arguments that come in the remaining chapters. The intention is to paint a picture of each of the embedded sub-units within the case; the Somerset Cancer Register, Clinical Vision 5 and Alert, as sociotechnical assemblages located at the Trust. The chapter is organised into three sections, one for each sub-unit. Each section serves to provide a mini-biography of each system as it exists within the context of the Trust and provides some background on how and why each system was acquired. The structure of each mini-biography differs reflecting what it is that sets each system apart from the others and makes each interesting to study.

In the next chapter (Chapter 5), the concept of controversy is used as an analytical device through which problematisations and enactments of EPR at the case study site are explored. The introduction of each new EPR system to the Trust has disturbed relationships between existing actors already present there, in some cases bringing into conflict actors which have previously been able to ignore each other. Five sites of controversy are identified, together with two recurring sources of controversy which are present throughout the other sites. These controversies concern the makeup and purpose of EPRs. At each site there are either differences in how EPRs are problematised, actors are unwilling or unable to occupy the positions in a network allotted to them in a particular problematisation or the outcome of one controversy is entangled in the outcome of another. Together they call into question the legitimacy of each of the three systems as EPRs. The chapter also identifies several modes of ordering and shows how the presence of these is entangled in the different ways in which EPRs are problematised.

There follows a discussion chapter (Chapter 6) in which EPRs are 'reassembled' such that the differences and disagreements that make up the controversies discussed in the previous chapter are understood not as being matters of epistemology, as different perspectives on a single reality, but rather as matters of ontology. The chapter is divided into three parts. In the first, EPRs are analysed in

terms of the ANT concepts of relational materiality and performativity. Here EPRs are understood as having multiple realities. A distinction is made between three different, although inextricably linked, EPR objects, *imagined EPRs*, *instantiated IT systems* and *EPRs in effect*, the latter occurring when the performance of an instantiated IT system coincides with the performance of an imagined EPR.

In the second part of chapter 6 there follows a discussion of the different ways the various heterogeneous actors from which these EPR objects are assembled relate to one another, the implications this has for how these EPR objects hold together as they move across time and place and how their different realities relate to, and interfere with, each other. Comparisons are drawn to three different forms of object assemblage identified in previous Actor-Network studies, immutable mobiles, fluids and fire. The final part of the chapter focusses on the implications of the theoretical findings from the first two parts have in terms of different ways of working for those responsible for EPRs in different contexts.

The final chapter (Chapter 7) draws this thesis to a conclusion. It begins by summarising the theoretical contribution made in the thesis, drawing on Actor-network theory and its successors, to understanding how EPRs are performed at an ontological level as complex and messy objects with multiple realities. Here it is argued that the capacity of instantiated IT systems to produce EPR in effect depends on the practices through which EPR are imagined as well as the practices through which instantiated IT systems are enacted. The chapter then moves on to summarise how the thesis makes an empirical contribution to knowledge of how EPRs are being problematised and enacted in a particular Trust following the demise of the NPfIT. The chapter ends with a discussion of the limitations of the thesis and possible areas for further study.

2 Literature Review

2.1 Introduction

In the first part of this chapter, existing literature is reviewed to show why, despite the vast amount that has already been written about EPRs, these are still complex and controversial objects that constitute an important topic for research. The literature in this review is also used to demonstrate why, in this thesis, these objects are understood as being sociotechnical in nature. A sociotechnical approach is defined by Berg (1999), as one which supports understanding of the inter-relationships between patient care, information systems and healthcare work, whereby "work practices are conceptualized as networks of people, tools, organizational routines, documents and so forth" (1999: 89).

The starting point of the literature search was to look for literature concerning the history of healthcare information systems in NHS secondary care up to the present and to look for sociotechnical studies of EPRs in secondary care. The former category returned a body of literature which included sociotechnical evaluation studies of the NPfIT; health informatics policy documents from the Department of Health and individual NHS organisations; critiques of UK health informatics policy. Prominent amongst the literature in the second category were a number of articles published in Issue 42 of *Methods of Information in Medicine* from 2003, 'Special Topic on ICT in Health Care: Sociotechnical Approaches' guest edited by Marc Berg, Jos Aarts and Johan van der Lei. From this initial start a 'snowball' approach was followed which drew in additional literature as a result of searching for articles which cited those returned in the original search and for further articles by the original authors. This snowballing grew considerably with the inclusion of several reviews of EPR related literature including that by Greenhalgh et al. (2009). Where the literature suggested a particular aspect of EPRs would be of relevance to the study, for example the prominence of references to EPRs as enablers of patient-centred care in policy documents, more targeted searches were conducted for further literature on that topic. Unless targeted in this way literature on EPRs in primary care was not included within the search.

Other than a deliberate focus on studies situated in the UK the geographical location of studies was not taken into consideration as a factor when conducting the literature review. No other regions were deliberately targeted however a consequence of the way in which the literature search was conducted is that much of the literature included in this review originates in the UK or neighbouring northern Europe countries. The prevalence of literature from the UK is explained by the location of the study which is situated in an NHS hospital in England. The prevalence of literature from countries such as Holland, Denmark and Norway is largely a consequence of the decision to focus on sociotechnical literature, particularly that which is theoretically informed by ANT. This approach to studying healthcare information systems has been particularly favoured by academics from these countries such as Marc Berg, Ole Hanseth and Margunn Aanestad. Studies of EPRs which were situated in other regions were not deliberately excluded from the

review and some literature covering studies from regions such as Italy, New Zealand, Canada, the USA and the Amazon was included, but only that returned using the methods described above as systematic review of overseas literature was conducted.

Whilst such a sociotechnical approach is not new to EPR research, Greenhalgh et al. (2009), in a meta-review of EPR literature, show that it is not the norm. In their literature review Greenhalgh et al. (2009) classify literature according to what they call 'meta-narratives'; shared sets of concepts, theories, and preferred methods which implicitly or explicitly set the standards by which 'good research' is judged. They found EPR research to be dominated by a 'health information systems' meta-narrative. This they describe as being predominantly positivist, quantitative, jointly developed by "doctors with an interest in computers and computer scientists with an interest in medicine" (Greenhalgh et al., 2009 citing Chiasson et al. 2006) and favouring randomised controlled trials as a research design. They identified twenty-four systematic reviews of EPR literature covering over 2,000 primary studies of EPR which they include within this meta-narrative. They argue that in health information systems research it is largely assumed that the benefits of well-designed EPRs are intrinsic and self-evident. In such research, "the key challenge was seen as getting the design right, implementing the technology, and ensuring that clinicians used it" (2009: 749). In sharp contrast to research that adopts a sociotechnical approach, Greenhalgh et al. (2009) state that in the majority of health information systems literature on implementation and use "at least until recently, neither the technology nor its social context was considered in depth" (2009: 749). The literature described in this review is used to build a series of counter-arguments to the assumptions that dominate the EPR literature and by extension the ontological and epistemological approaches which underlie them.

One of the key contemporary issues relevant to EPRs is that the imagined benefits they bring to healthcare are frequently not realised in practice. Where their impact is measured against these imagined benefits, as is often the case, it follows that EPRs are often presented as expensive failures. The following sections look at some of the reasons why EPRs are evaluated in terms of speculative benefits and dichotomous standards for 'success or failure'. They begin by examining EPRs as political objects at two levels: at a national level, where they are frequently linked to the economics of healthcare provision; and at an organizational level where EPRs have been seen as becoming entangled in conflicts between management and the traditional autonomy of healthcare professionals in clinical matters. In the following section (2.4) the political nature of EPRs is shown to be linked in part to the wide range of actors enrolled in them and the way in which the introduction of a new EPR can disturb existing relationships. This, it is argued, is especially the case with larger hospital-wide EPRs which cut across traditional organisational boundaries.

The distinction between hospital-wide EPRs and departmental, specialist EPRs is shown in the next section (2.5) as contributing to existing research in which the EPR object itself is recognised as being loosely defined and poorly understood. EPRs (or rather what is considered to be an EPR) take many different forms and are expected to serve many different purposes. In the penultimate section (2.6) in this chapter these differences are linked to wider fundamental controversies about

the provision of public services, and, in particular, the question of whether these should be organised around the requirements of service providers or service users. This serves to inform the earlier argument that EPRs should be understood as highly political objects rather than as essentially neutral technologies. The final section (2.7) links back to earlier observations, about the assessment of EPR projects as 'failures' arguing that this recurrent finding is partly a consequence of the positivist epistemological approaches that often underpin such evaluations, which are ill-suited to understanding EPRs as complex sociotechnical objects.

The second part of the chapter begins (section 2.8) with an examination of two areas of social theory: Critical Theory; and New Institutionalism, which have been used to inform some of the studies cited in the first part of the chapter. Both of these approaches fall outside of Greenhalgh et al.'s (2009) dominant, positivist 'health information systems' meta-narrative and were considered as possible theories to use in this study. They were eventually rejected in favour of a third, Actor-Network Theory (ANT) which is discussed in more depth in the remainder of the chapter. This begins (section 2.9) by examining the type of theory that ANT is and what it can offer to those who choose to work with it.

The following 5 sections then discuss in greater depth some of the key ideas and vocabulary of ANT and their relevance to sociotechnical studies of EPR. This starts (section 2.10) with ANT's rejection of foundational ontology in favour of a performative notion of reality. This notion of *performativity* is one of the key theoretical concepts underpinning the arguments developed in the rest of this thesis. This is followed (section 2.11) by a brief description of the concept of *translation*. This section also serves as an introduction to the concepts of *problematization* and *controversy* which are also key concepts within the arguments developed in this thesis. The next section (2.12) takes the idea of performativity and shows how this led ANT theorists to postulate that reality is not singular but multiple. The ontological notion of *multiple realities* is another theoretical concept underpinning the arguments developed in the rest of this thesis. The fourth of these sections (2.13) examines the closely related notions of *logics*, *discourses* and *modes of ordering* which are all terms which have been used to describe how some networks, in particularly spaces and times have an affinity with other networks in interconnected assemblages. The fifth and final of these sections (2.14) looks at how ANT has developed over time from early ideas of 'assemblages of actors' holding together within 'immutably mobile', 'actor-networks' to the proposal of new object configurations - likened to 'fluids' and 'fire' - being suggested as alternatives.

2.2 Imagined Benefits of EPRs and the Difficulty in Realizing Them.

In seeking to understand current conceptions of Electronic Patient Record systems (EPRs⁴), it is important to understand how for a long time these systems have been seen by policy makers and others as having the potential to deliver great benefits.

⁴ In this literature review the term EPR is used as a catch-all to include any system which electronically stores patient data. Some authors use alternative names such as Electronic Health Record and Patient Care Information System to distinguish particular types of electronic record keeping system.

Several studies observe how the idea of storing patient records electronically dates back to at least the 1960s (Berg and Winthereik, 2004; Boulus and Bjorn, 2010; Keen, 2010; Weed, 1968 cited in Fitzpatrick and Ellingsen, 2013). Calls for the introduction of EPRs have appeared regularly in policy documents in this country and abroad (Jones, 2003; Jensen, 2003; BSUH, 2010; Greenhalgh, et al., 2011; Ellingsen and Monteiro, 2012). In papers about the NHS National Programme for Information Technology (NPfIT), Currie and Finnegan, (2011) and Sheikh, et al., (2011) note that integrated EPRs were intended to be one of the key components - the 'jewel in the crown' - of that programme. The rhetoric used by policy makers has sometimes suggested that EPRs can even revolutionize healthcare delivery. Currie and Guah (2007) and Keen (2010) note that electronic records have featured in major speeches by US Presidents George Bush (2006 Annual State of the Union Address) and Barack Obama (2009 Inauguration Address).

Many authors have written about the benefits which EPRs are claimed to bring, although sometimes calling into question how realistic these claims are. These claims can be roughly divided into ones concerning quality and outcomes of care and ones concerning the efficiency of care delivery. Aderibigbe et al. (2007), Boulus and Bjorn (2010) and Jensen (2003) note claims made about EPRs bringing easier and timelier access to patient records; Greenhalgh et al. (2009) about eliminating the problem of lost or missing records; Aderibigbe et al. (2007), Berg and Winthereik (2004), Fitzpatrick and Ellingsen (2013), Knaup et al. (2007) and van der Ploeg (2003) about easier sharing of information between healthcare professionals and between professionals and patients; Aderibigbe et al. (2007) and van der Ploeg (2003) about empowering patients; Berg and Winthereik (2004), Boulus and Bjorn (2010), Fitzpatrick and Ellingsen (2013) and van der Ploeg (2003) about facilitating secondary uses such as medical research; Aderibigbe et al. (2007), Balka (2003), Berg and Winthereik (2004), Boulus and Bjorn (2010), Greenhalgh et al. (2009) and Jensen (2003) about improving patient safety through reducing prescribing errors and ensuring adherence to best practice; Balka (2003), Berg and Winthereik (2004), Boulus and Bjorn (2010), Ellingsen and Monteiro (2003), Fitzpatrick and Ellingsen (2013), Greenhalgh et al. (2009) and Jensen (2003) about EPR's claimed capacity to make healthcare cheaper, more integrated and more efficient. Aderibigbe et al. (2007), Fitzpatrick and Ellingsen (2013), Greenhalgh et al. (2009), and Sheikh, et al. (2011) even mention claims that EPRs can eliminate the problem of doctor's illegible handwriting.

Amongst those who have questioned where the evidence of such benefits is and whether the claims made about EPRs are justified, Jensen (2003), in a study of a regional EPR in Denmark, argues that the discourse that has developed around EPRs may be such that in some quarters the claimed benefits have become accepted as truths which are no longer challenged. Currie and Finnegan (2011) make a similar point in a paper on the NPfIT which draws on the theoretical ideas of 'New Institutionalism. They write of 'objectification' whereby the more often a choice is made, the more likely it is to be seen as an optimal choice which is less likely to depend on individual judgement. Greenhalgh, et al., (2011), in a piece reflecting on a different study of the NPfIT, go so far as to suggest that, when the usefulness of

EPR programmes have been questioned in academic studies, policy makers have simply chosen to ignore these findings and carry on regardless.

Not only is the evidence for the benefits of EPRs and other healthcare information systems open to question, there is also a significant body of literature that suggests they often result in failure. Berg (1999), in a paper advocating a sociotechnical approaches to patient care information systems and practices, cites several reports that document very high failure rates, leading him to conclude that “in healthcare, the fact is that most applications to date have failed” (1999: 87-88). Heeks, Mundy and Salazar (1999), when discussing why healthcare information systems succeed or fail, state that “there is also plenty of specific evidence that many - even most - healthcare information systems are failures” (1999: 2). Brown (2001 cited by Currie and Finnegan, 2011: 160) suggests a failure rate of between 60% and 80% for large-scale NHS IT development projects. Greenhalgh et al. (2009) noted that whilst EPRs are seen as the “cornerstone of a modernized health service” (2009: 730) failure is common and even systems counted as a success often perform badly. Ellingsen and Monteiro (2012), discussing EPR development in Norway, state that “Reports on failed large-scale ICT projects in healthcare are too common for comfort” (2012: 16) and cite Ham et al. (2011) as suggesting an “integrated electronic medical record remains an aspiration rather than a reality” (2012: 17). This view is echoed by Fitzpatrick and Ellingsen (2013) who, in another literature review, note that Berg’s statement from 1998 that fully integrated EPRs are hard to find remains true.

There are many studies which indicate that evidence of difficulties and failure with IT systems in healthcare settings can be found worldwide. Examples of this include accounts from Canada (Balka, 2003), Denmark (Jensen, Kjaergaard and Svejvig, 2009), New Zealand (Doolin, 2004) and Norway (Ellingsen and Monteiro, 2012). In the UK there have been several notorious health service IT disasters including the Wessex region IT programme, the Hospital Information Support System and the London Ambulance Service call handling system (Jones, 2003; Berg and Winthereik, 2004; Keen, 2010). The NHS National Programme for Information Technology (NPfIT) has also been seen as another such disaster, which Keen (2010: 149) describes as putting all previous IT disasters, anywhere, in the shade.

In the UK the NPfIT dominated NHS IT for nearly a decade from 2002 until its winding down in 2011. This was billed as the biggest civilian IT project in the world with an estimated cost of £12.7 billion (Takian and Cornford, 2012: 194). Throughout the duration of the programme it was the subject of several major evaluation studies by academics who produced a succession of articles and reports (Currie and Guah, 2006; Greenhalgh, et al., 2008; Greenhalgh, et al., 2010; Robertson, et al., 2010; Sheikh, et al., 2011) highlighting the difficulties and delays the programme was experiencing. However, Takian and Cornford (2012) argue that it may be misleading and counter-productive to criticise all that the NPfIT did. Some

aspects of the programme such as 'the Spine'⁵ and Picture Archiving and Communication System (PACS) have achieved widespread implementation despite the EHR component being beset by difficulties and falling short of its implementation target (Sheikh, et al., 2011: 8-9).

Although, as the studies discussed above have shown, problems are frequently encountered with large-scale healthcare IT projects, especially those involving EPRs, there is other evidence to show that there are many IT systems which operate successfully in healthcare settings. In many countries, including the UK, EPRs are common and have achieved relative success in primary care (Ellingsen and Monteiro, 2003; Berg and Winthereik, 2004; Jones, 2004; Greenhalgh and Stones, 2010; Keen, 2010). In secondary care there are IT systems that are widely used, for example those that support administrative or managerial functions, such as the Patient Administration Systems (PAS) used for scheduling appointments and managing waiting lists (Keen, 2010). Working examples of EPR systems themselves do exist in secondary care but they have tended to be specialist systems supporting the treatment of specific conditions rather than generic hospital or even national/regional-wide systems for which the greatest benefits are often claimed.

In attempting to understand why it has so far proved difficult to fully realize the benefits of EPRs, especially in secondary care, academics such as Berg (1999) have increasingly turned to sociotechnical approaches to provide insight. Such approaches are predicated on the belief that technology cannot be understood in isolation from the practices of which it is a part. That is not to say, as authors including Orlikowski and Iacono (2001), Hanseth, Aanested and Berg (2004) and Greenhalgh, et al. (2008) make clear, that technology is unimportant. Rather, that how such technology performs depends on its relationship to other actors including local work practices and the broader political and economic environment in which it is situated.

2.3 The Political Nature of Information Systems in Healthcare

When seeking to account for the difficulties experienced in realising the benefits of large-scale EPR systems, many studies have drawn attention to the 'political' nature of healthcare, in both the formal and informal senses of the word, as one possible reason for these difficulties. Examples of this have been identified in many countries including: the UK (Greenhalgh, et al., 2011; Klecun, 2005; Takian, et al., 2012); New Zealand (Doolin, 2004); the USA (Keen, 2010); Canada (Balka, 2003; Boulus and Bjorn, 2010); Denmark (Jensen, 2003; Jensen, Kjaergaard and Svejvig, 2009); and Norway (Ellingsen and Monteiro, 2003; Boulus and Bjorn, 2010) amongst others. Financial cost can be seen as one of the main reasons for the politicised nature of healthcare provision. Currie and Finnegan (2011) note how this is especially the case in a state funded system such as the NHS. An aging population with greater health and social care needs alongside new and expensive treatments have all

⁵ The Spine is a collection of key national applications such as the Personal Demographic Service which are accessible across the NHS (Health and Social Care Information Centre, 2015).

contributed to political pressure to reduce the cost of healthcare provision. As numerous studies have documented, IT has frequently been seen as one means of achieving such cost reductions (Balka, 2003; Ellingsen and Monteiro, 2003; Jensen, 2003; Jones, 2003; Doolin, 2004; Klecun, 2005; Currie and Guah, 2007; Keen, 2010). Since 2008 the perilous nature of the global economy has intensified this pressure but it is not new. Jones (2003), writing about an EPR implementation at an English hospital at a time of comparative economic prosperity, noted even then how the NHS had to cope with high levels of service demand and constrained resources.

However, whilst IT systems have been promoted as a means of reducing the cost of healthcare delivery other literature points to how they can also be a significant source of public expenditure in their own right which adds to their politically charged nature. Takian et al. (2012) describe the NPfIT with its estimated budget of €12.8bn as being very much a political project from the beginning. Keen (2010) notes how both the Prime Minister and Chancellor at the time were closely involved in its creation. Greenhalgh, et al. (2011) and Fitzpatrick and Ellingsen (2013) mention programmes in the USA, Australia and Canada with budgets in the billions or hundreds of millions. Other authors (Balka, 2003; Ellingsen and Monteiro, 2003; Keen, 2010) note how the provision of IT in healthcare is big business with large and small IT companies competing for a share.

Authors such as Keen (2010) have noted how in the UK there has been a growth of outsourcing with health informatics systems increasingly developed, implemented and maintained by private companies and contract IT staff rather than in-house IT staff. This practice was most evident in the NPfIT. Currie and Guah (2007) as well as Keen (2010) argue that the way the programme was structured, its centralized top-down approach, the policy of 'ruthless standardisation' (DoH, 2002 cited in Keen, 2010: 140) and the involvement of large private sector IT corporations can all be seen as stemming from a belief that the public sector could not manage large technology projects and that the private sector could do better. Currie and Guah (2007) and Sheikh, et al. (2011) suggest that this created tension with healthcare professionals concerned that large commercial IT providers without past experience of public sector healthcare would bring with them a market rather than public sector ethos.

There have been other examples of political influence on health informatics policy. Ellingsen and Monteiro (2003) note how the Norwegian government attempted to use investment in healthcare information systems as a form of economic stimulus. Klecun (2005), in a study of telehealth in the UK, has suggested that when IT initiatives in healthcare become a political priority there is some suggestion that the normal scientific proofs of effectiveness usually expected of medical treatments by the medical profession - typified by randomized controlled trials (RCTs) - are bypassed. Authors including Currie and Guah (2007), Keen (2010) and Currie and Finnegan (2011) state that one of the primary justifications for the NPfIT was the conclusion of the Treasury-commissioned *Wanless Report* (2004) that the NHS underinvested in IT. The vast investment that followed seems to have been based on little more than a deterministic belief in the power of IT to somehow make things better, with little or no evidence to support this belief. This lack of evidence may have contributed to scepticism or outright rejection of new IT systems from

healthcare professionals. However, as a counterpoint, Currie and Guah (2007) note that healthcare professionals may not be best qualified for undertaking purchasing decisions regarding IT systems and have sometimes been criticised themselves for making very poor purchases.

Closely linked to the issue of cost is the introduction of managerialism into healthcare. State provision of public services, including healthcare, is perceived by some (both politicians and the public) as inefficient compared to private sector ways of managing business. This general assumption has led to the introduction of private sector management techniques, sometimes described as New Public Management (NPM) and Business Process Re-engineering (BPR), into healthcare (Lowe, 2001; Doolin, 2004; Baines, Wilson and Walsh, 2010; Keen, 2010; Currie and Finnegan, 2011). Keen (2010) has argued that a consequence of this policy position is that much of the investment in healthcare IT has historically been in management information systems, intended to manage cost control, rather than clinical information systems. Currie and Guah (2007) argue that a further consequence of this is that the organisation of healthcare provision has been subject to frequent, politically inspired change, meaning that responsibility for the implementation and maintenance of IT systems also frequently changes along with requirements for information flows within the overall organisational hierarchy.

The macro political pressures to reduce healthcare expenditure also have political consequences. Authors including Currie and Guah (2007) and Doolin (2004) have noted how the introduction of new managerial practices into healthcare has led to challenges to the professional autonomy of healthcare professionals. Haynes (2003) suggests this is part of a wider process across the public sector. Where new healthcare IT systems have been perceived as being imposed upon healthcare professionals without adequate consultation (Currie and Guah, 2007: 241), or as tools to enable greater managerial control of healthcare workers impinging upon their traditional professional autonomy, they have sometimes encountered resentment and resistance (Doolin, 2004; Henwood and Hart, 2003; Currie and Guah, 2007; Jensen and Aanestad, 2007). Furthermore, Currie and Guah (2007) have noted that healthcare professionals, especially doctors, are generally professionally well-organised and their representative bodies can carry considerable political clout. Thus it can be seen that difficulties in realising the imagined benefits of EPRs stem from their political nature as well as their technical properties.

2.4 The Messy Reality of Healthcare

A further set of issues which may explain some of the difficulties experienced by large EPR programmes is the number of different actors at play in healthcare provision and the 'messy' reality this creates. Many of the benefits claimed for healthcare information systems, especially hospital-wide EPRs, are predicated on integration and standardisation. Data is to be captured once and used many times, not just by clinicians but also secondary users such as managers, researchers and even patients. Belief in the potential benefits to be had from integration and standardisation is consistent with a view of healthcare as following standard 'pathways' (Ritzer, 2011) which lend themselves to the neatly ordered processes of computerisation. However, authors such as Berg (1999), Berg and Goorman (1999),

Goorman and Berg (2000), Bjorn et al (2009) and Tjora and Scambler (2009) provide a counter-narrative arguing that in reality healthcare is far messier and less well-ordered.

The importance of teamwork in such a messy environment has been emphasised in studies including Berg (1999), Currie and Guah (2007), Goorman and Berg (2000) and Jones (2003) which note how the introduction of new IT systems can affect relationships within teams and that the ability to adapt can be a significant barrier to the introduction of new IT systems. Sheikh et al. (2011) have also noted how there is sometimes an imbalance between those who get to input into the design of these systems and those who actually have to work with them. Frontline staff may be burdened with extra data inputting which only benefits secondary data users such as managers or researchers. Sheikh et al. (2011) also found that some systems were designed for use by clinicians but actually used mainly by allied health professionals and administrators whose interests and concerns “seemed less likely to be elicited, understood, or acted on as implementations went forward” (2011: 7).

Whilst healthcare professionals and administrative staff, such as medical secretaries and receptionists, may each be viewed as homogenous user groups, researchers such as Jones (2003) and Sheikh, et al. (2011) have observed that even within a single professional group, such as doctors within the same department, there will be different attitudes towards IT systems depending on factors such as age and seniority. Attitudes towards IT both individually and institutionally may also be shaped, positively or negatively, by past experiences with IT. Doolin (2004) observed disillusionment with clinical staff in New Zealand towards a new IT system as a result of previous negative experiences. Individuals can make a big difference to the acceptance or rejection of a new IT system by colleagues, several authors (Greenhalgh, et al., 2008; Greenhalgh, et al., 2011; Currie and Finnegan, 2011) report on the importance of positive or negative ‘champions’. Henwood and Hart (2003) for example report on the hybrid role of the hybrid, ‘IT midwife’.

Further barriers to the introduction of new EPR systems, especially of the generic variety, may come from safety concerns. Berg and Goorman (1999) argue that information derives much of its meaning from its context and when information captured in one place is removed from its context and used elsewhere it can lose or change meaning with potentially dangerous consequences for patient safety. Other concerns have been raised about possible safety issues being caused by healthcare information systems. Aarts (2012) has written about the unregulated nature of the IT industry and the possibility that healthcare information systems may cause errors. An example of this has been provided by Bruni (2005) where the dosage of cancer drugs may be incorrectly calculated. Koppel, et al. (2005) found that medication errors can sometimes be facilitated by computerised systems with poorly designed screen layouts. These don’t always show all the necessary data in one place and can even lead to clinicians viewing the wrong patient’s record.

Boaden and Joyce (2006) raise concerns about training, the process of change (from paper records to EPR) and the completeness, accuracy and accessibility of EPRs. The validity of these concerns regarding training and the change process is

demonstrated in the account given by Jones (2003) of an EPR implementation in an English hospital. Jones (2003) quotes one IT manager as describing the implementation as “the worst experience of my 27 years in the NHS” and a senior clinician as suggesting that during it “the hospital was close to collapse” (2003: 411).

Knaup et al. (2007) and Currie and Guah (2006) have noted how yet another barrier to using EPRs to share patient data amongst care providers has been concerns about the confidentiality of personal medical records. Greenhalgh et al (2008: 4) report mixed views from general practitioners on uploading patient data to the NHS Summary Care Record. A small minority feeling it was their duty to protect patients’ data rather than pass it to the government. Many more expressed concern about how consent for sharing patient data was obtained and whether patients fully understood its implications. Interestingly, Berg and Winthereik (2004) recount that concerns about privacy and confidentiality are not new to electronic records but were also voiced about shared paper-based medical records when these were first introduced.

2.5 Varieties of EPR Object

Whilst EPRs have been very widely written about there is much less clarity on what the term actually means. Definitions of EPR have tended to be rather vague agreeing on little other than the broad insight that an EPR contains data about patients which is stored electronically (Leiner, Gaus, Haux and Knaup-Gregori, 2003 cited in Knaup et al, 2007; Jensen, 2003; Greenhalgh, et al., 2009). There is no agreement about, or even attempt to define: what is contained in the record; what sort of patients it is intended for; where it will be used; who will have access to it or what it will be used for. As van der Ploeg (2003) noted, the standard use of the term EPR disguises a huge amount of variation in EPR objects.

Even leaving to one side EPRs as used in primary care and just concentrating on EPRs in a secondary care setting this variation is substantial and clearly apparent within the EPR literature. At one end of the scale have been plans for EPRs with regional or sometimes even national coverage. This has been seen in Denmark (Jensen, 2003), Norway (Boulus and Bjorn, 2010; Ellingsen and Monteiro, 2012) and England as part of the NPfIT. However Greenhalgh et al. (2008: 1) claim that a nationally integrated EPR “has not yet been realised on a large-scale anywhere in the world” (2008: 1). Kreps and Richardson (2007) argue that the very size of such programmes means that failure is virtually inevitable and give many examples of failed, large-scale IT programmes throughout the public sector, not just in healthcare. Sitting somewhere in the middle are generic, hospital-wide EPRs which may attempt some form of integration with local primary care providers (Balka, 2003; Jones, 2003; Jensen, Kjaergaard and Svejvig, 2009; BSUH, 2010). Finally, there are standalone specialist departmental systems in areas such as midwifery or oncology (Henwood and Hart, 2003; Bruni, 2005; Greenhalgh, et al. 2011). These do not fit neatly with the prevailing policy narratives of integration and standardisation and as Knaup, et al. (2007) have observed, may not adhere to common data or messaging standards. However, they do reflect the historical way in which healthcare provision has traditionally been compartmentalised along functional lines into various medical and surgical specialties.

Some planned EPRs never get implemented; others are only partially implemented or implemented incrementally in one ward or department at a time. Some EPRs are implemented but little used, or used in ways that were not envisaged, or intended, by those who commissioned them (Jones, 2003; Aderibigbe, Brooks and McGrath, 2007). In some institutions there is an element of compulsion to EPR use (Jensen and Aanestad, 2007), in others there is more individual latitude. EPRs may be seen as a replacement for paper-based records but often they must co-exist with them (Fitzpatrick and Ellingsen, 2013), sometimes for legal reasons or because older paper-based records have not been digitized (Bruni, 2005). All of this can make it very difficult to conduct evaluations of EPRs in terms of 'before' and 'after' implementation, the so-called 'EPR on' versus 'EPR off' trial (Takian et.al, 2012). The methodological implications of this are important and are discussed in Chapter 3.

The way in which EPR systems are procured also may be of great significance. The NPfIT has been criticised for its central procurement model. The country was divided into regions and a central government agency negotiated very large contracts with a tiny handful of companies to act as local service providers which in turn procured the software in each region (Currie and Guah, 2007). This was intended to ensure commonality of systems and cost advantages of economies of scale. In reality this left the eventual users of systems, hospital trusts, in a weak position unable to negotiate directly with suppliers when things went wrong. Greenhalgh et al., (2011) observed how contractual complexity led to difficulty in integrating legacy software with NPfIT supplied software.

During the NPfIT era some long established, smaller, health informatics software suppliers found their market share severely squeezed and in some cases long term partnerships between customers and suppliers were ended. Some of these problems were recognized during the lifetime of NPfIT and arrangements put in place to allow for greater local autonomy in making purchases (Sheikh et al., 2011). In contrast, in Denmark a modular approach to EPR design allowed for different suppliers for each module. The engagement of healthcare professionals was then encouraged by getting different user groups to bid to host the development of each module in an auction (Jensen, 2003).

Currie and Guah (2007), reflecting on some of the difficulties experienced with the NPfIT, make the interesting observation that in a competitive marketplace IT firms and even clinicians may not consider it to be in their own interests to share knowledge. This may have profound implications for notions of patient-centred care that seek to break down silos of information and integrate information flows and yet at the same time use competition amongst service providers as a mechanism for raising standards.

2.6 Patients and Care

Healthcare information systems, especially EPRs have often been associated with, and seen as enablers of, 'patient-centred' care (DoH, 2002 cited in Currie and Guah, 2007; van der Ploeg, 2003; Knaup, et al., 2007; DoH, 2010a). Similarly to issues concerning the term Electronic Patient Record, 'patient-centred' care is

poorly defined and can have many meanings. This is apparent in UK government policy documents where patient-centredness can be seen as a multidimensional concept. It encompasses notions of: service delivery based around the needs of patients rather than the convenience of service providers; patient involvement in making decisions about their care; and providing patients with choice along with the information necessary to inform that choice (Currie and Guah, 2007). All these elements are interlinked and have to be seen in the context of much wider ideological debates about the best means of providing public services. A general lack of patient-centredness is acknowledged in Department of Health policy documents such as *Equity and Excellence: Liberating the NHS* which states,

[The NHS] lacks a genuinely patient-centred approach in which services are designed around individual needs, lifestyles and aspirations. Too often, patients are expected to fit around services, rather than services around patients. (2010a: 8).

With healthcare provision traditionally split between primary, secondary and tertiary care and further divisions into medical and surgical specialties in secondary care, the communication of patient information within healthcare can be poor (Berg and Winthereik, 2004; Knaup, et al., 2007). The same bits of information might be requested repeatedly by different departments, appointments not co-ordinated and test results not shared. *Information for Health* (NHS Executive, 1998 cited by Klecun, 2005: 399) claimed that electronic health records would benefit staff and patients alike by eliminating “the frustration felt through poor clinical records and co-ordination of services” (emphasis added). Integrated EPR systems can be seen as enabling patient-centred care by providing clinicians and even the patients themselves to share a single, holistic view of their medical history and treatment. Such a holistic approach maybe something of a challenge to the traditional biomedical view of treating illness but has been driven up the policy agenda by patients groups in areas such as mental health (Klecun, 2005).

The need to involve patients in making decisions about their care is another key dimension of the Department of Health’s vision for making care more patient-centred. This is summed up in *The Power of Information* (DoH, 2012) which has the motif running throughout the document of ‘no decision about me without me’. One enabler of this is the pledge to give patients electronic access to their own medical records (Currie and Guah, 2007: 245), starting with GP-held records. It is posited that giving patients access to their records might drive up the quality of the information in the record as they would be able to check them for accuracy. Despite such calls for patient involvement Fitzpatrick and Ellingsen (2013) note, in a review of literature on computer supported cooperative work in healthcare, that of 128 papers they reviewed only 20 included patients in their discussions.

Counter-arguments to ‘no decision about me without me’ have been raised by some academics. Currie and Guah (2007: 238) point out that historically patients have been ‘passive’ recipients of treatment options in which the doctor exercises their professional judgement as to what is best for the patient. They quote clinicians who questioned whether patients either wanted choice or had the necessary information to make an informed choice (Currie and Guah, 2007: 242). Van der Ploeg (2003)

has voiced concerns as to whether patients would be able to understand the technical language used by health professionals. Furthermore, patients may lack either the technical know-how or computer equipment necessary to view electronic copies of their medical record.

EPRs may challenge traditional relationships between clinicians and patients in other ways. Henwood and Hart (2003) recount how midwives expressed concern that time spent using a computer to record patient notes distanced the midwife from the mother at a time when they should be providing them with care and support. Sheikh et al. (2011: 8) talk of healthcare professionals' resentment at spending time entering data on a computer. Andreassen (2012) goes as far as to argue that if an EPR becomes a single repository for patient information this may remove the need for much face to face contact between clinicians and patients. In effect the EPR replaces the patient in some clinical encounters and what results, it is argued, is not patient-centredness but 'EPR-centredness' (van der Ploeg, 2003).

In ideological terms patient involvement and patient choice may be seen as means of driving up the quality of public services by using market mechanisms to allocate funding to the 'best' providers of services. In order for patients to be able to exercise choice, they need information that enables them to compare providers of services on a like-for-like basis. This may lead to the homogenization of care provision along standard care pathways which can to some extent be guided by the structure of EPR software, the sequence of screens etc. As has been discussed previously in this chapter this has led to concern by healthcare professionals about erosion of their professional judgement and autonomy. This may also have the unintended consequence of actually making care less patient-centred if the structure imposed by an EPR leaves less room to tailor care to fit the needs of individuals.

Many aspects of patient-centredness are not exclusive to healthcare but reflect a general desire to reform public services by making them more 'customer' focussed. This was evident in the thinking of the 'New Labour' government (1997-2010) and appears to have continued under the Conservative and Liberal Democrat coalition government (2010-2015). This continuity of policy can be clearly seen when comparing the quote above from *Equity and Excellence: Liberating the NHS* (DoH, 2010a), which was one of the first policy documents published by the coalition government with the core aims of the 1999 White Paper *Modernising Government* which focused on:

...delivering high-quality, efficient public services, ensuring that policy making is joined up and strategic and making public services focus on users, not providers. (Cabinet Office 1999 cited in Baines, Wilson and Walsh, 2010: 20-21)

It can thus be seen that in some respects notions of 'patient-centred' care and EPRs are tightly bound up with the politics of healthcare and the introduction of managerialism discussed previously in this chapter.

Whether care and the patient choice agenda are entirely compatible has been questioned. Mol (2008) argues that care is an on-going process in which health

professionals support those in ill-health, some of whom have conditions which may last a lifetime, throughout the duration of their illness. Choice can be seen as a one-off event and one where responsibility is shifted from the healthcare professional to the patient. Furthermore, the nature of the illness, or other personal circumstances such as work or parenting obligations, may limit how much choice the patient may in reality be able to exercise.

Patients' views of what patient-centred care means in primary care are explored by Little et al. (2001 cited by Stewart, 2001: 445). Their findings show some commonality with government policy documents, especially around patient involvement in decisions about their care and providing them with information but also a concern for a holistic understanding of the patient extending to "emotional needs and life issues" as well as "prevention and health promotion" and enhancing the doctor patient relationship. The focus here was on primary care but this serves to illustrate once again that a single phrase such as, patient-centred care, may mean different things to different people in different contexts. Van der Ploeg (2003) makes the point that patients just like health professionals are not a single homogeneous group. The needs of an expectant mother will be different to a road crash victim, a young diabetes patient or an elderly dementia patient. Age, education, technical literacy and general literacy will all differ.

2.7 Failure and Success Revisited

The complexity of healthcare work and the variety of actors at play in healthcare IT systems has lead authors such as Heeks, Mundy and Salazar (1999), Berg (2001) and Jones (2003) to question how meaningful it is to assess them in terms of success and failure. Jones (2003) points to how an IT department judged an EPR a success because it was successfully implemented whereas clinicians considered the same system to have failed to deliver what was promised. Authors including Stoop et al. (2004) and Greenhalgh et al. (2007) have suggested that one reason why so much literature on healthcare information systems is couched in terms of success and failure lies in the scientific training of the medical profession. They point to how the medical profession looks for scientific justification for new interventions and procedures, often in the form of randomized controlled trials (RCTs). Kreps and Richardson (2007) also link notions of success and failure to what they describe as "a managerial and technologist-led approach in which the technology per-se is seen as neutral" (2007: 441). Such an approach does not acknowledge the kind of impacts that new IT can have on working relationships which Berg (1999, 2001) amongst others has been so keen to address.

From a sociotechnical perspective assessing the impact of a new healthcare information system such as an EPR in binary terms of success or failure can be very difficult (Fitzpatrick and Ellingsen, 2013) and is arguably impossible. This difficulty in proving or disproving the claimed benefits of healthcare information systems may result in scepticism from healthcare professionals who are reluctant to change their working practices without what they see as scientific evidence of their impact (Takian, et al., 2012: 2).

The experiences of the NHS Care Record Service (CRS) evaluation study are explored in Takian et.al (2012). The difficulty of identifying a before and after position in evaluations of implementations is stressed together with the importance of what happens *during* the implementation process. Information systems are shaped in use as both the technology and work practices evolve. Takian et.al. (2012: 7) refer to this as taking a performative view in which EHR systems only come into being when they are performed by stakeholders. The NHS CRS may have been envisaged by policy makers as a unified national system but it embodied different meanings for different hospital trusts and different people. These could be at variance from the initial policy vision. Implementation was seen to be context-bound and attempts to produce non-contextual comparisons between implementations risks losing the ability to understand how and why implementations progressed as they did (Takian et.al, 2012: 5). The difficulties associated with conducting before and after evaluations of EPR implementations has important methodological implications which are discussed further in Chapter 3.

2.8 Theory and EPR Research

In the first part of this chapter an argument was made that EPRs cannot be meaningfully understood within the realist/positivist ontological and epistemological paradigm typically associated with the EPR literature categorised by Greenhalgh et al. (2009) as belonging to a 'health information systems' meta narrative. As such, many of the studies already discussed in this chapter have utilised theoretical approaches which belong to other ontological and epistemological paradigms. In these studies, EPRs are understood, with differing emphasis, as being both social and technical in nature. Three of these theoretical approaches were identified as suitable candidates for use in the theoretical framing of this study. These were Critical Theory (Doolin, 2004; Klecun, 2005), New Institutional Theory (Avgerou, 2000a, 2004; Currie, 2009) and Actor-Network Theory (Bruni, 2005; Cresswell, Worth and Sheikh, 2010). Each of these approaches will be considered here and their relative merits discussed.

Despite its name, Critical Theory is not a single coherent social theory. Rather, as Orlikowski and Iacono (2001) argue, it may be considered a paradigm in the same sense that positivism and interpretivism are. Klecun (2005) states that "the central idea in critical theory is that all social phenomena are historically created and conditioned" (2005: 389). In research into IT systems, Critical Theory is often associated with understanding why some groups are more powerful than others in the social shaping of IT systems and the role played by characteristics such as economic or professional status, race or gender. This can be seen in the definition provided by Greenhalgh et al. (2009) of a Critical research philosophy as being that which:

...assumes that the social order is inherently unstable. In particular it involves the domination of some groups by others, such as women by men, workers by capitalists, or patients by health professionals. The purpose of research is at least partly to help these dominated groups challenge their position in society. (2009: 734)

Much of the critical information systems literature has been framed in terms of having what McGrath (2005) calls 'emancipatory intent' towards those members of society who occupy less powerful positions in it. A more or less explicitly stated goal of being able to transform rather than simply 'predict or explain' is seen by Myers and Klein (2011: 19 citing Orlikowski and Baroudi, 1991: 19) as distinguishing critical from positivist or interpretive research.

Whilst Critical Theory is not a single social theory, Myers and Klein (2011) argue that it is important that critical theory research should be organized around key concepts from critical social theorists. Klecun (2005) exemplifies this in her study of telehealth by drawing on the concept of rationalities taken from the work of Weber and the 'Frankfurt School' including Adorno, Horkheimer and Habermas. Rationality is a complex concept frequently used in critical theory. Rationalities can be thought of as systems of reasoning or ways of acting which make sense, or are considered rational and legitimate, in the light of the specific goal the actor is trying to achieve within a particular political, social and economic context.

Doolin (2004) also used critical social theory in a study of power and resistance in the implementation of a new IT system in hospitals in New Zealand but in his study he drew on the work of Foucault on microphysical power. Brooke (2002), in a discussion of critical theory in information systems research, describes how microphysical power can be seen as resulting from 'discursive practices' that is historical developed, situated, dominant ways of doing. Power is not absolute but relational and dependent on context such that an actor who may exercise power over another in one context may find that relationship is inverted if the context changes. Microphysical power relationships may be embedded in information systems which reproduce and reinforce dominant discursive practices. As shall be discussed later (Section 2.13) the work of Foucault has influenced Actor-Network theory as seen in Law's (1994) work on 'modes of ordering'.

Avgerou (2000) is another information systems scholar who has been associated with critical theory but has also worked with a slightly different body of social theory known as New Institutionalism (Avgerou, 2004). New Institutionalism has subsequently been utilized in several studies of IT in healthcare (Currie and Guah, 2006, 2007; Jensen, Kjaergaard and Svejvig, 2009; Miscione, 2007). Institutions are defined by Powell and DiMaggio (1991 cited in Avgerou, 2004) as

...historically developed patterns of social actions and relations, which have acquired a taken-for-granted meaning, value and significance and are not subject to technical/rational considerations. (2004: 47)

Institutions share similar characteristics and are organized and act in similar ways. They have been conceptualised as operating at multiple levels of society from 'organisational fields' (Currie and Guah, 2007) such as IT and healthcare, through organisations such as hospitals down to individual people. Within institutions common values and ways of doing and thinking may, through historical repetition, become so ingrained that they ceased to be challenged or require justification. They may persist even past the point that the original justification for them has ceased to apply and other potentially better ways of doing or thinking may exist. These ways

of doing or thinking thus become 'rationalised myths' (Avgerou, 2004; Currie, 2009; Jensen, Kjaergaard and Svejvig, 2009). Jensen, Kjaergaard and Svejvig (2009) portray the idea of an 'efficient EPR' as a rationalised myth which "has travelled from the organisational field to the hospital ward and on to individual doctors" (2009: 343).

Some institutions, such as IT and management, may complement and reinforce each other forming 'Institutional Alliances' (Avgerou, 2004) whilst the values and logics of others may be largely incompatible. Disappointing outcomes of attempts to implement IT systems in healthcare settings may thus be seen as partly the result of a clash of contrasting institutional values associated with IT and management on one hand and healthcare on the other. Currie and Guah (2007) have argued along these lines when evaluating the performance of the NPfIT. They argue that a benefit of New Institutionalism as a theoretical approach is that it enables IT programmes such as the NPfIT to be understood within "the wider, socio-political and inter-organisational environment, rather than simply as an IT initiative designed to change clinical and administrative working practices" (2007: 244).

Critical Theory and New Institutionalism both offer interesting ways of understanding IT systems which look beyond the technological artefact to embrace the social context in which they are situated. Both were considered as theoretical frameworks with which to conduct the research described in this thesis. However, both have their weaknesses, chiefly that in concentrating on social factors, technology itself is largely ignored. This point is made about Critical Theory by Whitely (1999 cited in Doolin and Lowe, 2002) and about New Institutionalism by Hanseth, Aanestad and Berg (2004).

2.9 Actor-Network Theory - A kaleidoscope not a theory?

Actor-Network Theory, which at various times has also been known as the sociology of translation and actant-rhizome, is described by John Law (2008), who together with Michel Callon and Bruno Latour is considered as one of its founders, as:

...a disparate family of material-semiotic tools, sensibilities, and methods of analysis that treat everything in the social and natural worlds as a continuously generated effect of the webs of relations within which they are located. It assumes that nothing has reality or form outside the enactment of those relations. Its studies explore and characterize the webs and practices that carry them. (2008: 141)

This description of ANT as a 'disparate family' is telling, for as Law (1999) points out elsewhere, in arguing against the fixity that the common use of the single name Actor-Network Theory implies, "It is not a single thing. It is not singular. But neither is it simply a random heap of bits and pieces" (1999: 12). This lack of fixity, particularly in defining what constitutes an *actor*, it has been suggested by Callon (1999), is one reason for criticism levelled at ANT, "that it is everything but a theory" (1999: 182). Mol (2010), in an article discussing ANT, develops this point made by Callon (1999). She argues that ANT is not a theory in the sense that "it offers no causal explanations and no consistent method" (2010: 261). However, she goes on

to suggest that it may be considered a theory if the meaning of theory is radically altered such that it is taken to be:

...something that helps scholars to attune to the world, to see and hear and feel and taste it. Indeed, to appreciate it ... a repository of terms and modes of engaging with the world, a set of contrary methodological reflexes. (2010: 262).

What is meant by theory and the sorts of truth claims which can be made when working with a particular theory, have important methodological implications which are discussed more fully when the topic of research design is addressed in the following chapter (Chapter 3).

The earlier quotation from Law (2008) comes from a chapter in a sociology text book, *Actor Network Theory and Material Semiotics*, in which he provides an overview of ANT and the history of its development. In that chapter he discusses how, what he refers to as 'actor network theory 1990' has become a 'textbook' version of ANT, but makes the point that this is just an arbitrary point in time in the development of the theory. What is now commonly known as ANT continues to evolve as scholars who work with it apply its own analytical techniques back upon its earlier findings, so Law (2008) writes of ANT and its "successor projects". Mol (2010) writes of how this theoretical development is driven by case studies which build upon each other, but adds of these cases that:

Since they are in tension they do not simply add up, but neither is there a debate with winners and losers, where each new proposal seeks to cancel the earlier ones and each innovation depends on killing the ancestors. The point is not to purify the repertoire, but to enrich it. To add layers and possibilities. In this tradition, then, terms are not stripped clean until clarity is maximised. Rather than consistency, sensitivity is appreciated as a strength. (2010: 257)

ANT therefore, writes Mol (2010), should not be thought of as a scheme or a system but a kaleidoscope. The concepts discussed in the remainder of this chapter are drawn from the whole of this kaleidoscope, the successor projects as well as 'actor network theory 1990', and will be constantly referred back to over the course of this thesis. The discussion begins with ANT's rejection of foundationalism.

2.10 Anti-Foundational

ANT is anti-foundational, that is to say that the idea that things are 'given', in nature as well as society, is rejected. Instead reality is a relational effect; people, things, objects, ideas etc. become what they are as a consequence of their relationships to other people, things, objects, ideas etc. These relationships are not fixed in some undeniable order of things but have to be continually performed (Law, 1999). If these relationships change then so do the realities which they perform. Latour (2005) sums this up in the phrase 'no group, only group formation'. Social aggregates which are often taken for granted, such as 'upper middle class' or 'European' have to be continually performed or they cease to exist. Membership of these groups, delimiting who or what is inside or outside requires work. Boundaries are not automatically fixed. Some networks of relationships, some social

aggregates, have greater stability and durability than others. Understanding how such durability is or isn't achieved is something that ANT can be particularly useful for.

One consequence of this anti-foundationalism is that dualities which are often accepted as given are called into question (Law, 1999) or simply bypassed (Latour, 1999). Probably the most controversial of all is that, for analytical purposes, human and non-human are treated equally, referred to by Callon (1986) as the principle of generalised symmetry. In ANT both humans and non-humans are considered to be actors. In Callon's (1986) account of the scallops of St Brieuc Bay, scallops, starfish, tides, harsh winters, scientists and fishermen are all actors.

Latour (2005) defines an actor as "what is made to act by many others" it "is not the source of an action but the moving target of a vast array of entities moving towards it" (2005: 46). Every actor, irrespective of whether it is big or small, human or non-human, is in itself a network of other actors. Greenhalgh, et al. (2009) cite Latour (1992) as describing ANT as being built on a 'recursive philosophy' and offer this definition of what recursive means

[it] assumes that subject and object, micro and macro, social structure and human agency, are reciprocally related and that the purpose of research is to explore the flux between these various dualities over time. (Greenhalgh, et al., 2009: 734)

Berg & Bowker (1997) illustrate how the medical record is both a network performed by other actors and in turn an actor performing in other networks. The fluid balance recordings which make up part of the record are enacted by, amongst other things, urine containers and the nurses who read and record the fluid levels in them. The record is part and parcel of professional hierarchies in which only a doctor may write in certain sections of the record. The record is maintained not just to support the care of patients but in case it is required by the hospital to defend a case of alleged medical negligence. It is also, in some healthcare systems, an important part of the process by which a patient's insurance company is billed for the treatment they receive. All these are actors in the actor-network which is the medical record.

But the medical record is also an actor which is part of the performance of the patient's body, "we argue that the medical record is fundamental to the everyday production of that contemporary body" (Berg and Bowker, 1997). The actor is a heterogeneous network which is made up of other actors which are also networks and so on and so forth. Berg (1999) argues that a physician is only a physician because of the network of which they are a part and altering that network by introducing an EPR may change what a physician is, just as the previous changes in paper record keeping practices changed them "from an enterprising gentleman to a methodical member of a team" (1999: 90).

Other dualities that are undone or simply by-passed and ignored by this performative notion of actor-networks include structure and agency, before and after, micro and macro (Latour, 2005), big and small; these are all treated as relational effects not absolutes. This leads to two other characteristics that Hanseth,

Aanestad and Berg (2004) identify as setting ANT apart from and making it more useful than other social theories used in the study of technology. Firstly, the refusal of ANT to divide the components of society into structure and agency. They compare ANT to Orlikowski (2000 cited in Hanseth, Aanestad and Berg, 2004) who has proposed a dual concept of technology, technology as an artefact and technology in practice and argue that it is in fact the relationship between the artefact and the practice that it is important to understand. Secondly, by ignoring the micro-macro dichotomy nothing should be excluded from study on a theoretical basis because of its size.

That is not to deny that some things, people or organisations are bigger, more powerful or more durable than others, but rather to deny that these differences exist *a priori* (Callon & Latour, 1981). A big, powerful, macro actor is essentially no different to a small, weak, micro actor, they are both actor-networks made up of other human & non-human actor-networks, it is just that some are relatively bigger agglomerations than others. As Latour (2005) argues 'bigger' simply means that something has more *connections* with other things.

It is not that there are a macro-sociology and a micro-sociology, but that there are two different ways of envisaging the macro-micro relationship: the first one builds a series of Russian Matryoshka dolls – the small is being enclosed, the big is enclosing; and the second deploys connections-the small is being unconnected, the big one is to be attached. (2005: 180)

It therefore follows that it is no longer possible to call on overarching and pre-existing macro social forces as explanations, researchers must remain *agnostic* Callon (1986). As Latour (1999) states:

Far from being a theory of the social or even worse an explanation of what makes society exert pressure on actors, it always was, and this from its very inception (Callon and Latour, 1981), a very crude method to learn from the actors without imposing on them an *a priori* definition of their world-building capacities. (1999: 20)

2.11 Translation

The process by which these assemblages take shape is usually referred to in actor-network theory as *translation*. An early definition was given by Callon & Latour (1981)

By translation we understand all the negotiations, intrigues, calculations, acts of persuasion and violence, thanks to which an actor or force takes, or causes to be conferred on itself, authority to speak or act on behalf of another actor or force. (1981: 279)

Another slightly later definition comes from Callon's (1986) paper on the scallops of St Brieuc Bay.

Translation is the mechanism by which the social and natural worlds progressively take form. The result is a situation in which certain entities control others. Understanding what sociologists generally call power

relationships means describing the way in which actors are defined, associated and simultaneously obliged to remain faithful to their alliances. The repertoire of translation is not only designed to give a symmetrical and tolerant description of a complex process which constantly mixes together a variety of social and natural entities. It also permits an explanation of how a few have obtained the right to express and to represent the many silent actors of the social and natural worlds they have mobilized. (1986:19)

Callon (1986) argues strongly that ANT is “particularly well adapted to the study of the role played by science and technology in structuring power relationships” (1986:1). Lowe (2001) and Cresswell, Worth and Sheik (2010) have all made use of ANT in observing how the introduction of EPRs/EHRs have affected power relationships particularly between healthcare professionals and management and those who procure these IT systems and those who use them.

Translation occurs when actors become engaged in a *controversy*. Controversies are defined by Venturini (2010) in a paper describing ‘the cartography of controversies’, an educational version of ANT as

...situations where actors disagree (or better, agree on their disagreement). The notion of disagreement is to be taken in the widest sense: controversies begin when actors discover that they cannot ignore each other and controversies end when actors manage to work out a solid compromise to live together. (2010: 261)

Callon’s (1986) paper helped to establish a vocabulary, consequently widely used in ANT writing, to describe the process of translation as consisting of four moments. The first, *problematization*, occurs when each actor (or entity) in a controversy seeks to position itself within a network and to determine which other entities also fall within the scope of that network. Each actor may problematise the controversy differently and needs to compete with others to impose their version of which other entities are in or out of the network and what position they occupy within in. In order to achieve the desired outcome other actors have to be convinced to accept this version of the problematization. For this to be successful elements within the proposed network must become ‘obligatory points of passage’. In Callon’s (1986) paper for the scientist’s vision to be a success, anchorage of the scallops to the collectors must become an obligatory point of passage (as it turns out this fails to happen). Further examples of obligatory points of passage in early ANT literature are Lisbon in the Portuguese network of trade with India (Law, 1986) and Pasteur’s laboratory in Paris in the development of a vaccine for anthrax (Latour, 1988 cited in Law, 2008). The actions used to attempt this are collectively described as *interessement*. If interessement is successful it results in the addition, or *enrolment*, of other actors into their allotted position in the network.

Interessement and enrolment are processes that apply to a few representatives of a particular class of actor or entity. To gain general acceptance of the new network configuration by all examples of that class it requires the *mobilisation* of the masses by the representatives. The process of translation described here is an idealized representation. It may not smoothly follow such neat stages. Interessement,

enrolment and mobilisation may not be successful; the intended outcome to a controversy envisaged by problematization may never be achieved. The network may never achieve stability and may remain in semi-permanent state of translation. An actor-network that is able to move from one location to another whilst holding its shape is known as an 'immutable mobile', an expression originally coined by Latour (Mol and Law, 1994; Latour, 2005; Law, 2008). Mol and Law (1994) in a theoretical piece which explores alternative object configurations explain that:

An entity such as a text or a device is immutable when its elements do not change and the relationship between them is not altered. It holds itself stable wherever it goes. And it is mobile because, *from the point of view of a regional topology*, it displaces itself from one place to another. (1994: 649)

These alternative configurations are returned to later in this chapter (Section 2.14)

2.12 Performance and Multiplicity

In the process of translation described above, reality is performed or enacted by heterogeneous assemblages of actors. This notion that reality is performative led actor network theorists to question what happens to reality if the nature of the performance changes. This question has been tackled, by amongst others Berg and Bowker (1997) in a paper on medical records, and Mol (1999, 2002) in research concerning the diseases anaemia and atherosclerosis. In the case of both Berg & Bowker (1997) and Mol (1999, 2002) the argument is made that differences in performance can result in reality being multiple, not singular. This is a radical idea which, as is discussed later (Chapters, 5 and 6), is central to the analysis and findings presented in this thesis. Mol (1999) in a paper on ontological politics, describes how the pluralism of multiple realities differs from those of perspectivalism and constructionism using anaemia as an example.

The reality of anaemia takes various forms. These are not perspectives seen by different people – a single person may slide in her work from one performance to another. Neither are they alternative, bygone constructions of which only one has emerged from the past – they emerged at different points in history, but none of them has vanished. So they are different versions, different performances, different realities, that co-exist in the present. (1999: 79)

The argument put forward by Mol (1999) about anaemia can equally be applied to EPRs. Where controversies exist about their scope, scale, functionality or purpose these may be understood not as different perspectives on a single underlying reality, nor as historic alternatives, but as multiple, co-existing realities. This has radical implications for how EPRs are problematised, how they are practiced and how they are evaluated.

For Mol (1999) and others (see Law, 2008) the multiplicity of reality raises important political questions. Multiplicity raises the possibility of there being *options* as to which reality is performed. This does not necessarily equate with choice but invites us to explore how the conditions of possibility that lead to any particular reality being performed come about; a question of where options are. The reality of how an

object is performed may *interfere* with other objects. Whereas the pathophysiological performance of anaemia is only concerned with an individual, the statistical performance of the disease requires that an individual is considered in relation to other members of a group, children of particular ages, men, women, pregnant women. Thus one reality may interfere with another and there are questions of what is at stake in deciding between options. Mol (1999) questions whether one reality can be separated from another when they are *included* in the production of each other. The statistical practice of anaemia requires the clinical practice in order to set statistical norms, but statistical norms may in turn be included in establishing clinical practice. Taken together both practices complicate decision making. Information upon which choices are made can no longer be taken at face value.

A clinical trial in which the *effectiveness* of various interventions is assessed, can no longer be taken at face value. For another question must come first: what are the *effects* that we should be seeking. Answers to that question are incorporated in the information, but also in the techniques we currently live with. They tend to be implicit, entangled and inextricably linked up with the various performances of any one disease. (1999: 86)

In her work on ontological politics Mol (1999) raises some interesting questions about how realities are incorporated into, and interfere with, one another and what implications this has for making choices between realities. This short work ends with a brief discussion about patients and choice in healthcare. This is a theme that she later expanded on in a subsequent work (Mol, 2008) about the *logics* of choice and care. This later work tackles a similar theme to one previously explored by Law (1994) in a study of a large research organisation in which he develops the idea of *modes of ordering*. Law (2008) and Mol (2010) both make a connection between logics, modes of ordering and earlier work by Foucault on discourses, all terms which have been coined in order to convey the sense in which some objects/realities/networks co-exist with, yet at the same time are in tension with, one another.

2.13 Logics, Discourses and Modes of Ordering

Various ANT works such as Law's (1994) study of a large research organisation show that networks do not exist in isolation from other networks; they coexist in realities filled with other networks and share actors with these. As discussed in section 2.12 the translation of one network may have effects on others. Some networks, in particular spaces and times, may fit together, or share an affinity with (Mol, 2008) other networks in interconnected assemblages. These may be seen as sets of practices with a common thread running through them. This concept has been articulated in various different linguistic terms. Mol (2008) used the term logics, talking about the logic of care and the logic of choice. Law (1994) used the term 'modes of ordering'. Discourse has sometimes been used to serve the same or a similar purpose (Law, 2008; Mol, 2008). Mol (2010) finds fault with all these terms but states that "one way or another, these days most ANT researchers no longer unravel singular networks, but attend to co-existing ones in tension" (2010: 260).

These assemblages, logics, modes of ordering, discourses, are not fundamental, they are not the given order of things, and they don't exist in the abstract any more than the individual networks that they comprise of. They have to be enacted and performed just like any other. A mode of ordering may be thought of as a macro-actor in the sense that Callon & Latour (1981) talk of them, of a pile of black boxes stacked one on top of the other:

A black box contains that which no longer needs to be reconsidered, those things whose contents have become a matter of indifference. The more elements one can place into black boxes – modes of thought, habits, forces and objects – the broader the construction can raise. (1981: 285)

By the accumulation of sets of practices, logics may obtain durability and be hard to disrupt. As Law (2008) states, after Foucault, “discourses define conditions of possibility, making some ways of ordering webs of relations easier and others difficult or impossible” (2008: 149). Mol (2008) explores this idea in relation to two ‘logics’ which may be found in healthcare, the logic of care and the logic of choice. As discussed in Chapter 5 understanding how logics/discourses/modes of ordering define conditions of possibly is important to understanding how different problematisations and practices of EPRs become controversial and interfere with one another.

2.14 Boundaries, Malleability, Mobility Fluidity and Durability

As has already been discussed, ANT rejects foundational notions of reality in which overarching social forces exist as givens in favour of realities composed of heterogeneous actor-networks. Actor-networks are the outcome of controversies which are settled when through a process of translation actors become established as obligatory points of passage. But translation is not a once and for always activity, Actor-networks have to be continually performed and enacted or they fall apart and new ones are formed. Law (2008) notes how Mol in particular has shown how differences in performance may result not in a single uniform reality but in multiple realities. “Mol [washed] away a single crucial assumption: that successful translation generates a single coordinated network and a single coherent reality” (2008: 152).

Building on the work of how actor-networks are formed, what they are formed of and how they achieve stability have been studies of how these realities relate to each other (Law, 2008). This, in turn, has recursively led to a revisiting of some of the early ideas about how actor-networks are formed, what they are formed of and how they achieve stability. Mol and Law (1994) explore the possibility that ‘the social’ may have multiple topographies. They noted how the clinical diagnosis of anaemia isn't fixed and invariant, being performed in the same way in different places, an immutable mobile, but that the elements of which it is made and the way they hold together vary from one place to another; it is mobile but it is also mutable. In this they liken it to the flow of a fluid, “variation without boundaries and transformation without discontinuity”, and they point to how fluids and networks differ:

In a network things that go together depend on one another. If you take one away, the consequences are likely to be disastrous. But in a fluid it isn't like

that because there is no 'obligatory point of passage'; no place past which everything else has to file; no panopticon; no centre of translation; which means that every individual element may be superfluous. (1994: 661)

The clinical diagnosis of anaemia described by Mol and Law (1994) contrasts with the domestication of scallops described by Callon (1996). The technique of domestication was not successfully transported from Japan to France because to be successful larvae, tides, predators and fishermen all had to perform the role allocated to them in the network by the scientists. They did not, the network collapsed and the desired translation was not successfully achieved.

Another example of fluidity is provided by de Laet and Mol (2000) the Zimbabwean Bush Pump is a fluid object mutable across place and time. It is able to work successfully in different parts of the country because it was designed to be flexible and work with spare parts improvised on the spot rather than having to rigidly conform to a single specification. The pump changes, but slowly bit by bit, not abruptly. These are useful concepts to help understand what happens when EPR technologies are transported from one country to another, one hospital to another or even one specialty or sub-specialty to another (Bjorn, et al., 2009) and when they change over time due to upgrades, bug fixes etc.

There is another type of object which is arguably of relevance to the reassembly of electronic patient records and that is what Law and Singleton (2005) in a study of alcoholic liver disease refer to as a 'fire object'. The notion of fire objects is Law and Singleton's (2005) response to criticism of a perceived weakness in earlier ANT analysis which is that it tries to make sense of objects in terms of presence, the entities and their relationships which make up a network, but that sometimes objects need to be understood in terms of what is absent or 'other'. The importance of otherness is, they argue, inspired by 'a post-structuralist critique of what is sometimes called the metaphysics of presence' which can be summarised as follows:

Simply stated, the argument is that not everything can be brought to presence. Or, to put it differently, to make things present is necessarily also, and at the same time, to make them absent. Presence, in short, depends upon absence (just as absence depends on presence). (2005: 342)

And they go on to state that:

The argument, then, is that we cannot understand objects unless we also think of them as sets of present dynamics generated in, and generative of, realities that are necessarily absent. Such objects are transformative, but the transformations are not the gentle flows discussed above in fluid objects. (2005: 343)

In a hospital, one reality of alcoholic liver disease is that successful treatment involves the absence of alcohol, but in a run-down housing estate another reality is that if a person is drinking it may mean that they are not taking heroin instead. They argue that these realities are discontinuous, they jump from one to the other rather than flow into one another, they are not included in one another. Alcoholic liver

disease is therefore a different kind of object to the Bush Pump or the diagnosis of anaemia. The argument in part is that fires are energetic and transformative, and depend on difference – for instance between (absent) fuel or cinders and present (flame). Fire objects, then, depend upon otherness, and that otherness is generative. (2005: 344)

These three types of object assemblage, the immutably mobile actor-network, the mutably mobile fluid and the fire, in which, presence is generated from absence, are all useful theoretical concepts which are returned to later in the thesis when EPRs are 'reassembled' in Chapter 6.

2.15 Conclusion

In this literature review it has been shown that the term Electronic Patient Record has no hard and fast definition. Despite this, historically speaking, most EPR research has been conducted in a positivist paradigm although there is a growing body of non-positivist, sociotechnical studies. EPRs, especially those on a national, regional or hospital-wide scale have been seen as having the potential to bring many benefits but realising these has proved difficult to attain in practice. This was especially noticeable with the NHS NPfIT. Therefore, most EPRs found in hospitals are smaller departmental systems which are largely standalone silos of data. The reasons for this may include the political nature of information systems in healthcare, the complex nature of healthcare work and the multiplicity of stakeholders in healthcare information systems. One important stakeholder group is patients themselves and EPRs have been linked to notions of patients as active participants in, rather than passive recipients of, care. Given all of this there is a growing trend towards rethinking approaches to evaluating EPR implementation programmes in less binary terms than success and failure. However, studies that evaluate implementations will only ever be able to tell part of the story of why it appears so difficult for NHS hospital trusts to achieve the integrated hospital-wide EPRs many still hanker for in the post NPfIT era. There is a need for further research to understand what it is that different actors understand EPRs to be, why hospital-wide EPRs remain such a popular notion despite most EPR systems in Trusts being smaller departmental systems and how it is that Trusts end up with the EPRs that they do.

A sociotechnical study would appear best placed to help answer these questions and one theoretical approach which authors have found particularly useful for such a study is Actor-Network Theory. ANT is not a single uniform theory but neither is it a random heap of bits and pieces. It may be best thought of as a set of tools for engaging with the world. As a consequence of its anti-foundational, relational and recursive ontology the makeup of reality may be seen in different ways. Agency is no longer taken to be an exclusively human phenomenon, things that are taken as given are now seen as the outcome of a performance by networks heterogeneous actors, if they cease to be performed or are performed differently they disappear or change. A consequence of this is that if something is performed in different ways at different times or places it may have multiple realities. Sometimes realities may achieve relative stability, sometimes they may flow into one another and sometimes

they depend on absences as well as presences. All of this has implications for research design and method and these are discussed in the following chapter.

3 Methodology

3.1 Introduction

This chapter sets out the methodology and research design used in this thesis. These were developed iteratively over the course of the study. The final research design is the product of a complex set of relationships between the object of study, existing related literature, the development of a theoretical approach, the development of research questions and the gathering and analysis of data. For the convenience of the reader this chapter is set out in a linear fashion but in practice the exact relationship between each of the topics covered in this chapter was not so neatly and exactly ordered. Each built upon and informed the other until the final design was eventually settled upon.

In the previous chapter existing sociotechnical literature on the subject of EPRs was reviewed and various theoretical approaches which had been used in these studies discussed. Of these, ANT offered the most useful theoretical basis to inform this piece of research. This chapter picks up from this point, beginning (section 3.2) with a brief discussion of the relationship between ontology and epistemology. This is followed by a discussion of the type of theory that ANT is, what it can (and cannot) offer the researcher who chooses to work with ANT, and the sort of contribution to knowledge which can be made by ANT informed case study research. In particular the contentious issue of the generalisability of findings from single cases is addressed (section 3.3). The next section (3.4) examines the link between ANT and the study of controversies in science and technology. In the section after this (3.5) it is shown how the chosen case study site is at the centre of a number of controversies. It is then shown how these controversies informed the design of the case study and the development of a set of research questions.

The remainder of the chapter is devoted to a discussion of the methods of data collection and analysis used in this thesis. This begins (section 3.6) with an overview of Callon's (1986) three methodological principles of agnosticism, generalised symmetry and free associations which underpin ANT. The next section (3.7) sets out why qualitative methods, including semi-structured interviews and observation, were used for data collection, who was interviewed, and who and what observed. After this (section 3.8) there is a discussion of thematic data analysis including the implications that different research paradigms hold for its use and why it is important to be specific about the exact processes followed whilst performing thematic analysis. Finally, an exact account is given of how the data collected in this investigation was thematically analysed and how this led to the findings set out in the remaining chapters of this thesis.

3.2 Theory and Knowledge

Ontology is defined by Mol (1999) as that "which in standard philosophical parlance defines what belongs to the real, the conditions of possibility we live with" (1999: 74). As the previous chapter has shown, historically research into EPRs has been dominated by positivist research. According to this position there is no inherent

need to consider ontology as it is taken as stable (Singleton and Law, 2005; Mol 1999). Contention may occur at the level of epistemology, which Gregor (2006), in a discussion of the nature of theory in information systems research, refers to as “how knowledge is acquired and justified” (2006: 614), but what is ‘in the world’ is not a question to debate. However, Greenhalgh et al. (2009) do bring critical focus to ontology in their systematic review of the EPR literature in which they both question and categorise authors’ “assumptions about the nature of reality” (2009: 733). Greenhalgh et al. (2009) identified four main philosophical positions on ontology/epistemology, such positions are sometimes referred to (e.g. by Gregor, 2006) as paradigms. Their summary of these positions/paradigms is reproduced here:

- *Positivist*, which assumes an external and knowable reality that can be objectively measured, an impartial researcher, and the possibility of producing generalizable statements about the behaviour of the natural and social world.
- *Interpretivist*, which assumes a socially constructed reality that is never objectively or unproblematically knowable and a researcher whose identity and values are inevitably implicated in the research process.
- *Critical*, which assumes that the social order is inherently unstable. In particular, it involves the domination of some groups by others, such as women by men, workers by capitalists, or patients by health professionals. The purpose of research is at least partly to help these dominated groups challenge their position in society.
- *Recursive (or integrative)*, which assumes that subject and object, micro and macro, social structure and human agency, are reciprocally related and that the purpose of research is to explore the flux between these various dualities over time.

(Greenhalgh et al., 2009: 734)

In the context of these discussions about the potential for adopting diverse philosophical positions, Gregor (2006) takes a pragmatic view of how theory should support research design. She writes of there being four central goals of theory: analysis, explanation, prediction and prescription. She argues that it is in how these goals are pursued that we see the difference between different theoretical positions. She ends by saying that a researcher’s choice of theory should be informed by the nature of the research problem (2006: 634). Gregor (2006) and Greenhalgh et al. (2009) create their classifications of theory in order to understand two broad areas of literature both of which sit at the intersection of the social and technological. However, both acknowledge that whilst theory has embedded within it ontological and epistemological assumptions, it can take very different forms. Theory may be both an over-arching framework which governs the kinds of claims which can be made about knowledge, and knowledge itself may be drawn from the research scenario and expressed in the form of a theory. A requisite is that both theory and method are consistent with the overarching framework adopted.

Furthermore, theory informs how the 'object of study' is understood and the research questions it is therefore logical to ask. For example, as discussed in the previous chapter, in studies categorised by Greenhalgh et al. (2009) as belonging to a 'health information systems' meta-narrative, EPRs were largely understood as simple, functional objects that facilitate clinical work within a hospital setting. Alternatively, other studies situated outside of this meta-narrative drew on a range of theories to understand EPRs as complex sociotechnical systems.

This study originated out of an interest in how NHS Trusts were pursuing their EPR ambitions in the light of the NPfIT's inability to deliver a universal EPR solution across the majority of the NHS. The literature reviewed in the previous chapter suggested that this topic would be best approached by working with theory that was consistent with such a sociotechnical understanding of EPRs. Of the theories considered, Critical Theory, New Institutionalism and Actor-Network Theory (ANT), ANT (and its successor projects) appeared to be the most suitable because it opens up the analysis of EPRs to include their technical attributes, as well the setting in which they are situated and performed, in a way which the other others do not. This theoretical choice had a number of important, and interlinked, implications for the types of questions that can be addressed and the types of truth claims that can be made about the research findings, the overall research design, and the methods of data gathering and analysis.

The starting point for these, as discussed in the previous chapter, is that at the core of ANT is the rejection of foundational ontologies in favour of a performative understanding of reality. This distinguishes ANT, and the truth claims which can be made when working with it from theories which stem from foundational ontology and positivist epistemology. Callon (1999) argued that ANT is not a theory. Both Law (2008) and Mol (2010) have supported this statement but only in so far as to argue that it is not a theory in a positivist sense. Law (2008) writes that theories usually try to explain why something happens but ANT is "descriptive rather than foundational in explanatory terms" which is "a disappointment for those seeking strong accounts" (2008: 141). Mol (2010) makes a similar point that, that ANT is not a theory in the sense that "it offers no causal explanations" and "ANT writings do not offer something that remotely resembles a law of nature" (2010: 261). ANT is not compatible with the standard medical model for evaluating an intervention, the randomised controlled trial (RCT).

However, there are situations in which positivist epistemology, and research designs such as RCTs, are unsuitable vehicles for furthering knowledge. This is particularly the case where it is difficult to isolate and control for a single variable, where the 'object of study' does not have clearly defined boundaries, where it is difficult to identify a before and after position or to say what is 'in' and what is 'out'. In these situations (and the literature reviewed in the previous chapter suggests that the study of EPRs is one such situation) researchers cannot look to make claims which resemble 'laws of nature' and need to work with different kinds of theory. This echoes the point made by Gregor (2006) that there are different types of theory which can serve different purposes and are suitable for different situations.

Latour (2005), Law (2008) and Mol (2010) have all offered explanations of the sort of theory that ANT is. Mol (2010) argues that ANT is a theory if theory is something that:

helps to tell cases, draw contrasts, articulate silent layers, turn questions upside down, focus on the unexpected, add to one's sensitivities, propose new terms, and shift stories from one context to another'. It does this by providing 'sensitising terms, ways of asking questions and techniques for turning issues inside out or upside down (2010: 262)

Latour (2005), in dialogue with a PhD student, states that "It's a theory, and a strong one I think, but about *how* to study things, or rather how *not* to study them-or rather, how to let the actors have some room to express themselves" (2005:142). Law (2008) writes of ANT as a "disparate family of material-semiotic tools, sensibilities, and methods of analysis" (2008: 141). He states that the intellectual concerns of the actor network tradition are "Precarious relations, the making of the bits and pieces in those relations, a logic of translation, a concern with materials of different kinds, with how it is that every-thing hangs together if it does" (2008: 145). Law (2008) argues that ANT provides "a toolkit for telling interesting stories about, and interfering in, those relations" and that it "highlights practices off-limits or uninteresting to non-semiotic approaches" (2008: 147). ANT studies don't offer causal explanations, the focus is on *how* actor networks assemble (or in some cases don't) rather than *why*. ANT studies study 'up' rather than 'down' (Law, 2008); no universal social force or forces can be invoked to explain the events being investigated. Instead Law (2008) states, ANT investigations seek to know the world through grounded empirical case studies.

3.3 Generalisability

The 'studying up' referred to by Law (2008) is often equated with research which results in theory generation. It contrasts to deductive research, or 'studying down', in which the aim is usually to test hypotheses. Bryman (2008), in a textbook on research methods, states that "the process of induction involves drawing generalizable inferences out of observations" (2008: 11). The question of generalisability has important implications for both case study design and the kind of contribution to knowledge that it is possible to make in case study research. This applies particularly to studies which examine a single case in depth, such as Callon's (1986) study of the domestication of scallops, as opposed to studies which contrast multiple cases. Different authors have taken different positions on the ability to generalise from a single case. Thomas (2011), in a textbook on case study research, argues strongly that it is not possible to generalise from a single case. In contrast, Walsham (2006), in an article on interpretive research in information systems, argues the exact opposite equally strongly and maintains that generalisability of findings is possible from a single case.

The debate about the possibility of generalisation from a single case study is discussed in some depth by Greenhalgh et al. (2011) in an article reflecting on their experience of evaluating the NPfIT. In this article they distinguish between two kinds of generalization, analytic generalization drawn from comparing multiple cases and

naturalistic generalization drawn from a single case. They argue that some events are too complex to be universally generalised but that much can be learned from the detailed study of a single case. They argue that in such circumstances the pursuit of generalization by theoretical abstraction is fruitless and that “immersion in detail is the route to understanding complex cases” (2011: 545). This is not a rejection of generalization per-se but rather an advocacy of a very specific notion of generalization in which an understanding of the general is enriched by a detailed study of the particular. Greenhalgh et al. (2011) illustrated this by citing Simons (1996) who writes that:

The scholar who studies a painting of a tree by Cezanne and discusses with others its meaning and significance does not learn about merely this particular painting or the tree in it. Rather, he or she then will also look with a more sophisticated eye at other Impressionist paintings and other trees. (2011: 545)

This is certainly not a universally held view and a counter-position is expressed by Currie and Finnegan (2011) who conducted a different evaluation of the NPfIT to the one Greenhalgh et al. authored. In discussing their research method they state:

...exploratory-descriptive case studies on a single organisation or site (i.e. an NHS hospital) would not elicit in-depth and rich data to develop any meaningful analysis and conclusions on how IT was being deployed and managed. (2011: 157)

Currie and Finnegan's (2011) work drew theoretically on New Institutionalism in their work rather than ANT and Greenhalgh et al. (2011) used the work of the philosopher Wittgenstein in support of their arguments. The arguments of the latter are much closer to those employed by Mol (2008), in her book on the logic of care, and their challenging of what is meant by generalisation could be seen as an almost ANT like move. Mol (2008) used case study to develop her arguments about logics and gives this explanation of what case study allows an investigator to do.

Good case studies inspire theory, shape ideas and shift conceptions. They do not lead to conclusions that are universally valid, but neither do they claim to do so. Instead, the lessons learned are quite specific. If one immerses oneself long enough in a case, one may get a sense of what is acceptable, desirable or called for in a particular setting. This does not mean that it is possible to predict what happens elsewhere or in new situations. Dealing with whatever is different always requires work and logics do not do work. They are not actors, but patterns. Thus, the logic of care articulated here only fits the case that I studied. It does not apply everywhere. This is not to say that its relevance is local. A case study is of wider interest as becomes part of a trajectory. It offers points of contrast, comparison or reference for other sites and situations. It does not tell us what to expect – or do – anywhere else, but it does suggest pertinent questions. Case studies increase our sensitivity. It is the very specificity of a meticulously studied case that allows us to unravel what remains the same and what changes from one situation to the next. (2008: 10)

In this sense the way Mol (2008) is using a case (also Callon, 1986) has many similarities with what Stake (1995), in a guide to case study research, called an instrumental case study which is held in contrast to an intrinsic case study. In the latter - explain Baxter and Jack (2008) in an article of qualitative case study methodology - it is the particular case which is of interest and "it is not undertaken primarily because the case represents other cases or because it illustrates a particular trait or problem" (2008: 548) whereas in the former a case is chosen because "It provides insight into an issue or helps to refine a theory. The case is of secondary interest; it plays a supportive role, facilitating our understanding of something else" (2008: 549). In the studies by Callon (1986) and Law (1986) cases are used as devices to illustrate, develop and expand what is now known as Actor-Network Theory as much as to inform their readers about scallop farming and Portuguese imperial expansion.

3.4 Controversy

Callon's (1986) study drew on the concept of controversy as an analytical device. The 'proposed scheme of analysis'⁶, which he sets out in this work, was intended to examine questions relating to controversies, "why and in what conditions they occur and how are they ended" (1986: 15). The link between ANT and controversy can be seen more recently in Latour's (2005) decision to entitle the first part of his introduction to Actor-Network Theory 'How to Deploy Controversies About the Social World'. Callon and the other forefathers of ANT did not invent the notion of controversy, indeed Callon noted that sociologists have devoted numerous studies to controversies, but they did make use of controversies as a device for developing their particular analytical methods.

Controversy has been defined in this respect in several different ways. Callon (1986) himself wrote that "controversy is all the manifestations by which the representativity of the spokesman is questioned, discussed, negotiated, rejected, etc." (1986: 15). This being a reference to the act of mobilisation, a concept central to ANT, in which actors attempt to impose themselves as representative spokesmen for other actors. Venturini (2010) who worked with Latour, cites a definition from the MASCOPOL (MAPPING Controversies on Science for POLitics) consortium which promotes the 'cartography of controversies', an educational version of ANT initiated by Latour:

The word "controversy" refers here to every bit of science and technology which is not yet stabilized, closed or "black boxed" ... we use it as a general term to describe *shared uncertainty*. (2010: 260)

Venturini goes on to add his own definition that:

Leaving aside the reference to science and technology (which will be discussed later), the definition of controversy is pretty straightforward: *controversies are situations where actors disagree* (or better, agree on their

⁶ Callon (1986) called this scheme of analysis 'the sociology of translation', it is to all intents and purposes an early version of what is now commonly known as ANT.

disagreement). The notion of disagreement is to be taken in the widest sense: controversies begin when actors discover that they cannot ignore each other and controversies end when actors manage to work out a solid compromise to live together. Anything between these two extremes can be called a controversy. (2010: 261)

There are several points of interest to this investigation here. The first is the recurring⁷ connection with science and technology studies. Controversies often occurring in dynamic environments characterised by change and this is often most visible in the fields of science and technology. Linked to this is the second point. It is in situations such as the introduction of new technology, where actors which were previously able to ignore each other may find themselves brought into conflict. Venturini (2010) goes on to add that

In controversies, actors tend to disagree on pretty much anything, including their disagreement itself. That's why issues are so difficult to solve, because they are impossible to reduce to a single resuming question. (2010: 262)

It can thus be seen that ANT offers a useful theoretical set of tools for exploring cases which are the subject of controversy and that controversies are often visible in dynamic environments such as the introduction of new technologies. This made ANT and case study the ideal theory and method with which to design a piece of research to investigate controversies concerning how NHS Trusts were pursuing their EPR ambitions post NPfIT.

3.5 Case Study and Research Questions

The specific case which was chosen for this study was a local NHS Trust, Brighton and Sussex University Hospitals NHS Trust which was in the very early stages of introducing a new Trust-wide EPR system. This made an ideal case study site for several reasons. Firstly, this new Trust-wide EPR appeared to be a good source of controversy. Existing literature on EPRs suggests there is little evidence that such organisation-wide EPRs can deliver the benefits claimed of them. Therefore, to invest large sums of money, particularly at a time when the NHS is under severe financial pressure, in such an EPR is in itself controversial. Furthermore, the Trust already had several existing standalone specialist departmental systems and the introduction of a new Trust-wide EPR created tensions with these. Lastly, from a very practical point of view, the Trust had well established links to the researcher's university department and was amicable towards having a PhD student on site thus greatly facilitating access.

In order to capture the tensions between different problematisations of EPR the case study was designed to include three embedded subunits. These were: the new Trust-wide EPR, Alert; and two legacy departmental/specialist systems the Somerset Cancer Register; and a renal specialist system Clinical Vision 5. These specific systems were chosen for the contrasts they provided with each other. These are summarised in Figure 1 below which describes each of the three EPR

⁷ See also Callon (1986)

systems studied in this research according to four key characteristics. It highlights the differences between these systems in terms of the specialties they serve, their implementation status, their origins and who uses them. This is explored in much greater detail in the following chapter (chapter 4).

	Alert	Somerset	CV5
Specialties	All specialties	Multiple specialties involved in cancer care	Renal only
Implementation status	In process of being implemented	Implemented and in use	Implemented and in use
Origins	Foreign, commercial	NHS produced	UK, commercial
Users	Trust use only	Some shared use outside of Trust	Some shared use outside of Trust

Figure 1 Contrasts between EPR systems in study.

Before field work could commence an initial set of research questions were drafted on the basis of the kinds of tensions existing literature on EPR suggested might be present at the case study site. This initial draft served several purposes: it helped to inform the overall research design; it was necessary to satisfy the various requirements of university regulations and to obtain the ethical and access permissions necessary to gain access to the field; and it provided a framework to guide data collection and analysis. However, as Braun and Clarke (2006) note “Although all projects are guided by research questions, these may also be refined as a project progresses” (2006: 85). In this investigation the research questions were gradually and iteratively developed over the course of many months as the data which had been collected was analysed in line with the ongoing development of a theoretical position. This is entirely consistent with, and indeed necessitated by, a research design which is empirically grounded and exploratory in nature. These questions in their final form became:

Question 1

How are EPRs being problematised in an NHS secondary care Trust post NPfIT?

Question 2

How do differences in the problematisation of EPRs relate to and interfere with the sociotechnical enactment of these systems in the Trust?

Question 3

How might changing the way EPRs are problematised effect how they are enacted?

3.6 Data Collection and Analysis

ANT is not prescriptive in terms of research methods but there are a number of underlying principles which were set out in Callon’s (1986) work on the sociology of translations. His contribution centres around three methodological principles that he applies to the analysis of controversies in science and technology, those of agnosticism, generalised symmetry and free association. He believed that when sociologists have studied controversies in science and technology they have

created an artificial distinction between social and natural scientific/technical aspects of these controversies. This asymmetry he argued leads to three difficulties: firstly of style; secondly of a theoretical nature; and thirdly methodological difficulty. Stylistically he was concerned that sociologists censor actors' accounts of themselves, allowing them only to speak freely about nature. His response to this is to extend the agnosticism of the observer to include the social sciences as well as nature:

Not only is the observer impartial towards the scientific and technological arguments used by the protagonists of the controversy, but he also abstains from censoring the actors when they speak about themselves or the social environment. He refrains from judging the way in which the actors analyze the society which surrounds them. No point of view is privileged and no interpretation is censored. The observer does not fix the identity of the implicated actors if this identity is still being negotiated. (1986: 4)

Theoretically, he believed that once it is accepted that the social and natural sciences are equally uncertain, then both must play an equal role in analysis. This is the principle of generalised symmetry:

We know that the ingredients of controversies are a mixture of considerations concerning both Society and Nature. For this reason we require the observer to use a single repertoire when they are described... the rule which we must respect is not to change registers when we move from the technical to the social aspects of the problem studied. (1986: 4)

The third, methodological difficulty is that the identity of actors is problematic and to ignore this is to risk writing slanted stories. To overcome this requires the principle of free association:

The observer must abandon all a priori distinctions between natural and social events. He must reject the hypothesis of a definite boundary which separates the two... Instead of imposing a pre-established grid of analysis upon these, the observer follows the actors in order to identify the manner in which these define and associate the different elements by which they build and explain their world, whether it be social or natural. (1986: 4)

Callon (1986) does not explicitly state that these principles can only be adhered to by the use of qualitative methods but there are a number of reasons why qualitative, rather than quantitative methods are most suitable for studies which work with ANT. This is most apparent in the principle of *free association* in which he rejects imposing pre-established grids of analyses and urges the observer to follow the actors. Many past studies in the sociotechnical and/or health and social care fields, such as Aanestad (2003), Berg (2001), Bruni (2005), Ellingsen and Monteiro (2003) and Henwood, Harris and Spoel (2011), which have worked with theoretical concepts associated with ANT and its successor projects have used qualitative methods and no examples of such studies using quantitative methods spring readily to mind.

3.7 Methods of Data Collection

Commonly used qualitative methods of data collection include interviews, observation, focus groups and the gathering of documentary materials. Each has its own strengths and weaknesses and by using a combination of methods it is possible to exploit those strengths whilst compensating for the weaknesses and hence increase the robustness of the investigation. For this reason it was planned to use all four of these methods in this investigation.

The first method employed was the semi-structured interview. Totally unstructured interviews might have been more in keeping with Callon's (1986) principles of agnosticism and free association however these run the risk of veering completely off topic. The semi-structured interview has the advantage of enabling the researcher to gather the thoughts and experiences of participants in a way which is more focused than a totally unstructured interview, without being as rigid as using a closed set of questions. Currie and Guah (2007) consider that this is "critical for allowing interviewees to raise additional themes, issues and concerns that they felt were important to the research study" (2007: 240). Takian et al. (2012) that

Encouraging research respondents to narrate their own stories drawing from their past experiences, present understandings and future projections, builds a rich picture of the many processes that are at work, not all of which align directly with the innovation or technology in question. (2012: 8)

Topic guides and schedules of interview questions for the semi-structured interviews were developed progressively over the course of the research project. In the early design phase of the research plan, prior to the commencement of fieldwork, a matrix was drawn up which matched of interview questions with the types of interview participants it was hoped to recruit (see Appendix 4). At this stage the topics covered in the interview schedules were quite broad in scope and their match to participants quite generic. They were based on a combination of the evolving research questions and the literature reviewed in Chapter 2 including various strategy and policy documents. However, it was an explicit part of the research plan that the topics covered in interviews would be refined as understanding of the research topic evolved as the fieldwork part of the project progressed.

As participants were recruited individual interview schedules were drawn up for each participant with questions tailored towards their specific relationships to the EPRs in the study. The scope of the topics covered in these schedules varied from being quite broad based, such as questions about EPRs and patient-centred care in general, through more focussed questions about a particular EPR to sometimes very specific and detailed questions about, for example a technical point to do with electronic interfaces between specific IT systems. The more broad based topics were included in almost all schedules, there was a basic distinction made between the schedules for patients and everybody else, whereas some of the more specific questions were only relevant to very limited numbers of interviews. An example interview schedule used with a clinical user of the renal CV5 EPR is provided in Appendix 1. The majority of interviews were recorded and then transcribed for later

analysis. A couple of interviewees preferred not to be recorded so during these notes were taken instead.

Sometimes participants supplied documentation prior to interview which they thought would be of relevance to the interview. This could lead to questions being included in individual schedules (for those interviewees and others) which were much more specific than those set out in Appendix 4. An example is a document concerning giving access to Brighton's Somerset system to healthcare professionals employed at neighbouring Trusts which stated that Somerset was not an EPR. This led to a specific question about this statement being included in interviews with participants who worked in cancer services. One participant's response to that question, which focussed on the importance of EPRs as a source of data that had to be supplied to external audit bodies, then in turn led to the inclusion of questions about audit data sets being asked to subsequent participants associated with all three of the EPRs in the study. Similarly what was observed in meetings led to extra questions being included in some interview schedules. For example it was noted that certain groups of professionals, such as information analysts and managers, were not present at the Trust-wide EPR programme meetings which were observed. Therefore a question about engaging with them was included when interviewing participants involved with that programme.

Not all interview topics elicited responses from interviewees in ways which produced as rich information as expected, or related to data from other sources, such that questions on those topics were further developed along the lines outlined above. This was most notably the case with the relationship between EPRs and notions of patient-centred care. The prominence of this topic in the literature review, especially as a feature of government policy, had suggested that it might have featured in interviewees' accounts of, for example, what they considered the most important features of an EPR to be. However, this turned out not to be the case. It was not a phrase used spontaneously by interviewees and two explicit questions⁸ about EPRs and patient-centred care didn't, for the most part, elicit the depth of response that other topics did. Two further questions⁹ were partly intended to see whether participants were familiar with national and Trust level policies and strategies related to IT and healthcare. For the most part, even with more direct prompting along the lines of "The Trust's 2010 *Information Strategy* states..." participants were much less aware of the existence, let alone content, of these documents (particularly the Trust's 2010 *Information Strategy*) than had been anticipated when these questions were formulated. There were however a few exceptions to this where a couple of participants connected to cancer services and the Trust-wide EPR programme were very familiar with the content and implications of some of these policies and strategies. More generally there was a noted absence of rich accounts of negative experiences that the literature review indicated might be produced by questions such as those relating to, for example, participation in decision making about EPRs, about the influence of past experiences with healthcare IT and about EPRs shaping working practice.

⁸ Questions 8 and 9 in the Interview Participant/Question matrix (Appendix 4)

⁹ Questions 3 and 11 in the Interview Participant/Question matrix (Appendix 4)

Whilst interviews allow an in-depth exploration of individual's experiences and are comparatively easy to arrange they suffer from a number of drawbacks. The time taken to recruit, conduct, transcribe and analyse each interview means that they are not a good way to gain access to a large number of participants. Secondly, interviewees are effectively self-reporting and studies that have combined interviews with observation have sometimes revealed that what people say they do and what they actually do are not always the same. Another method that overcomes these problems is the focus group. This allows access to more people at the same time and may produce more accurate data as participants correct one another's accounts. They can stimulate discussion and as participants recount their experiences in the presence of their peers this can be an effective way of disclosing different standpoints on the same events and issues. In the research plan it was intended to arrange a focus group involving patients, however after meeting with a patient group it became clear that they were not in favour of this method, it being logistically difficult to organise. For this reason semi-structured interviews were used instead.

The intention was to recruit interview participants with as wide a range of relationships with each of the EPR systems in the study as possible, including clinicians, patients, IT specialists, service managers and the systems vendors. Recruitment of participants was strictly governed as a condition of the ethical and R&D approvals outlined in Appendix 2. The initial starting point was a small group of individuals who had been informally approached in the early stages of scoping out the research design and had agreed to act as contacts or 'collaborators'. These were named on the ethics/R&D applications and all recruitment had to be initiated through them. It was not permitted to approach potential interview participants 'out of the blue' but these collaborators could contact people they thought they might be interested in the investigation and pass details on to them. If these people responded with an expression of interest a formal process of sending them participant information sheets, arranging interviews and obtaining written consent was undertaken. Several of the early participants then offered to pass on details of the investigation to other potential participants and recruitment snowballed from there. The arrangement for recruiting patients differed slightly. Attempts were made to establish contact with various patient representative groups and this was done successfully with a renal patient group who, following approval from the research ethics committee permitted an advert to be placed in their group magazine.

In total 20 interviewees were eventually recruited. A table giving basic descriptions of interviewees is provided in Appendix 3. It was a particular concern of the NHS Research Ethics Committee that the identity of participants was to be protected and details such as exact job titles, gender or age or anything else which might lead to their identity being disclosed could not be revealed. Consequently, the descriptions given in Appendix 3 are intentionally rather vague. Each interviewee was given a unique but meaningless identifier (e.g. Interviewee 1) and any quotes used in the thesis are attributed to these identifiers. Interviewees occupations are only referred to in very generic terms and only to the extent which is relevant to the analysis, e.g. when discussing different level of access that different professions have to patient

records a distinction might be made between doctors and other healthcare professionals.

Nine interviewees were recruited primarily because of their involvement with Somerset and cancer services; seven because of their involvement with CV5 and renal services, two as patients; and four because of their involvement with Trust-wide IT issues including the new Trust-wide EPR. Figure 2 gives an indication of how interviewees were associated with each of the EPRs in this study. Seven interviewees were practicing healthcare professionals including doctors, nurses and allied healthcare professionals. Two were patients. Five worked for vendors of EPR software. Six had non-clinical roles in IT project work and service delivery. The distribution of interviewees by occupation is shown in Figure 3. There was however some degree of crossover between these categories. Some Trust employees had responsibilities which encompassed more than one of the EPRs in the study. Thirteen interviewees either worked for, or were patients at, the Trust. As such all of these were potentially affected by the new Trust-wide EPR. Additionally some non-Trust interviewees had had some interaction with the Trust in connection with the new Trust-wide EPR. All of these participants were therefore asked questions about this programme. Whilst two participants were recruited specifically because they were patients, as one interviewee pointed out anyone could find themselves being a patient at some time.

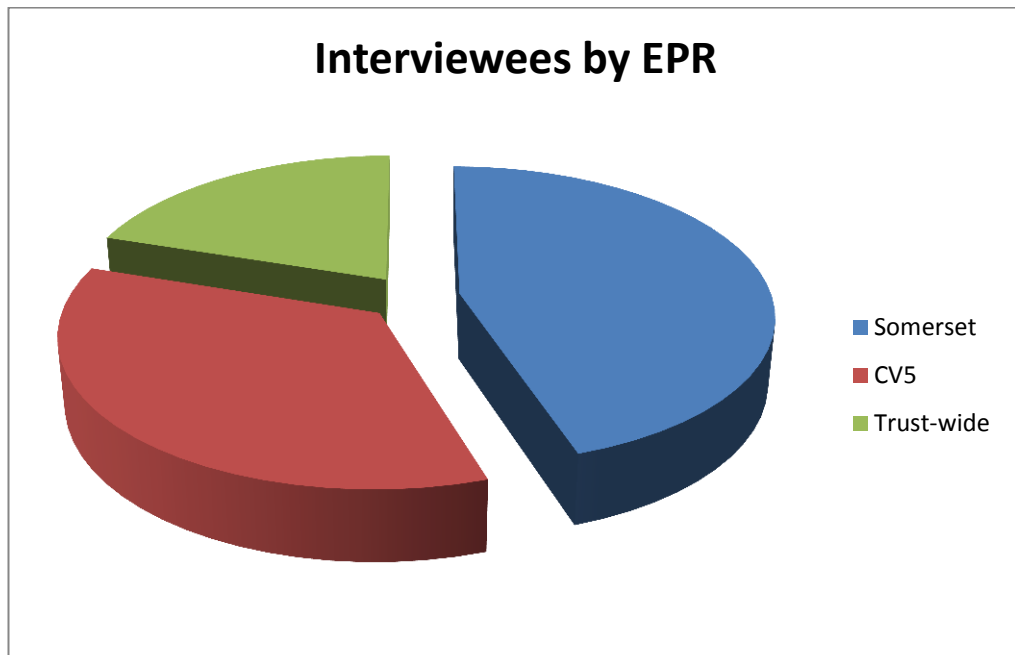


Figure 2 Interviewees primary domain of EPR experience.

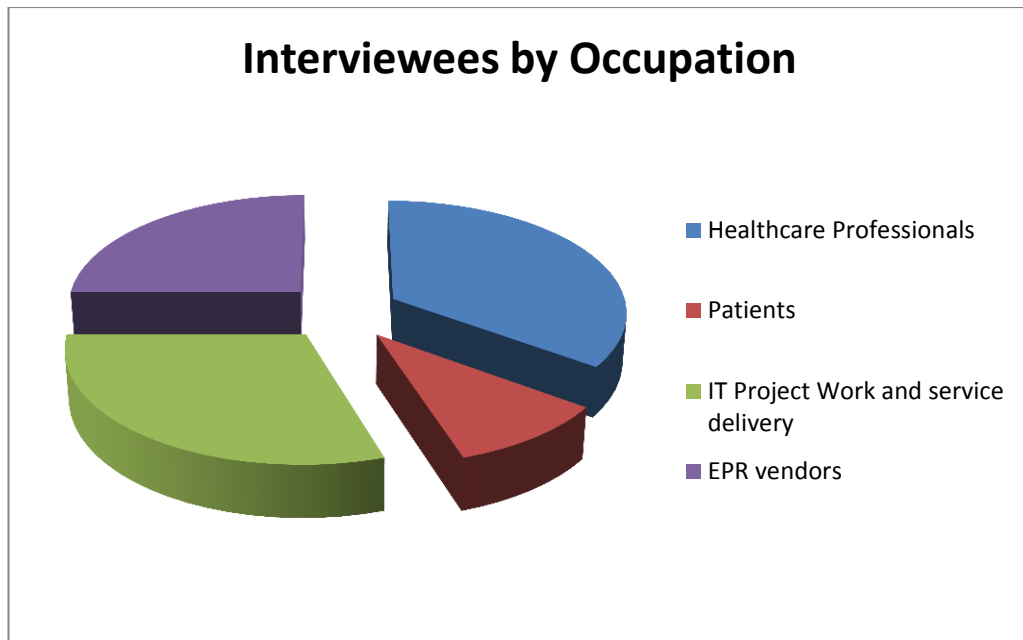


Figure 3 Interviewees categorised by their occupations.

Although the process of recruitment of interviewees was never intended to be fully or evenly representative of everyone with an association with the EPRs in this study there are some shortcomings that should be highlighted. No employees of Alert Life Sciences, the vendors of Alert were interviewed. One participant kindly volunteered to pass on details of the study to other potential participants who might then be able to pass them onto Alert but this did not result in any participants being recruited who worked for Alert. Similarly, no one who worked with any of the EPRs in an administrative capacity such as a medical secretary or patient pathway co-ordinator was recruited either. This may possibly be a reflection on people's freedom to manage their own work schedules. Lastly, every interviewee was broadly speaking an enthusiast for EPRs with no one strongly opposed to them, although as will be seen in the following chapters their ideas as to what constitutes an EPR varied. Possibly this may be a reflection of the process by which they were recruited which led to them being, to a large degree, self-selecting.

Some of these drawbacks were addressed by observation. This method is particularly favoured in the cartography of controversies (Venturini, 2010). Observation allows the investigator to see events as they unfold, in their natural surroundings it is also a way in which non-humans, i.e. the EPR technologies, to 'speak for themselves'. There is however the obvious disadvantage that it is only possible to observe contemporary happenings. Agreement was negotiated to observe a variety of meetings being conducted as part of the Trust-wide EPR programme and the regular Action Learning Group meetings held in the kidney unit. As a result of attending these meetings an invitation was extended to attend a CV5 users' day, jointly hosted at the kidney unit by CCL and staff at the unit. A total of fifteen observation events took place at the Trust. These are summarised in Figure 4.

Event	No. Observed
Renal ALG monthly meeting	6
CV5 Users' Day	1
Trust-wide EPR programme stakeholder engagement meeting	1
Trust-wide EPR programme current process workshop	3
Trust-wide EPR programme future process workshop	3
Trust-wide EPR programme implementation progress meeting	1

Figure 4 Table of observations activities.

Obtaining ethical permission for these observations was governed in a slightly different manner to interviews. As the ALG meetings were held regularly with a relatively stable membership written consent had to be obtained from group members. The situation was different with the Trust-wide EPR programme meetings. These were not a continuous series of regular meetings and did not have a fixed and stable set of attendees, therefore it was permitted to assume consent for observation so long as the observer's presence was made known at the start of meetings and no objections were made to their presence. Written notes were made during observations but no audio or video recordings were made.

During some of these meetings test versions of the EPR software were demonstrated to attendees, for example, to illustrate bug fixes/enhancements to CV5 and to show how Alert was supposed to work. One interviewee, an IT specialist, also gave a demonstration of a test version of one of the EPRs using dummy data. As the investigation was never intended as an evaluation of how the EPRs were used in practice no permission was sought to observe, and no observations were made of, any of the systems being used with 'live' patient data. It was felt that this was unnecessary for the objectives of the study and therefore not ethically justifiable.

Finally, documentary materials were gathered from a variety of sources over the course of the project. In the early stages of research plan development an internet search was conducted for documents concerning NHS health informatics policy in general and more specifically concerning BSUH, the Sussex Renal Innovation Programme or the Sussex Cancer Network and EPRs. This was carried out using internet search engines and a search tool on the BSUH website that allowed visitors to search the Trust's online document repository. Examples of documents collected in this way included the Trust's *Health Informatics Strategy* (2010) and a Sussex Renal Innovation Programme newsletter. Once NHS ethical permission for the study had been granted and access negotiated with the organisations involved more sources of data became available. Interviewees and the organisers of the various meetings that were being observed supplied documents such as project plans, organisation charts, business cases, issue logs, the agenda and minutes from meetings together with copies of presentations and handouts from those meetings. Other types of documents collected included copies of posters and personal papers that some interviewees had written concerning their thoughts about EPRs as well as a variety of patient information leaflets from the renal unit.

3.8 Method of Data Analysis

The most serious and central difficulty in the use of qualitative data is that methods of analysis are not well formulated. For quantitative data, there are clear conventions the researcher can use. But the analyst faced with a bank of qualitative data has very few guidelines for protection against self-delusion, let alone the presentation of unreliable or invalid conclusions to scientific or policy-making audiences. How can we be sure that an 'earthy', 'undeniable', 'serendipitous' finding is not, in fact, *wrong*? (Miles, 1979 cited in Miles and Huberman, 1994: 2)

The quote above, from a textbook on qualitative data analysis, illustrates a common criticism of qualitative data analysis, that a lack of rigorous method can lead to accusations, frequently attributed to those more used to working with quantitative data, that findings can be unreliable, invalid or just plain wrong. Braun and Clarke (2006), in a paper on thematic data analysis, and Silverman (2011), in a textbook on interpreting qualitative data, make similar points. They refer to the potential for accusations of unreliability and anecdotalism, taking singular examples of some happening as evidence of a wider phenomenon when this may not in fact be the case. These criticisms it is suggested may be particularly applicable if little or no account is provided of exactly how the researcher went about analysing their data. Braun and Clarke (2006) make this point in citing Attride-Stirling (2001)

If we do not know how people went about analysing their data, or what assumptions informed their analysis, it is difficult to evaluate their research, and to compare and/or synthesize it with other studies on that topic. (2006: 80)

This may be considered especially pertinent to research in the ANT tradition. As Law (2008) points out, early work by Latour that led to the development of ANT was concerned with examining the *practices* (accounts of which were often missing from final reports) which lead to the production of scientific knowledge.

Qualitative data analysis is defined by Miles and Huberman (1994) as "consisting of three concurrent flows of activity: data reduction, data display, and conclusion drawing/verification" (1994: 10). In this investigation the practices that lead from the collection of data (described in the previous section) to the answers to the research questions (also described above) presented are provided in the chapters that follow. The first and second flows are the necessary enablers of the third. These may be described as the actions of multiple heterogeneous actors, principally the investigator, but also including audio recordings, texts, databases, theory, methods, posters, conversations, audiences and academics, whereby the approximately twenty hours of interviews and forty-three hours of observation (plus supporting documentation) assembled during fieldwork are turned into the findings presented in the next three chapters of this thesis. The method chosen for this was thematic data analysis.

Braun and Clarke (2006) define thematic analysis as a method for "identifying, analysing and reporting patterns (themes) within data" (2006: 79) which is "essentially independent of theory and epistemology, and can be applied across a

range of theoretical and epistemological approaches” (2006: 78). Despite (or perhaps because of) this they also note that it is “poorly demarcated and rarely acknowledged” (2006: 77) and there is “no clear agreement about what [it] is and how you go about doing it” (2006: 79). They see its flexibility as one of its benefits but also caution that an absence of clear and concise guidelines can leave its use open to an ‘anything goes’ critique of qualitative research. They are critical of passive accounts of themes ‘emerging’ or being ‘discovered’ and cite Taylor and Ussher (2001) as stating that this “denies the active role the researcher always plays in identifying patterns/themes, selecting which are of interest, and reporting them to the readers” (2006: 80). This echoes a point made by Law (2008) about all texts, “They come from somewhere and tell particular stories about particular relations. This implies the need for a health warning.” (2008: 142). For this reason Braun and Clarke (2006) advocate that those who use this method make sure they clearly describe precisely how it has been used particularly as differences in how it is practiced have important ontological/epistemology implications.

Arguably, the first analytical acts in this investigation were undertaken during data collection. As it was impossible to write down everything being said and done when observing a meeting, note-taking became an act of data reduction with the content of a three hour meeting reduced to as much as the observer was able to write in their notebook during the meeting, plus any reflective notes written up immediately afterwards. Therefore, a judgement had to be made as to what to record. Here it is worth noting what Braun and Clarke (2006) write about different positions on when to engage with literature during an analysis. They note that there are different positions on when the optimal time is. Some schools of thought argue that if done too early this may prejudice the analysis into favouring some aspects of the data over others. Others argue that failure to engage with literature early on may lead to the analysis missing something of importance. No position is taken here as to which of these views may be correct other than to note that a lot of reading around the topic had been done prior to beginning data collection and that this undoubtedly did influence what was noted during and immediately after observations. For example the work of Bjorn et al. (2009) on the difficulty of configuring common templates had heightened awareness of this as a potential issue when observing Trust-wide EPR programme future process workshops.

The next analytical step taken concurrently with observing meetings was the transcription of the audio recordings of interviews. This was done by the investigator and whilst painfully slow, taking approximately ten hours to transcribe an hour’s worth of recording, did ensure that the data became very familiar. Data was transcribed in its entirety and as close to verbatim as possible. Interviewees were sent transcripts of their interviews and given the opportunity to correct or withdraw them if they so desired. Some corrections, mostly of spellings of unfamiliar medical terms, were received back and no participants asked to withdraw their interviews from the study. Once all data gathering and transcribing had been completed the next stage of the analysis was to code the observation notes and interview transcripts.

The act of coding of the interview and observation data, and the subsequent organisation of these codes into a database, can be seen as an act of both data

reduction and data display. Whilst the meaning of data reduction is reasonably self-evident some further explanation of what Miles and Huberman (1994) mean by data display is required. These are devices, such as matrices, graphs, charts etc. that:

...are designed to assemble organized information into an immediately accessible, so that the analyst can see what is happening and either draw justified conclusions or move on to the next step of analysis the display suggests may be useful. (1994: 11)

Thirty nine sets of observation notes and interview transcripts were systematically coded in their entirety. In keeping with the grounded, data driven principles of ANT, codes were generated from the data rather than attempting to fit the data into a pre-determined set of codes. A custom database was designed to store all the coded data such that it could be easily organized and sorted in ways analogous to the charts and matrices suggested by Miles and Huberman (1994).

The approach taken to coding can be illustrated with two examples, one an excerpt from observation notes (Appendix 5) and one an excerpt from an interview transcript (Appendix 6). The processes started by reading through each text and marking them up with numerical codes. These numerical codes each represent a textual description which was entered, along with their associated code, in a database table. Each appendix includes a table of the codes used, together with their textual descriptions. In the original texts each code was preceded with a unique location identifier so that when logged in the database all occurrences of any code could be easily located within the original texts. These location id's have been omitted from the examples in the appendices.

Most of the codes generated at this stage are quite specific and the work that coding is doing here is data reduction and categorisation. Sometimes quite lengthy passages would be reduced to a single code whereas at other times codes were applied much more frequently. The coded excerpts in appendices 5 and 6 give some idea of this variation. These initial codes were specific and fine-grained because this was the first time in this study that most of the points had been encountered and therefore no thematic categories for grouping codes yet existed. For example, all the codes shown in Appendix 5 were being used there for the first time. As the participants in the meeting reiterated certain points a few of the codes (918, 929) are used more than once during the excerpt. This reiteration reinforces particular codes.

The excerpt in Appendix 6 is taken from an interview which occurred at a later stage in the fieldwork, after the meeting observation from which the excerpt in Appendix 5 is taken. Whilst new codes (1788 to 1792) were still being generated, two (514 & 918) had been used previously. The latter for the first time when coding the observation excerpt shown in Appendix 5. Altogether some 2261 unique codes were generated in this initial exercise. Of these the vast majority, 1899, were used only once, with only 362 being used multiple times. However, many of these codes represented very similar points. Therefore the next stage in the analysis process was to group together these similar initial codes. Multiple initial codes were thus

given a common parent code. Figure 5 shows the initial codes from the excerpt in Appendix 5 together with their 'parent' codes and associated descriptions.

Initial Code	Parent Code	Parent Code Description
918	2395	Usability including performance, process fit, licences, infrastructure, information governance, training, product awareness
919	927	Tensions surrounding pathways, templates and how EPRs might be too rigid for way clinicians like to work
920	921	How can EPRs support working practices crossing organisational boundaries
922	1862	Legal status of paper especially signatures
923	924	Tensions between free text and coded data
925	927	Tensions surrounding pathways, templates and how EPRs might be too rigid for way clinicians like to work
926	927	Tensions surrounding pathways, templates and how EPRs might be too rigid for way clinicians like to work
928	2337	Negative attitudes to EPR
929	927	Tensions surrounding pathways, templates and how EPRs might be too rigid for way clinicians like to work
930	927	Tensions surrounding pathways, templates and how EPRs might be too rigid for way clinicians like to work
931	1811	Legacy of past NHS IT experience
932	252	Issues with entering data onto EPR
933	921	How can EPRs support working practices crossing organisational boundaries
934	254	EPR and auditing reporting external national mandatory
935	2395	Usability including performance, process fit, licences, infrastructure, information governance, training, product awareness

Figure 5.

This exercise reduced the overall number to a more manageable 138 code/descriptions and at the same time began to transform the superficial meaning of the initial codes into the beginning of themes. The initial code 918, 'Clinician concern that consultations will take longer using the new EPR' was grouped together with seven other initial codes into a new code, 2395 'Usability including performance, process fit, licences, infrastructure, information governance, training, product awareness'. Figure 6 below shows all of the initial codes which were grouped together along with 918 into code 2395. Altogether these initial codes occurred 11 times across three sets of observation notes and four interview transcripts.

Initial Code	Initial Code Description	Parent Code
291	Somerset perceived as not as easy to use as it could or should be	2395
331	Somerset has been improved over the years to try and make it faster and easier to input data	2395
667	Acknowledgement by Somerset team that historically Somerset not as good as it could have been	2395
723	Usefulness of an EPR depends on multiple people entering data	2395
880	Clinician asks if any specialities want to opt out of hospital-wide EPR due to change in working practices	2395
918	Clinician concern that consultations will take longer using new EPR	2395
935	Goal of new EPR is to make things quicker not slower	2395
1037	Belief that technology needs to be more customisable to improve ease of use	2395

Figure 6.

This was followed by a further iteration of thematic grouping in which the 138 'parent' codes were further grouped together into 10 'grandparent' codes. The parent code 2395 was grouped with 7 others into code 2397, 'Usability and support, systems strengthening'. These are shown in figure 7.

Parent Code	Parent Code Description	G Parent Code
692	Importance of skills and training required to get the most out of informatics tools	2397
716	Dissemination of awareness of product capabilities	2397
1091	Data quality problems as an impediment to EPR use	2397
2034	Importance of key individuals as EPR champions	2397
2354	Means of providing ongoing post implementation support to get most out of EPR systems strengthening	2397
2369	Levels of IT literacy/skills and like/dislike of using computers	2397
2392	Effectiveness or not of ALG as systems strengthening	2397
2395	Usability including performance, process fit, licences, infrastructure, information governance, training, product awareness	2397

Figure 7.

Altogether the initial codes which eventually grouped into code 2397 occurred 205 times across 14 sets of observation notes and 17 interview transcripts, the most being 33 occurrences in one interview. Organised in this way it was very easy to locate any occurrence of a code/theme, or any word or phrase within a code/theme (e.g. 'paperless') at any of three coding levels, anywhere in any of the 37 observation note/interview transcript texts. All 10 grandparent themes are shown in Figure 8.

G Parent Code	G Parent Code Description
2030	Procuring EPRs, who and what participates and influences
2031	Implementing EPRs
2035	Economic context
2396	Attitudes to EPR and the fit to existing work practices
2397	Usability and support, systems strengthening
2399	EPR as more than a replacement for paper records
2401	Paper and data silos
2411	EPR and data sharing
2412	EPR and how it affects the patient and their health
2413	EPR is not stable, evolves, changes

Figure 8.

Reducing, organising and displaying the data in this way enabled the analysis to focus on two theoretical concepts drawn from actor-network theory, controversies and modes of ordering.

The documentary data which was gathered over the course of the research project was treated differently to interview and observation data, which constituted the primary data for the investigation. Although it is possible to code documentary data in the way just described this was not done in this study. This reflects the different roles this kind of data was intended to perform within the research design, and also because the quantity of data¹⁰ involved meant that was not a practical proposition given the time and resources available. Instead, documents were treated in a number of different ways depending on the types of documents they were. Firstly there were the strategy and policy documents, some of which are discussed in Chapter 2, which provided contextual information which situated the EPRs in this study in relation to national, local and disease specific health informatics strategies and policies. Examples of these kinds of documents include *Liberating the NHS: An Information Revolution* (DoH, 2010b) and *The NHS Cancer plan: a plan for investment, a plan for reform* (DoH, 2000). These were most useful in the early stages of developing the research design and research questions.

Secondly there were the documents, such as various business cases, supplied by research participants which provided finer grained detail of the EPR systems in the study such as how they had come to be chosen and implemented at the Trust. These were subject to closer analysis than those in the first category. They helped guide the preparation of interview schedules, as described in section 3.7 above, and provided pointers to subjects to particularly watch out for during observation activities. These also served as a reference source which provided extra detail to the thematic analysis of the interview and observation data described above and the development of the controversies set out in Chapter 5. This involved frequent reading and re-reading of sections these documents alongside interviewee and observation data which referenced the same topics. For example there were

¹⁰ For example, *The Power of Information* (DoH, 2012) is 115 pages long, the Trust's *Health Informatics Strategy* (BSUH, 2010) 48 pages and the Sussex Cancer Networks business case for Somerset 16 pages

documents which gave extra detail of the technical and information governance process which had to be undertaken to enable the shared access to neighbouring Trusts' Somerset data referred to by some interviewees.

Once the coding of interview and observation data was complete a number of other analytical devices began to be employed in order to help develop and verify these themes. These started with discussing the emergent themes with the supervisory team and ended, after several iterations of drafts, with the remaining chapters of this thesis. The nascent thematic groups taken from the grouping of codes formed the basis of a series of notes and memos sometimes shared with supervisors sometimes used purely to help clarify ideas. Many of these were assembled into a 'mind-map' diagram drawn on a sheet of wall-paper in order to help trace the relationships between them. Here it is worth noting the distinction made by Braun and Clarke (2006 citing Boyatzis, 1998) between semantic and latent themes. Semantic themes are those identified "within the explicit or surface meanings of the data" (2006: 84) whereas latent themes go beyond the semantic content of the data and start

...to identify or examine the *underlying* ideas, assumptions, and conceptualizations – and ideologies – that are theorized as shaping or informing the semantic content of the data. (2006: 84)

This they associate with a constructionist paradigm. As Latour (2005) and Law (2008) make clear, ANT strongly rejects the notions of construction or the possibility of fundamental underlying forces of an essentialist nature through which sociologists are able to reveal some hidden meaning to data. No attempt was made to do so in this analysis. But Braun and Clarke (2006 after Patton 1990) also advocate that:

Ideally, the analytic process involves a progression from *description*, where the data have simply been organized to show patterns in semantic content, and summarized, to *interpretation*, where there is an attempt to theorize the significance of the patterns and their broader meanings and implications often in relation to previous literature. (2006: 84)

Such a criticism of description sits slightly awkwardly in an analysis which attempts to engage with ANT, Latour (2005) stating that "only bad descriptions need an explanation" (2005: 147).

During this analysis a lot of theoretical reading from ANT was being done which was informing how the nascent themes were organised into rough drafts of chapters. The themes became sections within chapters and writing these chapters involved constant reference back to the texts of the original interview transcriptions and observation notes and cross referencing these against each other and the documentary data which had also been collected. As the chapters were drafted and re-drafted some of the initial thematic ideas had to be discarded in order to make room to expand others more fully. It was also at around this time that the further refinement of the research questions discussed above took place as not all the

questions initially drafted prior to the commencement of field work fitted particularly well with the data that had been collected.

Frequently referring back to existing literature during this iterative process of writing and analysis was an integral part of both thematic development and data verification. By referencing existing work about EPRs and the theoretical characteristics of complex objects readers are able to compare the findings of this study to those from other studies. The choice of research design further aided the process of data verification and helped to guard against the danger of anecdotalism. Studying three contrasting EPR systems and gathering data from multiple different sources enabled data about one particular system or from one interest group to be cross referenced against those from contrasting systems and different interest groups, i.e. clinicians against technicians. This is of particular relevance to the concept of multiple-realities which is explored at greater length in chapter 6. Thematic development and data verification were further aided by preparing and delivering presentations about the research. The first of these involved designing a research poster for a University of Brighton research poster competition. There followed several other oral presentations at the 10th Social Study of ICT Open Research Forum at the London School of Economics on 24th April 2014; the University of Brighton Doctoral College Conference 2nd – 4th July 2014 and Brighton and Sussex Medical School Integrated Health Care Research Day 19th November 2014.

3.9 Conclusion

Research design stems ultimately from the nature of the object of study and the philosophical position of the research designer with regards to ontology and epistemology. The literature reviewed in the previous chapter showed EPRs to be complex and messy objects which are both social and technical in nature. Research which aims to understand such objects requires a research design which is based on solid theoretical foundations which recognise and allow for this at an ontological level. Actor-network theory was chosen as the most suitable theory on which to build. ANT works through telling the detailed stories of individual cases. These cases are often most instructive when they are at the centre of controversy, that is when actors find themselves in disagreement and unable to ignore each other.

The object of this study, EPRs in NHS secondary care, are embroiled in a number of controversies and a case study and set of research questions were developed to explore these. The study consisted of three contrasting EPRs at a single NHS secondary care Trust. The three were deliberately chosen for their contrasts in implementation status, their scope and their origins so as to capture a range of different problematisations and performances of EPR at the Trust. The design of the case study was guided by a set of research questions but as the study was of a grounded and exploratory nature these evolved as the case unfolded. The decision to study a single case has important implications for the generalisability of findings and the kind of contribution to knowledge that the study can make. The ability to generalise from a single case depends to an extent on what is meant by generalisability. It is not possible to generalise by theoretical abstraction from a single case but arguably the understanding of the general is enriched by the detailed

study of the particular. Single cases may also form part of a trajectory and provide points of contrast to other cases.

The object of study, and the decision to work with ANT to provide the studies theoretical underpinnings, had important implications for the methods of data collection and analysis which were used. The complex, messy, heterogeneous and sociotechnical, nature of EPRs together with the principles of agnosticism, generalised symmetry and free association which underlie ANT, all necessitated the use of qualitative rather than quantitative methods of data collection and analysis. A range of different qualitative methods, semi-structured interviews, observation and collecting documentation were all used as data sources. Using multiple methods allowed the strengths of each to be exploited whilst compensating for their weaknesses. Interviews allowed for the gathering of in-depth accounts. Observations captured events as they unfolded and brought disagreements and non-human actors (especially the EPR artefacts) to the fore in ways which interviews could not. Documentation provided a record of historical happenings a useful source of reference to re-inforce the other sources. There were however certain limitations to data gathering imposed by practical and ethical considerations which somewhat curtailed the ability to freely 'follow the actor'.

The chapter ends with a detailed description of the way in which this data was thematically analysed. A detailed description is necessary to add validity to the research findings and to guard against 'anything goes' criticisms of qualitative data analysis. Thematic data analysis is not a method exclusive to ANT but applicable to a number of different philosophical paradigms. It can be conducted in a variety of forms, not all of which are consistent with ANT. For example, to be consistent with the principles of agnosticism and free association, data was 'openly' coded rather than fitted to a pre-determined group of codes. This is an important example of how care was taken to ensure that all the way through the investigation the research design, data collection and data analysis were not only appropriate to the object of study but also that theory and method were ontologically and epistemologically consistent with each other. It is only through such consistency that the rigor and validity of the findings presenting in the remaining chapters of this thesis is assured. This is essential to any study but it is perhaps especially important to one which is based on the ontological radical theoretical underpinnings of ANT which are most likely unfamiliar in the epistemologically positivist dominated healthcare environment in which it was conducted.

4 Case Study

4.1 Introduction

This chapter provides an overview of each of the Alert, Somerset and CV5 systems, thus giving the background to the arguments and discussions that follow in the next two chapters. It introduces many of the actors, whether human (such as doctors, nurses, patients and IT specialists), or non-human (such as hardware and software, government policy documents, audit data sets, diseases and budgets), which together enact the practices which make up these systems. For ease of presentation in this chapter each system is described and accounted for as a self-contained assemblage. In the chapters that follow there is far more focus on the inter-relationships between these assemblages as it is one of the central arguments of this study that they cannot be treated in isolation and each interferes with the others. Each account is intended to be roughly similar in content outlining: the various component parts of each system; how each system has evolved to take its present form; how each came to be implemented at this case study site; and how they are enacted in practice.

There are necessarily some differences in how these accounts unfold. These result from the different access that was available to each and differences in how each system is enacted. For example, in the renal department there is a level of engagement with patients about their electronic records which was not apparent elsewhere, so this has added a unique dimension to the account of CV5. In cancer services there was greater access to the producers of Somerset, including a site visit to their headquarters, which distinguishes this account from those in renal and Alert. Finally, the Alert system has not yet been implemented. No account could therefore be given of how it is used, however, there was an opportunity to observe at first-hand aspects of the implementation process which can only be partly reconstructed from second hand accounts in the cases of CV5 and Somerset.

4.2 The Somerset Cancer Register

The Somerset Cancer Register is a cancer information system which was developed, in-house at Musgrove Park Hospital in Taunton, by local NHS IT staff. It has been described by its vendors, in a press release, as an electronic patient record for cancer patients.

It's really an electronic patient record for cancer patients. The benefits are that patient care can be tracked and treatment is very prompt as a result of improved communication and reduced duplication. (ehealth INSIDER, 2009)

As of the end of 2013 it has been implemented in approximately 90 NHS Trusts. It has been present at Brighton since 2007 and is also present at two neighbouring Trusts, in Worthing and Eastbourne, which frequently send patients to Brighton for specialist surgery and radiotherapy treatment. It is still being developed and maintained by Taunton and Somerset NHS Foundation Trust who employ a dedicated team for this purpose. The system is designed to integrate three

significant areas of cancer information: audit data along a patient's pathway; multi-disciplinary team (MDT) meetings; and cancer waiting times.

In cancer services there are many mandatory audit and reporting requirements. These include supplying data to local and national cancer registries and fulfilling both regular and one-off audits relating to individual types of cancers. Waiting times are of the utmost importance in cancer as early diagnosis and treatment improves the chances of a patient surviving the disease. Cancer wait times track performance against national standards and one clinician interviewed was supportive of these describing the two week 'wait target' as easy to understand, intuitive and sensible. The importance of having a single Trust-wide system to monitor waiting times and track patients along their pathways is illustrated by what can happen if no such system is in place. Concerns about the safety of cancer services at Colchester Hospital University NHS Foundation Trust were partly blamed on the fact that it had failed to implement Somerset despite purchasing it (NHS England, 2013).

Audit data allows comparisons of service provision and survival rates at both a national and local level. It helps to ensure all patients receive treatment that meets current best practice guidelines. National and regional cancer registries record basic patient data relating to new instances of cancer and deaths resulting from cancer. The clinician mentioned above described how data sent to the Thames Cancer Registry, which is extracted from Somerset, was not particularly useful locally, but was useful nationally in looking at cancer trends and understanding the epidemiology of the disease. The cancer audits relate to specific types of cancers. Some are national clinical audits such as DAHNO the National Head and Neck Audit; these are mandatory reporting requirements. Others are conducted by professional bodies such as BAUS, the British Association of Urological Surgeons. They may be conducted on a regular basis, such as annually, or be one-offs such as a recent national mastectomy and breast reconstruction audit.

The data sets for these audits can be complex with the interdependencies between data items based on things such as the treatment programme being followed. Many of these rules have been built into algorithms within the Somerset product so that the end-users only have to input data. Somerset is then able to automatically work out which data items need to be extracted for a particular audit under what circumstances, thus reducing the work load on their clients when it comes to producing these data extracts. As well as capturing this data and producing the extract files for submission to clinical audit bodies, Somerset also provides a range of data quality reports to try and ensure that the correct data items are being recorded in each individual case. The content of the audits are frequently subject to change and much of the work done by the Somerset development team revolves around keeping the product in step with these changing requirements.

4.2.1 The SCR as enacted at BSUH

Aside from collecting audit and reporting data Somerset is probably best known as a tool that facilitates MDT working. Cancer care is often provided by MDTs. These teams are typically based around one of the twelve tumour sites such as lung, breast, skin, head and neck etc. They normally consist of healthcare professionals

such as: medical and surgical consultants from specialties specific to the tumour site; cancer specialists such as consultant radiologists and oncologists; clinical nurse specialists; allied health professionals such as dieticians and speech and language therapists; and a dedicated administrator called a patient pathway co-ordinator. MDTs may cross organisational boundaries and can have members from more than one NHS organisation. Somerset is used to generate the agenda for the MDT meetings from patient lists and records who is in attendance. Used in conjunction with video conference technology it means that not everyone has to be physically present in the same room. This is especially useful for MDTs where the care of the patients being discussed is shared between organisations.

The way the MDT meetings are conducted varies, but often Somerset is projected onto a big screen in the meeting room. The meetings are generally chaired by a lead clinician and the patients' progress along their care pathway is shown on a summary screen. The patients themselves are not present at the meeting and in some ways the electronic record can be seen as taking their place. Sometimes the meeting chair invites a clinician with a particular knowledge of the patient such as a surgeon to 'present' the patient to the meeting. As the patients are absent from these meetings it is one of the roles of specialist cancer nurses to act as their advocates. If for whatever reason a nurse is unable to be present their notes are available in Somerset for other team members to see.

In some MDT meetings the outcome of the discussion, such as decisions about the patient's treatment, is entered into Somerset straight away during the meeting. In others it is done afterwards. Entering data there and then has several benefits:

The inputting onto Somerset in the best MDTs is done there and then in front of everybody so that everybody can see that it's been typed in. There are drop down menus so as they're having that discussion, are we're going to do this and we're going to do that, that that is up on the screen for everybody to see which effectively becomes the data validation so there is live validation by the clinical staff rather than somebody writing notes and then afterwards typing it into Somerset. That's where it works the best. (Interviewee 4)

This has important implications for the timeliness of data which will be returned to in the following chapter (section 5.3). Data can be a mixture of free text or codes. Updating the record may be done by a dedicated administrator known as a patient pathway co-ordinator but in some MDTs the lead clinician themselves enters the data. This appears to depend on the individual chairing the meeting and their level of enthusiasm for Somerset.

The patient pathway co-ordinator is a key figure who uses Somerset to prepare the data extracts for the various audits. This is a process which the clinicians may also get involved with. Somerset is not the only source of audit data and it may be necessary to combine the data it holds with data from other systems, such as the chemotherapy system. Preparing the data so that it uploads successfully to the registries and audits can be a complex task and the Somerset team at Taunton provide assistance via a telephone helpdesk service.

Because Brighton hosts the local regional specialist cancer centre, and the treatment of increasing number of cancer patients is shared between Brighton and its neighbouring Trusts, there have been moves to grant staff at each Trust access to the other's Somerset systems. Doing this has surfaced an intriguing debate about the status of Somerset as an EPR. The document which outlines these inter-trust access proposals states that staff being issued with logins for a neighbouring Trusts' Somerset system must be given this reminder:

The SCR is primarily an audit system with some operational functionality - MDT meetings; patient contacts for CNSs; AHPs & Palliative Care; Palliative Care MDT meetings - and should be used accordingly. It is not an electronic patient record¹¹

This declaration that Somerset is not an EPR not only contradicts the statement made by the systems vendors, quoted at the beginning of this section, but is something that was refuted by several participants in this study. When asked about this reminder, one Somerset user replied that they had not seen the notification, adding that whilst they didn't know what 'properly defines' an EPR, "Somerset clearly is a record, an electronic record, of some important things that happen to a patient" (Interviewee 5). Another user did seem to have some awareness of the disputed status of Somerset but for them, how they worked with the system was of more importance. They stated that, "I know that Somerset is not an electronic patient record. I know it's not. It's a database. However that's how I've come to use it" (Interviewee 6). This disagreement about whether or not Somerset is an EPR is something which will be explored further when controversies about EPRs are examined in the following chapter.

Outside of the MDTs Somerset may be used by clinicians in a variety of ways. The user who, earlier, described Somerset as an electronic record of important things that happen to a patient, also talked of it being both a 'thumbnail EPR' and a 'surrogate EPR'. They talked of it being their first port of call if they were contacted or asked a question about a patient as it was the quickest way for them to get the information they needed to answer a clinical query. The same person sometimes used Somerset when they were on call to familiarise themselves with where a patient was on their treatment pathway. They found this particularly useful if they were asked to see a patient they have never met before. Somerset was also used as a data source for dealing with complaints and as a means of identifying potential participants for research projects. Some nurses and other healthcare professionals who used Somerset no longer wrote paper notes; all their notes were written electronically on Somerset. These notes often revolved around recording any contact they have had with a patient or with other health professionals about that patient. This allowed them to build a detailed holistic picture of what was happening with the patient, not just concerning their illness and treatment but also their social circumstances.

¹¹ Sussex Cancer Network (2010) 'Somerset Cancer Register - Inter trust access paper V1.0' [unpublished in-house document]

4.2.2 Why was it chosen by BSUH

Introducing Somerset into Brighton and the other Sussex Trusts was at least partly instigated by the Sussex Cancer Network (SCN). The original purpose of this was seen within the network as being driven by the increasing need to collect cancer data to fulfil the various mandatory Audit, Registry and waiting time reporting requirements. The ability of Somerset to facilitate MDT meetings was considered a by-product rather than one of the original requirements leading to the decision to acquire the system. In the period leading up to Somerset being implemented at BSUH, cancer was seen as being high profile within the NHS and had received a lot of government attention and investment. One consequence of this attention was an increasing demand to provide the data to prove the effectiveness or otherwise of these new measures.

The existing cancer informatics infrastructure at BSUH and across the Sussex network generally, was struggling to cope. The situation in cancer informatics across Sussex at this time was one where there was no visibility of data for clinicians, data quality was poor and clinical buy-in was poor. Data was held on paper or in a variety of 'grey systems' such as Excel spreadsheets and Access databases; all the MDT meetings were run using paper. New audit and waiting time requirements were not being met. BSUH had attempted to develop its own in-house cancer information system known as the Cancer Audit System but lacked the programming resources to be able to do this. Added to this there was supposed to be a common data set in use across the cancer network. One of the *raison d'être* for the establishment of these networks being to compare best practice across neighbouring Trusts in order to drive up standards and ensure that care was uniformly high quality. Trying to maintain this given the fragmented nature of the various grey systems in use throughout the different Trusts in the network was considered to be a 'nightmare'. The tipping point came with a new national lung audit, LUCADA, which effectively absorbed all of the cancer informatics resources in Sussex as they struggled to gather the required data at each Trust.

From an audit perspective, therefore, the need for new cancer information systems across Sussex was clear. A number of different options were considered by the SCN. These included doing nothing and waiting for Connecting for Health to deliver an EPR; the SCN developing their own network-wide cancer information system; buying a commercial product (of which four were considered); or purchasing the NHS developed Somerset system. At this time the NPfIT was still in existence and the official line was that Connecting for Health would eventually be delivering an integrated EPR solution to Trusts across the NHS. However, problems with NPfIT were already manifest, the integrated EPR solution had so far failed to materialise, and the pressing need for a new cancer information system led to the consideration of acquiring a short-to-medium term solution in cancer until such a time as Connecting for Health delivered.

The preferred option put forward to the Trusts by the SCN was the Somerset Cancer Register. Staff at the SCN had first seen this product when they were invited to a demonstration at a neighbouring cancer network which was also considering implementing it. This in turn led to the SCN putting on their own demo of Somerset

in January 2007 to which they invited interested parties from across the three acute Trusts in the network. Fifty-seven people attended including: clinicians from most of the tumour sites, radiologists, pathologists, nurses and non-clinical staff such as cancer managers and data officers. After the demo and a pause for reflection, a vote was held and a unanimous decision was made to acquire Somerset.

The business case, the demo and the voting procedure were a deliberate attempt by the SCN to try and get buy-in from the potential users in the Trusts so that Somerset was not perceived as being something that was imposed on them against their will by the network. The case for Somerset included the integration of the disparate existing systems, support for the mandatory reporting requirements, its MDT functionality, greater visibility of data to clinicians, the relatively low cost compared to the commercial alternatives, and the fact that it was a tried and tested solution which at that time had already been implemented in approximately twenty other Trusts across three cancer networks. The main disadvantages were seen as being a loss of control by the Trusts over the future development of their cancer information systems, and an inability to customise it to exactly meet local needs. Purchasing Somerset was done by the SCN on behalf of the Trusts using some external national service improvement money. Although this was done by the SCN, it is the Trusts themselves that own the licences and are responsible for maintaining and replacing the IT equipment it runs on. The initial costs included the software licences, training and support and some dedicated IT equipment.

4.2.3 Origins and development

Somerset originated at Musgrove Park hospital in Taunton in the early 2000s as a simple Access database. Its purpose was to record significant milestones on a cancer patient's pathway such as referral, diagnosis and treatment, in order to monitor compliance with cancer waiting time requirements. As there were overlaps between this data and some of that required for the cancer audits the system was extended to cover these as well. The local cancer network then provided additional funding to continue development and the system spread to other systems in this network and eventually (largely by word of mouth) to other cancer networks around the country. The combination of increased demands for cancer informatics as a result of the *NHS Cancer Plan 2000* and the newly created cancer networks led to the Somerset being in effect the right product at the right time and it spread rapidly throughout the NHS.

In the relatively early days of the product's development a Change Advisory Board (CAB) was established. This board comprises of members of the development team, representatives from some of the audit bodies and the wider national cancer informatics community and, until April of 2013, representatives from some of the cancer networks. This board helps to shape the strategic and operational direction of Somerset and allocate development resources. Changes to mandatory datasets take priority but users are able to submit change requests which then get voted on. There is an agreed allotment of development time set aside for meeting these change requests and those that come out top in the vote get acted upon.

Somerset is in an unusual position of being a widely used piece of software which is still developed by a single NHS Trust. As an NHS product it was effectively sold at cost without the need to generate large profits. Also as an NHS organisation and part of an Acute Trust the Taunton team have access to clinical expertise which they have leveraged in shaping the products development and which might have been costly for a commercial competitor to acquire. Somerset's future as an NHS product has not always been assured. The user community and some of the national cancer bodies had however, via the CAB, put pressure on Taunton to commit more resources to Somerset to enable it to keep up with change requirements and requests. As a result in 2013 a major restructuring of the development team took place which increased resources. Recent areas of product development have focussed on enabling users, especially clinicians, to greater leverage the historic data they already have and to make it easier to input new data. New analytical functionality has been introduced and the user interface is being improved.

4.3 Clinical Vision 5

The Sussex Kidney Unit (SKU) is part of BSUH and located at the Royal Sussex County Hospital site in Brighton. It serves as the regional centre for most of Sussex and looks after about 2,000 patients. Patients with chronic kidney disease may live with the condition for many years as their kidney function gradually declines. The treatment they require can change as this happens eventually leading to dialysis and possibly even transplant. From a healthcare provider's viewpoint this makes chronic kidney disease expensive to treat because of its long duration and the high level of intervention required. The SKU cares for a mixture of pre-dialysis, haemodialysis and peritoneal dialysis patients. Transplant surgery is not performed in Brighton; patients requiring this often go to St George's in London but may return to the SKU for post-operative care. Clinicians from the SKU run outpatient clinics at several remote locations and dialysis patients may also attend satellite units in Crawley, Bexhill or St Leonards, or the neighbouring Worthing hospital, in order to enable patients to dialyse closer to home.

The SKU has its own departmental specialist renal EPR, Clinical Vision 5 (CV5), which is produced by Clinical Computing Ltd (CCL) an English company with a history of producing renal specific software. This started with a product called Proton which whilst basic compared to its modern counterpart was widely used. Proton was succeeded by Clinical Vision 4 a much more modern product of modular design utilising client server architecture and a separate database. CV5 is an evolution of this which was released in 2009. A major change is its web-based architecture which gives greater portability and flexibility over the locations in which it is used compared to its client server predecessor. CCL has products installed in over fifty healthcare organisations, not just in the UK but also in the USA, Canada, Australasia and Belgium.

As implemented in the SKU, CV5 interfaces with the Trust's Patient Administration System (PAS) from which it receives demographic updates from a unidirectional interface. All patients that are registered on CV5 first have to be registered on PAS in order to receive a hospital number which serves as their unique identifier. CV5 is

also interfaced to the Trust's WinPath pathology system allowing clinicians to view blood results on CV5. At the time this study was undertaken work was ongoing to provide further interfaces from the pathology systems at other local Trusts. CV5 provides a wide range of reports and is used in conjunction with Crystal Reports and Word to produce sophisticated clinical letters. CV5 provides the facility to record and code diagnosis and treatments. It provides medication lists and dialysis prescriptions. Observations and measurements such as blood pressure, height, weight and fluid balance are recorded on CV5. There is an area of the system called Progress Notes for recording free-text. There is a specific module for transplant patients; however, this is not currently being used at the SKU as they are waiting for the Trusts where transplants take place to implement the system themselves before the SKU start to use it. There is an additional 'bolt on' analytics module that uses third party business intelligence software to provide a combination of off-the-shelf and bespoke reports. The SKU had a very limited number of licences for this and at the time this study was undertaken it was not currently used in the unit. CCL support the product via a web based user forum which they are actively trying to promote and enrol users onto.

4.3.1 Who uses CV5, where and for what

CV5 cannot currently be directly used by patients themselves but it is used by a range of staff at the SKU including MDT members such as consultants, nurses and AHPs. Additional users include medical secretaries and a data manager. Whilst CV5 is available throughout the SKU, and at various satellite units, it is not well-used on the inpatient wards and this seems to also be the case in other renal units throughout the country. CV5 has been used to replace paper nursing notes but it is not the legal medical record. The orange folders of paper medical records are still a common sight in the SKU and CV5 serves as a source of printed reports which are then added to the orange folders.

Nurses are amongst the most active and enthusiastic users of CV5, some spending most of their day using the system. Prior to seeing a patient in clinic the nurse will use CV5 to review the letters from their last attendance to bring them up-to-date with what is going on with the patient. They can also view on the system the results of any blood test they ordered. CV5 can be used to record observations and measurements such as the patient's weight, blood pressure and medication. It can also be used to record any internal referrals made to other health professionals in the SKU. Progress Notes are used to record things like telephone conversations with patients and make notes about ad-hoc visits to see patients on the wards. Some nurses have their own offices with PCs in whilst others have to make use of shared machines, for example in unused consulting rooms. For pre-dialysis patients, of whom there are approximately four hundred, CV5 prints a monthly on line status report which gets reviewed jointly by a nurse and a consultant.

Access to CV5 is also available at satellite units such as Bexhill which is a nurse-led unit dialysing about 60 patients. Prior to CV5 they did not have access to the medical notes there and the arrival of CV5 has greatly improved both communication and confidentiality, especially by getting rid of the need to use faxes. Staff at Bexhill made use CV5 to produce reports for dialysis patients going on

holiday so that they can take them to another dialysis unit whilst they are away. A further use of CV5 is in the investigation of clinical incidents where CV5 provides a much better chronology of events than paper notes.

CV5 appeared to be less well used by doctors. The most frequently stated reason for this being the time it takes to input data, a lack of user friendliness in the interface and insufficient training. Of particular concern was the lack of patient modalities being entered for new patients. This has data quality issues both in terms of data being sent to the renal registry and for using CV5 as a source of research data. As a consequence at least one member of staff in the unit spent a lot of their time trying to rectify data quality issues on CV5. Of doctors below consultant level, registrars reportedly make good use of CV5; however, junior doctors who are on relatively short rotations do not necessarily have the time to be properly trained to use the system.

Other people who use CV5 include AHPs, such as dieticians, who make use of Progress Notes. In common with some users of Somerset, it was described that one benefit of CV5 was that it enables them to quantify the work they do. CV5 also provides a source of data for the renal registries and is visible to clinical coders as a data source for charging commissioners. Not all the charging data comes from CV5. Much of it also comes from PAS and a lot of work is required to compile the data needed for charging commissioners. In another parallel with Somerset, CV5 can be used to code diagnosis which is beneficial for income.

4.3.2 How CV5 got into the SKU

Prior to the implementation of CV5 the SKU was already using CCL's predecessor product CV4, albeit in less areas than CV5 is currently used. Notably it was most common in the outpatient department area, although outpatient nursing notes and the dialysis unit were still paper-based. However, the decision to move to CV5 was not simply about upgrading to the latest version of an existing product. CV4 was not seen as meeting all the SKUs needs. Also the relationship between CCL and the SKU at that time was acknowledged by both parties as having not been as smooth as it might have been. Before tendering for a replacement system a thorough requirements analysis was conducted. One of the clinicians in the unit was a particular advocate of EPR use and they were instrumental in establishing the Sussex Renal Innovation Programme (SRIP) and it was under the aegis of this programme that the process of acquiring a new EPR was undertaken.

As part of the SRIP an Action Learning Group (ALG) was established with the involvement of an academic who had a background in encouraging the involvement of service users in health and social care. A thorough review of what the unit wanted to get from a new EPR, and how this might change the way the unit worked, was undertaken. This involved consultants, nurses, AHPs and IT professionals. As part of this overall process a visit was undertaken to the New York Presbyterian hospital to see an EPR in operation there. There was some enthusiasm for bringing this system to the UK although eventually the extent of the Anglicisation work required meant that this was not pursued further. Following this period of reviewing their business processes a requirements definition was drawn up and in 2009 systems

from five different suppliers were evaluated against this specification as part of a formal procurement process. Whilst no system was deemed to fully meet the unit's requirements the decision was eventually taken to procure CV5 from CCL.

Some of the funding for this came from outside of BSUH via the SRIP. As part of the implementation process new equipment was acquired. Areas such as dialysis which had not used the old CV4 system needed the most. For these areas computers on wheeled trolleys were purchased. A survey of computer literacy was carried out amongst staff at the unit to identify any who might have difficulty using the new system and appropriate training was provided where necessary.

The decision to go with CV5 appears to have been only partly due to the technical fit of the product. CCL's approach to implementation and the post-implementation support of the product was considered as being an important factor. Super user and power user groups were created in all areas of the unit to support staff with their ongoing use of CV5. These groups have continued to meet and are attended by representatives from CCL who have been able to identify areas where data input has not been happening correctly and provide appropriate assistance to overcome these difficulties.

The ALG has also continued to meet on a regular monthly basis since go live and it has gradually changed in composition from being consultant-led to being nurse-led. Membership of the ALG includes consultants, nurses, administrators, AHPs, IT specialists, an academic and a patient representative. Consultants based at another local Trust who have access to CV5 at the SKU are members of the ALG and although they do not routinely attend the meetings they are copied in on correspondence.

CCL have maintained an ongoing presence at the ALG and this is clearly valued both by staff at the SKU and by CCL themselves. The ALG and the super user/power user meetings provide CCL with the opportunity to work together with staff at the SKU to help them make more effective use of CV5. This may involve bringing in experts from CCL to work in partnership with users to analyse a particular issue. Sometimes they may suggest ways in which CV5 as it currently stands can be better used to overcome that issue. Alternatively this may lead to a need for a product enhancement being identified and possibly the product being modified accordingly. These meetings also provide CCL with the opportunity to present product innovations to users for review and critique which provides them with valuable feedback. Other than the need to meet regulatory requirements the ongoing development of CV5 and the priority attached to user generated change requests becomes a commercial consideration. Those that offer CCL a good potential return on investment, such as the possibility that they may be wanted by multiple customers, are viewed as a more attractive proposition.

ALG meetings are also regularly attended by a patient representative who brings an additional viewpoint with them in a way that is not really mirrored in either the Somerset or Alert set ups at BSUH. There has been a long standing history of patient representation at the SKU stemming back at least as far as 2004 when a Renal Patient User Group (RPUG) was set up which acted as something of a

communication gateway between patients and staff. Staff from the SKU attended RPUG meetings and a member of the RPUG attended some SKU business meetings. When the ALG was formed a patient representative was then recruited to its membership. Having a patient member of the ALG and their contribution to meetings was described as being invaluable, because, as one staff member at the unit put it, at the end of the day they'd never been a renal patient.

Recently there have been moves to establish closer links with other renal units using CV5 with the aim of mutual learning of how to get the best out of the system. To this end, the SKU in conjunction with CCL hosted an event in October 2013 to which users from other Trusts were invited. Staff at the SKU looked forward to this enthusiastically, with one person stating that:

I think that will be invaluable to hear about peoples other experiences about using the product and I would be particularly keen to discuss with them issues that we've found challenging with CV5 to see if they've found an easier workable solution that we just hadn't thought about. (Interviewee 11)

Attendees at the event included staff from the SKU, staff from CCL, other ALG members such as the patient representative, an academic and a project manager from the Trust-wide EPR programme.

4.3.3 Patients and CV5

Chronic kidney disease is a long-term condition which may affect people for many years. As a result these patients can have a lot of contact with healthcare providers, regularly having to have blood and urine tests in order to monitor how their kidneys are functioning. The results of these tests may necessitate adjustments in their medication or diet and so knowing the results can be very important to patients. This has led to an organisation called the Renal Information Exchange Group (RIXG) to develop a web portal, Renal Patient View (RPV), which allows renal patients to view a range of personal data, such as lab results. The ability to do this depends on the patient's renal unit having a compatible IT system which can upload the data to RPV.

CV5 is compatible with RPV and work has been undertaken at the SKU to enable patients who register for RPV to use it to view test results. They can also, if they wish, share their login credentials with their GP so that they can also access the system. The initial work in getting it set up at the SKU was funded by a charity, the South East Kidney Patients' Association, but the unit pays an annual subscription fee out of its own budget. As this is a lump sum irrespective of how many patients are registered there is some pressure to register as many patients as possible to reduce the cost per-head. RPV registrations are also linked to CQUIN payments which is a further incentive to get more patients registered. Progress with RPV patient registration was a regular agenda item at the ALG meetings.

Whilst RPV seems to be well received by patients and clinicians alike there are some perceived shortcomings. RPV was reported to be slow in responding to change requests such as being able to see a wider range of results. There is also some demand from patients to be able to see copies of letters about them which are

generated from CV5. This is something which is being worked on. The main hold up seems not to be technical but with deciding what should be made visible to the patients. There is sensitivity over the possibility that something such as a suspected cancer diagnosis may be exposed to the patient in an uncontrolled manner. Another handicap to progressing RPV at the SKU is that there are no staffing resources in the unit who are specifically paid to look after RPV. Furthermore, RPV is only a UK system and CV5 is an international product which makes it less commercially attractive to devote resources to further integrating CV5 with RPV.

The other highly visible benefit to patients of CV5 centres on travel. The SKU is a regional centre covering much of East and West Sussex. The Royal Sussex County Hospital where the SKU is located is in a part of Brighton some distance from the railway station and where parking is extremely difficult. Queuing to get into the car park can last an hour. Patients travelling by car often arrive stressed and with resultant high blood pressure, therefore travelling to the SKU is unpopular with many patients and their carers who live outside of Brighton. As CV5 can be accessed from remote locations across Sussex it greatly facilitates the conduct of clinics at satellite units at places like Worthing, Crawley, St Leonards and Bexhill. Not only is this more convenient for the patients but CV5 brings cost savings to the Trust as paper notes don't have to be physically transported to the satellite units and there is less call to pay for patient transport to get patients to the SKU.

4.4 Alert

The final system in this study is the new Trust-wide integrated EPR which is being implemented across all specialities and all hospital sites within the Trust. In May 2012 BSUH signed a contract with Alert Life Sciences (e-Health Insider, 2012), a Portuguese company to supply their Alert EPR product. This was followed shortly afterwards by the Trust setting up a programme team to oversee the products implementation. Alert is a modular product and the overall programme has been divided into five constituent projects - A&E, Order Comms, Clinical Documentation, E-Prescribing and Theatres Management - which are being undertaken in that order. The implementation phase of the programme was planned to last for three years with a further seven years of post-implementation support.

4.4.1 Making a case for a hospital-wide EPR

BSUH, like many other Trusts throughout the country, had been expecting to implement a Trust-wide EPR as part of the NPfIT. A great deal of preparatory work, such as process mapping, had been undertaken in anticipation of this. However, no such system was ultimately implemented under the NPfIT and the Trust's 2010 *Information Strategy* states that, "The Trust has not been well served by the National Programme for IT" (BSUH, 2010: 12). Nevertheless, despite this there still remained a desire at the Trust to implement a new Trust-wide EPR system. In the same strategy document it was stated that:

The Trust recognised the value and need for an electronic patient record and was an early candidate for the NPfIT Care Record Service. The case for the

electronic patient record was strong then. It is much stronger now. (BSUH, 2010: 15)

The reasons for this are many and varied. The Trust had a relatively modern patient administration system and several¹² specialist EPR systems but the majority of patient records, prescribing and test ordering were still on paper. The Trust was seen as being 'backward' and 'very slow in its utilization of IT'. It was compared unfavourably in this respect with other kinds of organisation such as: banks and utility companies; other Trusts clinicians had previously worked at; and general practice. One clinician described the Trust as being twenty years behind GPs in its use of IT. Paper records were considered to slow down everything that the Trust did and there were complaints that for every patient there were many different versions of the truth about what was going on with them because people didn't have access to the same information. The work that the Trust had undertaken in preparation for the (ultimately undelivered) NPfIT EPR solution had also given those involved a sense of how far forward an electronic patient record would take the Trust.

However, a general sense that the Trust was behind the times in terms of information technology could not in and of itself make a justifiable case for the significant financial investment, and disruption to current business practices with the potential for associated clinical risk, required of a major new IT programme. As the Trust did not have Foundation status it had to make a business case for the EPR programme that would pass the scrutiny of the local Strategic Health Authority. Herein was a potential difficulty for the Trust for although the benefits of reducing the reliance on paper might seem obvious they were hard to quantify and as discussed in the literature review, the availability of hard evidence to back up the claimed benefits of a hospital-wide EPR is scarce.

Part of the business case was that the EPR programme would pay for itself out of efficiency savings over a period of years. This is of great significance to the type of EPR the Trust opted to acquire and as will be discussed in the following chapter is central to many of the controversies about EPRs that the Trust is engaged in. The Trust concluded that an EPR which was just a clinical documentation system, replacing paper patient records with an electronic equivalent, was unable on its own to produce the necessary savings. It had been noted how the experience of other Trusts had been that it was very difficult to demonstrate that clinical documentation, on its own, could demonstrate a measurable financial benefit.

Here the lack of other IT systems at the Trust proved to be an advantage however. The Trust was able to make its business case for a new EPR by seeking a system which integrated clinical documentation with other functionality including electronic prescribing and electronic order comms which could produce more easily quantifiable financial benefits. For example, electronic order comms is expected to save money by reducing duplication of test ordering for a patient and the electronic ordering of prescriptions should save money by reducing length of stay. How it could do so was explained by one interviewee:

¹² There are 12 listed in the clinical documentation project initiation document including CV5 and the SCR.

When you decide a patient is fit to discharge probably they have to go home with some medication. At the moment that could take hours for that medication to come so they're sitting there using up the bed when actually they don't need to be there, they've been discharged as fit. Sometimes that can take hours and hours whereas with the EPR system at the point of discharge you can order the meds, interface directly to pharmacy, and then the delivery of those could save you hours. (Interviewee 20)

As well as the financial benefits which would come from electronic order comms and electronic prescribing it was also felt that an electronic prescribing system would improve patient safety. Because the Trust didn't currently have these sorts of systems it created an opportunity to bring in the less easily quantifiable benefits of clinical documentation by going for an EPR which provided all three in a single integrated system.

4.4.2 Why now and why Alert

The timing of the decision to undertake the Trust-wide EPR programme was influenced by several factors. The evidence in favour of e-prescribing and electronic order comms, in terms of patient benefit and improvements in safety, was considered to be so clear that the Trust just needed to get on with it and that it would be wrong not to. Many of the Trust's buildings at the main Brighton site date back to the mid-19th century and the Trust is part way through the lengthy process of planning a substantial rebuild. This has had an influence on the timing of the EPR programme through a desire to implement the new EPR and associated business change processes before moving to the new buildings.

The new building is part of the overall programme at the Trust known as the 3Ts which stands for Teaching, Trauma and Tertiary care. This is seen as leading to an increase in Trust activity away from the main hospital sites. Therefore, just as in renal and cancer services, an EPR is seen as important to facilitating this by bringing freedom from the physical constraints of having to move paper records around. Taken together then the non-delivery of an EPR under the NPfIT, the desire to improve the communication of patient information, the need to integrate clinical documentation with electronic order comms and e-prescribing, the pressing argument for these on patient safety grounds, the new hospital building programme and the 3Ts strategy, all contributed to the timing of the EPR programme.

The timing however placed the Trust in somewhat uncharted waters. The NPfIT had effectively collapsed by then and there was a lack of suppliers with a proven track record in the UK market of supplying the kind of integrated EPR system that the Trust wanted. The Trust was therefore right in the middle of the first, post NPfIT, wave of Trusts looking to implement this kind of integrated, Trust-wide EPR system and would not be able to benefit by learning from other's experience.

Having decided what they wanted the Trust then had to go out to tender for a supplier. Procurement was undertaken as part of the Additional Supply of Capability and Capacity process. Procurement of this nature requires strict adherence to a very formal process and as such had to be management led to a large extent,

however, the Trust were very keen to maintain clinical engagement throughout. Staff at the Trust were given sight of the tender specifications and invited to demonstrations of the competing products.

The Trust eventually chose Alert. This is a Portuguese product which has very little existing presence in the UK and for which Brighton would be the first NHS customer to fully implement the system (ehealth INSIDER, 2014b). However, Alert has been implemented in Portugal and South America and clinicians from Brighton were able to see the system running in a hospital in Portugal. The impact of the product at that hospital together with the vision of the company, the flexibility of the product, its use of customisable templates, and the ease and intuitiveness of the user interface were all factors in its selection. The user interface seems to have been a particular selling point for the system and one which stood apart from the other EPR systems being considered by the Trust. Alert was described by one interviewee as being amazingly innovative and user friendly; another, a clinician, talked of how the Alert interface was easy to use and stressed how important this was.

In some respects choosing an overseas supplier without a well-established presence in the UK market represents a risk for the Trust. However, given the type of integrated EPR they wanted, and when they wanted it, this was somewhat inevitable and well-recognised at the Trust. There was also a belief within the Trust that this could potentially turn out to be an advantage. It was hoped that as the lead customer in the UK, a new market for Alert, BSUH would have an opportunity to shape the product more closely to their particular requirements.

The product is of modular design and the Trust procured some but not all of the available modules. As well as the order comms, e-prescribing and clinical documentation modules they also chose to purchase an A&E module, a GP portal, a complex scheduling module, a health information exchange module, decision support, care pathways and MyAlert, a patient web portal with the aim of ultimately allowing patients to view test results and correspondence on-line. Alert does have a patient demographics module which the Trust has not purchased as they have no immediate plans to replace the existing PAS system with Alert. Instead the intention is to have a two way interface between PAS and Alert so that demographic updates made on Alert will be passed back to PAS. This is the first time this has been attempted at the Trust as the existing demographic interfaces between PAS and other systems are unidirectional only.

4.4.3 Implementation

The overall EPR programme has been divided into five projects, A&E, Order Comms, Clinical Documentation, E-Prescribing and Theatres. The clinical documentation project has been further divided into phases according to speciality and within each phase the specialities will be implemented a few at a time rather than all together. Dermatology and physiotherapy are scheduled to go live first. Not all of the Alert modules will be included within the initial implementation phases. The overall intention is to get basic functionality implemented across all specialities first rather than a few specialties receiving everything whilst some have nothing. The more advanced features such as care pathways, decision support and complex

scheduling will come later on in the programme along with the health information exchange and the MyAlert patient portal.

The selection of 15 specialties to be included in the first phase was aimed at realising the most financial benefit from the fewest specialties and was based on criteria that included the level of inpatient and outpatient activity, the throughput of admissions from A&E and whether or not they already had a specialist departmental system. Specialties with their own departmental EPRs have been deliberately left until later in the project. There is an anomaly here with Somerset which, whilst it is a specialist system, its use cuts across many specialties. These include some in the first phase of the clinical documentation project such as dermatology and digestive diseases.

Prior to Clinical Documentation going live the implementation team met with the specialties concerned in a series of stakeholder engagement meetings. These were followed by current and then future process workshops. There has also been a regular series of implementation progress meetings. The intention being to first understand how these specialties currently work and identify any gaps between what Alert can do and what the specialties require. Then any product development work, such as building new templates, would be carried out prior to a phase of product testing and acceptance and eventual go-live. The Trust-wide EPR programme team was made up of a mixture of people. Some had worked at the Trust for many years, were well known to many of the staff at the meetings and have a good overall familiarity with the ways many of the specialties currently work. Others were implementation specialists, brought in from elsewhere for the duration of the programme. At the future process workshops staff from Alert were also present and gave demonstrations of Alert using a test version of the system.

As well as the implementation team and Alert people the current process workshops were attended by a mixture of doctors, nurses and administrators. They were not always well attended with some specialties being entirely unrepresented at meetings; this could sometimes be down to clinical commitments. There were no patient representatives at these meetings. The workshops were typically split between, firstly, outpatient activity and then inpatients. The structure of the meetings followed a patient journey and the activities departments needed to do to support these. In outpatients this covered referrals, preparing for the appointment, what happens when the patient is present, follow-up activity and then discharge. During the current process workshops it quickly became apparent that there were many differences in current practices, for example in the way referrals are managed, both between different specialties and even within different areas of the same specialty. Furthermore, these practices were often subject to change as a result of other business change programmes which are being undertaken in the Trust at the same time.

It was also apparent from these meetings that vast amounts of paper are currently in use and that attendees, healthcare professionals and non-healthcare professionals alike were generally positive towards the new EPR. This was particularly so with people who had worked at other Trusts which already had EPRs. For the implementation team these meetings also provided an opportunity to gather

information about data gathering requirements for things like national datasets and audits. It became apparent during the current process workshops that there are a large number of other IT systems in use throughout the Trust. Sometimes these were very small and previously unknown to the implementation team, and some of them were either totally new or being rolled out across a widening number of specialties at the same time as the EPR programme was ongoing.

Participants at the meetings also raised as a concern the amount of shared care that was carried out in partnership with other organisations. Where the only attendees from a specialty were consultants, it became very apparent that they had little knowledge of the administrative practices that went on in their department. In these circumstances there was a certain amount of second-guessing from the EPR implementation team as to what was going on in this respect. During the future process workshops clinicians present were generally enthusiastic about the potential for Alert to provide a clear picture of all the activity that was happening relating to an individual patient. They did however have concerns about instances where this might not happen such as when some data was on other standalone systems or still on paper such as notes coming from another organisation. Attendees appeared appreciative of some of the things that Alert would eventually be able to do to improve efficiency, such as complex scheduling, meaning that an appointment could not be made before any necessary tests had been ordered. However, whilst people were appreciative of the benefits Alert could bring them there was constant concern about the amount of time that would be taken up by both doctors and nurses in inputting data.

4.5 Conclusion

This chapter has provided an overview of each of the EPRs in this study, their origins, how they came to be chosen at BSUH and some of the practices they are entwined in. The brief accounts presented here provide evidence of some the “huge variation in scope, form, configuration and structure” of EPRs referred to by van der Ploeg (2003: 477). The grand but as yet unrealised ambition of the Trust-wide Alert EPR programme contrasts with the more limited, but at least partially realised, scope of the specialist systems in cancer and renal services where in the case of Somerset its status as an EPR has been openly called into question.

The chapter serves as an introduction to some of the different ways in which EPRs have been problematised at the Trust and some of the means by which disputes about EPRs are negotiated in practice. These accounts provide the empirical evidence which forms the basis of the more theoretical arguments about EPR which are developed in the next two chapters. In Chapter 5 the differences in problematisations and enactments which are introduced in this chapter are examined in more detail and presented in the form of a number of controversies. Also evident within these accounts are a number of common themes which allude to debates about the ontological nature of EPRs. Firstly, it is apparent that, at any one time, there is a great deal of inconsistency in how each individual EPR is enacted. Secondly, none of these systems has remained constant over time and each has mechanisms in place to cope with this. Thirdly, it is clear that none of Somerset, Alert and CV5 exist in isolation from other IT systems. Each has enrolled within the

practices through which they are problematised and enacted other systems such as the non-delivered NPfIT solution, the Trust's Patient Administration System, the previous renal EPR CV4, and indeed each other. These themes will be picked up again and developed further in Chapter 6.

5 Sites of Controversy

5.1 Introduction

In this chapter an analytical device commonly associated with Actor-Network Theory, that of exploring controversies, is employed to help answer the first two research questions addressed in this study: how are EPRs being problematised in an NHS secondary care Trust post NPfIT and how do differences in the problematisation of EPRs relate to and interfere with the sociotechnical enactment of these systems in the Trust? These controversies were developed from the thematic data analysis described in Chapter 3. As is common when working with qualitative data this was a somewhat messy and iterative process. The act of coding interview and observation data and the subsequent organisation of the coded data into thematic groups, reduced and displayed the data such that it made visible two clear analytical categories. These were ‘controversies’ (see Figure 9) and ‘modes of ordering’ (see Figure 10).

Sites of Controversy		
1 EPRs and Paper – Is it sufficient for an IT system to hold patient data electronically without necessarily replacing paper records to be considered as an EPR or must it replace paper records?	Technical Constituents – What areas of functionality should an EPR be comprised of? For example should the Patient Mater Index be part of an EPR or PAS? Does an EPR have to include Order Comms or E-Prescribing?	Distribution of Advantages/Disadvantages – Who or what benefits from an EPR: patient care, Trust finances, healthcare professionals, EPR vendors? What are the disadvantages and who is disadvantaged: duplicate data entry, erosion of professional standing?
2 Audit and Operational – Can an IT system which is primarily use ‘off-line’ to record patient data retrospectively for audit purposes be considered an EPR or must it be use ‘online’ operationally to trigger the interactions of health staff and patients while they are happening?		
3 Single Source of Patient Data – Must an IT system be a single source of patient data to be considered an EPR? If so does this apply to multiple co-morbidities being treated by a single healthcare provider, a single morbidity being treated by multiple healthcare providers or both?		
4 Access – Who should be able to access patient data held electronically?		
5 New Ways of Working – Is one of the purposes of an EPR to deliberately instigate changes in the ways healthcare professionals work or should an EPR be made to fit in with as closely as possible existing ways of working?		

Figure 9 The five Sites of Controversy and two sources of controversy which run through them.

Data which described sites of controversy¹³, offered insight into the sources of disagreement that made up those controversies. In this latter category different modes of ordering¹⁴ generated incompatibilities which then formed the constituent

¹³ See section 3.4 for a discussion about controversy as an analytical device.

¹⁴ See section 2.13 for an explanation of ‘modes of ordering’

parts of what made the controversies controversial. This distinction was most apparent in the difference between data grouped under the heading of 'EPRs as a replacement for paper' and that under 'economic context'. The former, an obvious site of controversy as it appeared fundamental to most definitions of EPR but was infrequently realised in practice and the latter a mode of ordering.

Mode of Ordering	Example of Enrolment in Problematism of EPR
Legal	Somerset not considered to be an EPR as it is not the statutory medical record.
Economic (Efficiency)	Potential of Alert to reduce the costs of storing, pulling and transporting paper records.
Economic (Income)	Potential of CV5 and Alert to help Trust generate income from CQUIN payments.
Patient Care	CV5 facilitates activity at satellite locations away from SKU thus easing travel burden for renal patients.
Technical	Alert seen as remedying Trust's technological backwardness compared to other healthcare providers and other industries.
Professional Identity	Reluctance of some healthcare professionals to enter data electronically e.g. surgeons not entering operation notes on Somerset.

Figure 10 Summary of different 'modes of ordering' enrolled in problematisations of EPR.

Having made this distinction the coded data in the database was re-organised, this time in the form of a wall chart. The chart was divided into two columns, one an initial list sites of controversy, the other, the sources of disagreement that made up the controversies. These disagreements took several forms: differences, sometimes contradictory, in the ways actors problematised EPRs; actors being unable or unwilling to occupy the positions assigned to them in a particular problematisation; and situations where the outcome of one controversy was entangled with the outcome of another. Identifying these initial sites of controversy involved drilling back down into the thematic groups to look for instances of disagreement. Sometimes this meant going right back to their original sources in the interview transcripts and observation notes and also cross referencing these to documentary data sources.

The sites of controversy initially identified on the wall chart differed somewhat from the five sites discussed in the chapter below. The initial sites were drawn from the data because they spoke most clearly of disagreement. For example several interviewees categorically disputed that Somerset and CV5 could be considered EPRs whilst others maintained that they were. However, by drilling back down through the data to look again at the reasons these interviewees gave for their views, it could be seen that rather than this dispute about the status of specialist departmental systems being EPRs or not being a site of controversy in its own right there were several different aspects to this. Several of these themes, the importance of replacing paper records, access to data, and the distinction between data that was used for audit purposes and that which was used operationally, could be found repeatedly throughout other data sources. Thus in this particular instance what initially appeared to be a single controversy ended up being treated as three

distinct sites of controversy. At one stage it was in fact considered as being four distinct sites. However during the writing process it was found that it made more sense to consider the audit/operational divide as a single site of controversy rather than as two separate ones.

A slightly different case is a statement by another interviewee that the new Trust-wide EPR was not a PAS¹⁵. This was included on the wall chart as a potential site of controversy as it appeared to speak to the first of the research questions concerning how EPRs were being problematised and raised questions as to what functionality properly belonged on a PAS and what an EPR. As is explained in Section 5.4 the relationship between the Trust's PAS and the Somerset system was enrolled in one site of controversy, concerning EPR as a single source of patient data. However, differentiating between PAS and EPR in fact proved to be remarkably uncontroversial. None of the three EPRs in the study was intended to replace PAS functionality and no participants or documentary data suggested that they should. Therefore, this relationship was not developed further as a site of controversy in its own right.

Another example of the sorts of decisions which lead to topics being excluded from the sites of controversy concerns participation in the process of selecting which EPR to procure. This is a topic that the literature review suggested had proved controversial in other hospitals acquiring EPRs and a question about this was included in interview schedules with staff and patients at the Trust. However, in this case this topic did not prove to be the source of much disagreement. Most participants across all three EPRs seemed satisfied that they had the opportunity to participate in this process should they have so desired and therefore this was not pursued further.

By the end of the analysis process five sites of controversy were left. These are: the effect of EPRs on paper records; the balance between audit and operational functionality; how EPRs are envisioned as a single source of patient data; how and by whom these EPRs are accessed and how EPRs bring about new ways of work. Threaded through these five sites were two other recurrent sources of controversy which were the makeup of the technical constituents of each EPR and how the potential advantages and disadvantages of EPRs are distributed. The first of the sites to be examined is the effect of EPRs on paper records.

5.2 EPRs and Paper

The relationship between electronic patient records and paper is at the heart of that which defines an electronic patient record. The very term *electronic* patient record is used precisely because it differentiates these from traditional paper-based records. However, the relationship between EPRs and paper is not without controversy. Electronic patient records are often equated with 'being paperless' but, at BSUH, whilst CV5 and Somerset have replaced some paper, much, including the statutory medical records in their orange folders, remains. For some this has called into question the status of these systems as EPRs. Dispensing with paper medical

¹⁵ Patient Administration System

records in the day-to-day work of the hospital is one of the aims of the new Trust-wide EPR. How this can be achieved, and whether or not this aim is of fundamental importance, is one source of controversy. This controversy is intertwined with some of the other sites of controversy discussed in this chapter, particularly those concerning EPRs as a single source of patient data and who gets access to them.

Problematizations of EPRs as a paperless solution can commonly be found in policy statements and in academic literature. For example, in a speech in 2013 the Health Secretary Jeremy Hunt has called for the NHS in general, and patient records specifically, to 'go paperless' by 2018 (DoH, 2013a; DoH, 2013b). Similar views were expressed by participants in this study, for example, one interviewee, a clinician, stated that:

What it [EPR] means to me is a paperless solution to maintaining a patient's history and any findings you might have had in the process of assessing that patient or looking after them. (Interviewee 3)

Achieving such a paperless solution requires two moves. The first is to start using an electronic system or systems to store patient data, the second is to stop using paper. Studies such as those by Bruni (2005), of a specialist EPR in an Italian hospital, Sheikh et al. (2011) of the NPfIT and Nilsson et al. (2002) of EPR in Norwegian hospitals, have demonstrated that the former is much easier to achieve than the latter. In this study, the two specialist systems, Somerset and CV5, have replaced some paper records but they have not replaced the formal medical records in their orange card folders, of which the Trust at the time had approaching five million.

Here it is important to distinguish between the various kinds of records that are kept at the Trust because, for at least some of the participants in this research, this appears to be highly significant to what makes an EPR. In cancer services one of the reasons given for the previously quoted warning that Somerset is not an EPR is that it had not replaced paper notes as the 'statutory medical record' (interview 2). The *medical* record is a distinct entity which exists separately to other forms of records such as nursing notes, outpatient physiotherapy notes and the records kept by dieticians or specialist cancer nurses about the contact they have had with patients. Whilst the paper versions of some of these latter kinds of records have been replaced by CV5 and Somerset, such that they now only exist electronically this is not the case with the medical record. There are several reasons why this is the case, and why the paper medical records were considered by interviewees to be the *statutory* or *legal* medical record whereas records kept on CV5 and Somerset were not.

One interviewee, (interview 11), stated that healthcare professionals who prescribed medication had a legal obligation to document their consultations in the paper medical records because these were accessible throughout the Trust whereas those made on departmental systems such as CV5 were not. Such healthcare professionals, where they had access to them, could choose to also make records electronically in systems like CV5 or Somerset but there did not appear to be any legal obligation for them to do so. In both renal and cancer services there were

plentiful examples given of healthcare professionals who made their notes on paper, such as surgeons operating on cancer patients, but chose not to also do so not electronically. And where notes were made electronically this was not always done in a timely fashion, something returned to in Section 5.3. There were also several examples of practices where data was recorded electronically in the first instance, such as clinic letters on CV5 and MDT outcomes on Somerset, but then printed out and paper copies placed in the orange folders. The *statutory* medical record is thus currently the record kept on paper because, for the *medical* record, there *has* to be a paper copy even where there is also an electronic one, whereas there is currently no compulsion to maintain an electronic record.

However, when it comes to other forms of records apart from the *medical* record there did not appear to be a legal or statutory requirement that these must be held on paper. Within cancer services some instances were encountered of nurses and allied health professionals, but not doctors, who made all their notes electronically on Somerset and no longer made paper copies. Their ability to do this depended partly on their profession and consequently their legal record keeping obligations. Some nurses for example did not usually have access to the paper-based medical record and it was stated that for them Somerset was their *legal* form of documentation.

The Somerset cancer register thus has two different legal realities depending on the profession of the person using the system. For those in professions who normally write their notes in the orange medical record folders, Somerset is not the legal record and as a consequence, it is not a paperless solution. For others, like those nurses who do not have access to the medical records in the orange folders, Somerset serves as their legal form of documentation which has put them in a position where they don't have to keep paper notes. Somerset therefore has multiple realities, it both 'is and isn't' a legal record and it both 'is and isn't' a paperless solution depending on who is using it. The same thing can be said about CV5 in the kidney unit. CV5 may not be a paperless solution in the sense that it has not replaced the orange folders but it has replaced most of the outpatient nursing notes so in that respect it is.

It can be seen here that the ability to get rid of paper is made controversial by a legal mode of ordering and is also inextricably bound up with another source of controversy, access to records, which is explored further in this chapter (section 5.5). There are parallels here with the Italian hospital observed by Bruni (2005) where the specialist cancer EPR he observed was similarly not the legal record and a paper record had to be maintained.

At present, in fact, for a patient record to have legal validity it cannot exist solely in electronic form but must also have 'materiality' (i.e. it must exist on paper and bear the signatures of the doctor and the chief consultant). Each EPR is therefore printed out and placed in a folder containing all documentation on the patient. (2005: 364)

Exactly how the new Trust-wide Alert EPR would affect the status of the paper medical records as the statutory or legal medical record was seldom explicitly

discussed in any of the meetings observed or by any of the interviewees who participated in this research. Just as in Bruni's (2005) example where a legal requirement for an ink signature was a stumbling block to getting rid of paper one doctor noted during an Alert future process workshop that consent for surgery requires an ink signature on paper. This was further complicated because in some specialties BSUH is a regional specialist centre where patients from other Trusts come for surgery, the consent for which may be taken at the other Trust. However this was about as far as any discussion of legal issues went.

Replacing the paper records was clearly important to the Trust-wide EPR programme. It was seen by one interviewee as being a core part of it:

I think it's our clinical documentation project that's the biggest challenge. It's the piece of Alert that's the core of the Electronic Health Record so it's the bit that's actually going to **get rid of the patient notes** and as a result of that it's a massive shift for this organisation to not be reliant on those patient notes. (Interviewee 20 - emphasis added)

A draft version of the Project Initiation Document (PID) for the clinical documentation project¹⁶ lists success criteria including that the EPR should be in use. The PID lists evidence which will demonstrate that this has been successfully achieved including that the EPR will be used to record patient data 'in place of paper records' and that there will be a visible reduction in the use of paper. However, it was not a point raised in these meetings, the phased roll-out of Alert may also have implications for Alert's ability to replace the paper as the statutory medical record. Even if implementation went to plan it would still be several years before it is available to all specialties suggesting it cannot become the legal record until it is available throughout the Trust.

The picture concerning EPRs and paper has so far has been a mixed one. It has been seen how, in the Trust and elsewhere, EPR is still frequently problematised as a 'paperless' solution and yet in the Trust there has only been limited progress in getting rid of paper notes. The question remains however whether, as long as notes are held electronically, it actually matters if they are also held on paper at the same time. As shall be shown over the course of this chapter, many of the benefits of EPRs may be realised even if the statutory medical record remains on paper. Somerset has made a big difference to meeting reporting requirements and the sharing of patient data amongst multi-disciplinary teams. CV5 has improved access to records at satellite clinics. It also means that if the orange folder fails to arrive in time for an outpatient appointment, the consultation is not affected as the electronic record is still available. Alert was chosen for the Trust-wide EPR programme because it is an integrated EPR which includes other functionality besides clinical documentation, such as e-prescribing and electronic order comms. It might therefore be argued that being a paperless solution is not really an essential quality of an EPR. However, there are reasons why this may not be the case, especially in the Trust-wide EPR programme. One of the reasons is financial, the programme

¹⁶ Brighton and Sussex University Hospitals NHS Trust (2013) 'EPR Programme Project Initiation Document Clinical Documentation' [Draft 0.3]

has to pay for itself out of efficiency savings, and as shall be seen in the remainder of this thesis the necessity to replace paper is inextricably intertwined, directly or indirectly with other controversies.

As the continued interest in EPRs over a period of more than 40 years shows, many clinicians and politicians have great faith in the potential benefits of holding patient records electronically, but it remains difficult to make a financial case for this. In the post-NPfiT, post-2008 financial crisis NHS, this is especially important. In order to make a business case for clinical documentation the Trust have had to combine this with e-prescribing and electronic order comms results reporting, which as evidenced above, can exist as standalone systems without having to replace paper medical records. This does not however mean that clinical documentation does not have to make a contribution to these efficiency savings. The programme needs to find every saving it can and the programme team are under pressure from the Trust's finance department to show that it is delivering the promised savings.

One area of efficiency savings is dependent on dispensing with the paper records in the orange folders. Reduction in health record consumables was identified as one way in which the new Trust-wide EPR could make a significant contribution to cost saving. Further potential for savings were identified in reducing the costs of storing and retrieving these records. Getting rid of paper should also contribute to staffing efficiencies and outpatient clinic administration. In short, in an economic mode of ordering, dispensing with paper is essential to the EPR programmes' business case. There are similarities here with Norwegian hospitals (Boulus and Bjorn, 2010; Ellingsen and Monteiro, 2003) where the storage of increasing amounts of paper records was becoming a problem and policy makers envisaged EPRs producing large efficiency gains by eliminating these. It is also interesting to note how the kidney unit have undertaken a research project which quantified the savings made through using CV5 to get rid of nursing notes so clearly it is not just the Trust-wide EPR programme where an economic mode of ordering is important in justifying an EPR system.

Another reason that getting rid of the paper records is important is to cut down on duplicate data entry. This is important both financially and for clinical engagement. Having to enter the same data onto more than one system, whether electronic or paper was a particular 'bug bear' of clinicians encountered in this study with one explaining that:

All of us can see that these tools are useful, the frustration is trying to make sure that they don't create work and that's the big problem that we have with the electronic records, whatever they are within the hospital, is that they need to replace tasks that already exist. If they become a task in their own right user engagement falls away very rapidly and in order for people to engage properly with a new database or a new system it has to replace something that's a task. If it's in addition to a task that already exists it's already failed. The minute you have to put in data twice, the same data twice, I think your functionality has failed. (Interviewee 5)

This does not automatically mean that no one will use an EPR if they still have to keep paper records. After all some clinicians still chose to use Somerset and CV5 even though they also had to keep paper records and medical records may be dictated to be typed up by others later. Nevertheless, keeping two sets of records, electronic and paper, creates extra work and unless this can be balanced out by other benefits, especially ones that can be financially quantified, this is likely to be a problem. Here, we see the EPRs the problematisation of EPRs as a paperless solution is also bound up with two of the other sites of controversy discussed below, namely: EPRs as a single source of patient data and EPRs and new ways of working.

In concluding this section on the relationship between EPRs and paper it can be seen that whilst at first these questions might appear straightforward, in practice EPR as a 'paperless solution' is rather more controversial. There are disagreements concerning how EPRs replace paper records, what records they replace and whether or not replacing paper records is an 'obligatory point of passage' for an EPR system. In examining these controversies it has been shown that they are intertwined with legal, economic and professional modes of ordering and as will be shown, with the other sites of controversy discussed below.

5.3 Audit and Operational

In the previous chapter (section 4.2.1) it was noted how it had been proposed to issue a reminder to new users of Somerset that the system was not an electronic patient record. The reasons for this were partly to do with the legal status of the record but it also concerned a distinction between audit and operational functionality. The reminder stated that Somerset is "primarily an audit system with some operational functionality" and linked this to the statement that "It is not an electronic patient record". In so doing the reminder problematised EPRs as something which has to be primarily operational in functionality. The reminder gave examples of operational functionality as being "MDT meetings; patient contacts for CNSs; AHPs & Palliative Care; Palliative Care MDT meetings". The distinction between 'audit' and 'operational' performed in this reminder is very similar to the distinction between 'off-line' and 'on-line' made by Ellingsen and Monteiro (2012):

...traditionally EPRs in healthcare have primarily played the role of an "off-line" tool for documentation of treatment, results and clinical assessments where patients' interactions with the different parts of a health facility are documented – after the interactions have taken place. Increasingly there are demands for EPRs as an "online" operational tool for support of work process where the EPR is intended to trigger the interactions of health staff and patients while they are happening. (2012: 19)

The distinction here is between a tool for the retrospective documentation of events, roughly analogous to audit, and an operational tool to intervene in events as they are happening. One property of an operational EPR is therefore the timeliness of the information it provides. This indeed was something that was talked about in connection with the reminder about Somerset not being an EPR. There was concern that, because the system was seen as being primarily for audit, sometimes

data was not being entered in a timely manner. This contention is supported by another interviewee, a nurse, who spoke of being so busy that they might build up a backlog and have to enter a fortnight's worth of patient contacts in one go.

The importance of the timeliness of information as an attribute of EPRs can be found in academic literature such as Martin, Mariani and Rouncefield's (2007) study of integration work and EPRs. It is also present in the Trust's information strategy document (BSUH, 2010). This points to a very operationally, and indeed clinician-orientated, view of the sort of Trust-wide EPR they intended to implement.

For the purpose of this strategy an electronic patient record is defined as the health informatics information and applications that support clinicians in providing safe, effective, efficient and quality patient care. The electronic patient record is a tightly integrated suite of health informatics functions that provide all clinicians involved in the care of a patient with up to the minute information on the condition and care being received by the patient plus a suite of applications designed to support clinical decision making and the delivery of that care. (BSUH, 2010: 15)

This has been carried forward into the Trust-wide EPR programme with the purchase of Alert. Alert is a modular product with lots of functionality which can be used operationally to trigger the interactions of health staff and patients while they are happening. For example clinical documentation, care pathways, decision support, complex scheduling, e-prescribing, electronic order comms and results, a health information exchange and a patient portal. There was also a great deal of stress placed on the importance on each of these functionalities being used in a timely manner by the EPR programme team. One of their key messages, which was usually included in the introduction of process workshops, was that data must be entered there and then, at the point of care. The mechanics of doing this, and why it may prove difficult to achieve in practice, are another source of controversy, discussed at greater length later on in this chapter (section 5.6) which is intertwined with this audit/operational controversy.

Whilst the Trust-wide EPR has to meet the needs of multiple specialties, specialist departmental systems are much more closely tailored to meeting the requirements of treating a specific patient population. There are two aspects to this which had a particular bearing on the sort of system the Sussex Kidney Unit wished to acquire. The first is that, as the name suggests, the Sussex Kidney Unit is a regional specialist centre looking after patients from a wide geographical area. Many of these are elderly and some have to dialyse three times a week. One requirement therefore was for a system which supports distributed care across a number of satellite units so that patients can be cared for close to where they live. This not only brings a significant improvement to patients' quality of life through reducing the, often very substantial, burden of having to travel for treatment but it also has the added benefit of reducing the units expenditure on providing hospital transport for these patients. This is an example of two different modes of ordering, care and economy being enrolled in the same system. It is also closely intertwined with controversies about access to EPRs and this is discussed at greater length later on (Section 5.5).

A second requirement for a renal EPR is also intertwined with controversies about access. It stems from chronic kidney disease being a long term condition where there is an ongoing need to measure a patient's kidney function and adjust their treatment and lifestyle accordingly. There is a desire from patients and clinicians alike to give patients access to view test results and even ideally be able to enter data themselves. Currently some patients are able to view some results via Renal Patient View and this is already triggering "the interactions of healthcare staff and patients as they are happening", as one patient explained:

Depending on my blood figures today, this is where Renal Patient View comes in to its own, because either the nurses before I leave today will give me my blood figures or I can go back on-line tomorrow, onto Renal Patient View, look at my figures and either the hospital will phone me and say right you've got to change things or I'll phone and say I'm not happy about this one what should I be doing? (Interviewee 8)

This can be seen as fitting in with recent government policy which commits the NHS to moving "away from patients and service users merely receiving care, to patients and service users being active participants in their care" (DoH, 2010c: 5).

In cancer services whilst Somerset may be principally a system for collecting audit data about activity after it has taken place, it has, as previously noted, some functionality which can be used operationally. Whether or not Somerset is performed as an operational system which triggers the interactions of health staff and patients while they are happening varies from MDT to MDT depending of the preferences of the clinicians involved. This was explained by several interviewees:

Some of the clinicians, you know the real keen switched on ones, do use it like an EPR. But they've made the decision that their team's all switched on and that they all use it and they use it actively in clinics and its open and stuff. Well we can't say that about every ... every team aren't using it like that. (Interviewee 2)

Again the timeliness of data is crucial:

I think the beauty is that it's going in while you're there so it's keeping it very alive. You're not looking at data that's old. You don't want to be speaking to a patient where the information's not in date or not accurate, particularly when somebody's worrying about whether they've got a cancer or not or whether they've got a secondary or a relapse or whatever it is. (Interviewee 6)

However, this operational functionality is limited. Another interviewee, a clinician, talked of how the data was very macro and did not give the microscopic level of detail required to manage a patient on a day to day basis. It gave details such as patient X is going to have chemotherapy, or patient Y has had radiotherapy but it was not a daily log of clinical activity.

These examples from both renal and cancer services illustrate how both specialist EPRs do have operational realities, ones which trigger interventions in patient care as it is happening. However, these operational realities are not things which are

solely the result of either the technical properties of the systems, or the way they are enacted in practice. Instead, each of these factors is a product of the other. As the example of Somerset MDT practices shows, it is not sufficient just to purchase a system with operational functionality; the EPR has to be performed operationally i.e. by entering data 'there and then' in the MDT meeting. Likewise, the functionality has to there in the product so, for example, patients cannot enter data directly into CV5 and the cancer specialist cannot see a daily log of clinical activity. Some of these issues are explored further, later on in this chapter when examining controversies about access and new ways of working. In the remainder of this section the focus switches to EPRs as audit systems and how the necessity to meet audit requirements cannot be ignored when problematising EPRs as operational systems.

As well as practices in which CV5 and Somerset are used operationally 'on-line' there are many different ways in which the data collected in EPRs is used 'off-line' after interactions between clinicians and patients have taken place. EPRs may be a source of management information within the Trust which is functionality being looked for from the new Alert EPR as one interviewee explained:

I think people like our audit teams and our safety teams are really looking forward to the EPR coming in because for the first time ever they'll be able to see evidence of how the Trust is behaving and what kind of things it's doing whereas before trying to get any of those statistics was so piecemeal.
(Interviewee 10)

EPRs are sometimes used by clinical coders as part of the billing process which brings income into the Trust. Interestingly, the importance of this was something which was raised in interviews by several clinicians. Also, on the theme of income, both CV5 and Alert were spoken of as having a role to play in the Trust receiving CQUIN¹⁷ payments. For example, from asking elderly patients, on the point of discharge, questions about dementia. Several participants mentioned the usefulness of EPRs as a source of evidence when investigating clinical incidents and complaints with one suggesting that EPRs provide a much better chronology of events than paper records.

At Taunton the Somerset team talked of policy pushes to get clinicians to engage with their own data, especially now that performance data about individual clinicians is starting to be published. It was felt that hospital information departments may not have the resources necessary to help clinicians do this, therefore Somerset have developed a reporting tool called Data Views to enable clinicians to directly query the underlying database. CCL have added an analytics module to CV5 for similar reasons. In the SKU they have purchased several licenses for this as at least one clinician in the unit was said to want to be able to 'follow their nose' through the data. From the vendors viewpoint these are ways of adding value to their products by exploiting something that newer, generic hospital-wide EPRs do not yet have, a base of historic data.

¹⁷ Commissioning for Quality and Innovation

Another important demand for audit data comes in the form of myriad national datasets and external bodies to whom the Trust has to supply data. As one interviewee put it, “Whether you like it or not a lot of delivering healthcare is about collecting national datasets and meeting national targets” (Interviewee 2). As previously discussed, Somerset was initially developed to capture data to ensure compliance with the waiting time directives of the *National Cancer Plan 2000* and to meet the dataset requirements of various registry and audit bodies.

In the Sussex Kidney Unit there is also a need to supply audit data, in this case to the Renal Registry. Data for this submission is extracted from CV5 and the ability to support data schemas required to meet compliance and reporting requirements, not just in the UK (CV5 being an international product), is an important part of the products design. It is worth noting that when CCL and the SKU jointly hosted a learning event for CV5 users they invited representatives from the Renal Registry who come along and gave a presentation. They talked about revamping the submission and adding new data items demonstrating again that this is not a static requirement but one that changes and requires ongoing development work to meet the new requirements.

Meeting these audit requirements has implications for the operational functionality of both productions. The vendors of these systems have finite resources to work on their development and must prioritise the allocation of these resources. At CCL a product management team prioritises product development according to mandatory regulatory changes and their own product development strategy. For the Somerset team in Taunton, keeping up-to-date with audit requirements is their main priority and this is reflected in their resource allocation. This has meant that there are only limited resources available to work on improving the operational functionality of the system which perhaps explains why one Somerset user described the process of getting a user change request actioned as ‘really slow’.

Given all that is involved, it would seem unlikely that a generic product such as Alert, especially given that it is an overseas product with very little NHS experience, would be able to match the audit functionality of Somerset. Neither does it seem likely that hospital Trusts could or would wish to give up this functionality in favour of a less functional generic solution. In fact, the Trust have stated that, where there is an existing departmental EPR system, if Alert doesn’t come really close to matching what that system does, then it will remain until such time as Alert does.

Members of the Trust-wide EPR team regularly enquired about national data sets and audit requirements during engagement meetings, workshops and progress meetings. These enquiries revealed that these are present in the Trust in large numbers. In physiotherapy it was mentioned that there is a ‘vast variety’ of them. In gynaecology, ENT, digestive diseases and colposcopy there were several electronic systems which collected these kinds of data. Whether or not these audit requirements, and the existing electronic systems for fulfilling them, were as complex as those handled by Somerset was unclear, nevertheless there was potential for these to act as a barrier to the Trust-wide EPR programme attaining its stated goal of becoming a single patient record. In colposcopy, for example, several Trusts in the region used a common system which facilitated the comparison of data

between Trusts. It was not immediately apparent how this inter-Trust commonality in colposcopy could be preserved whilst at the same time replacing the colposcopy system with Alert.

In concluding this section it has been seen how all three of the systems in this study have both audit and operational functionality and that the balance between the two has been enrolled into problematisations of what is and what isn't an EPR. However, it has also been shown that the boundaries, between what is an operational system and what an audit one, are fluid rather than clear-cut, in part a product of how each system is being performed. Controversies about this audit/operational balance are also entangled in other controversies concerning access, for example renal patients viewing lab results via RPV, and new ways of working, for example where the need for operational data to be timely has led to the EPR programme team wanting clinicians to enter data at the point of care. As will be explored more fully later, this last example may interfere with established professional modes of ordering, changing some aspects of the work that particular health professions are expected to do. This may also be seen in the data mining tools being provided by Somerset and CV5 which may give clinicians the capacity to interact directly with underlying data in ways which were previously the preserve of information analysts and IT specialists. Furthermore the audit functionality of EPRs can be seen as enrolling clinicians in economic modes of ordering, via clinical coding and CQUIN payments.

5.4 Single Source of Patient Data

The ideal electronic patient record would be a single source of data you could go to and have all the information you need to manage the patient properly.
(Interviewee 5)

The idea that an EPR should be a single source of patient data was a recurring theme throughout this study. It was present in the Trust's 2010 informatics strategy document and has been carried through to the new Trust-wide EPR programme. The programme's mantra is 'One Patient One Record'. The clinical documentation project initiation document states that the purpose of introducing the Alert EPR is to create 'One Patient One Record'. This phrase was included in the logo which appeared on programme documentation. The existing fragmented mixture of electronic and paper records was viewed as unsatisfactory. In the PID it was declared a safety risk. One interviewee, a clinician, talked of there being 'multiple versions of the truth' about what is happening to a patient because people do not have access to the same information. In the Trust-wide EPR programme it was spoken of how patients' had a 'perhaps naïve' expectations that the Trust would have a single record of their care. The importance of having a single record was also mentioned by one of the patients who participated in this study who expressed the hope that it would mean that the left hand would know what the right hand was doing.

The notion that an EPR should be a single source of patient data was considered so fundamental to what it meant to be an EPR that another interviewee, an IT worker rather than a clinician, disputed that small departmental systems such as, CV5 or

Somerset, could be called EPRs. In their view an EPR had to be a complete clinical record of a patient's care. It follows that the EPR programme and its mantra of 'One Patient One Record' can be seen as carrying a clear threat to the existence of these specialist and departmental systems. The One Record vision does not appear to leave any room for these other systems. The PID lists 12 of them, including CV5 and Somerset. It states that in the second phase of the project a decision will be made as to whether these systems will be replaced by Alert or interfaced with it. Here, the solidity of the notion of 'One Patient One Record' begins to dissipate somewhat.

To achieve 'One Patient One Record' the Trust faces a dilemma regarding what to do with their existing specialist systems. If they remain as isolated standalone systems then for patients with co-morbidities there will clearly not be 'One Patient One Record'. One option is to replace these systems with Alert. However, there were concerns that Alert will not be able to match all of their functionality. This was particularly apparent in cancer services. For some working in cancer informatics, the worry was that Alert would be a system which, whilst probably working well in supporting the day to day care of patients on the wards and in outpatient settings, would not be fit for the purpose of collecting the data they needed for cancer wait times and the national cancer audits. Because of this doubts were expressed that Alert would be able to replace Somerset and therefore the two systems would need to run side-by-side.

The dilemma regarding what to do with these specialist systems, whilst trying to achieve 'One Patient One Record', is reminiscent of the problems manifest in the 'one size fits all' approach of the NPfIT. In fact the EPR programme team have stated that if Alert does not come close to matching what an existing EPR does then that EPR will remain in use until such a time as Alert does match it. The remaining option then becomes to interface these systems with Alert. This was sometimes talked about by the EPR programme team in rather simplistic terms; there 'just' needed to be an agreement to have an interface between a particular specialist EPR and Alert and then they would 'just' agree what information goes backwards and forwards across that interface. Whether or not this would turn out to be so simple in practice remains to be seen. Elsewhere it was acknowledged that interfacing is never a satisfactory solution because when data is exchanged between systems via an interface engine there is always the possibility for data loss which could be potentially catastrophic in a healthcare situation.

For the Trust's IT department the practical difficulties of putting interfaces in place were much more readily apparent. Even when interfacing very basic data, such as patient names and addresses, there can be variations in how this is held on different systems. For example, one system may hold multiple addresses another only allows two. With more complex data like diagnostic tests these issues rapidly become more complicated. This was explained by one interviewee:

The challenges are that no two systems are close enough to be able to interface directly so you're always having to make decisions on how the data is going to be brought across ... the logistics of the technology, actually making the two systems be able to see each other is actually often the

simplest and can be achieved by the infrastructure guys who can do that very quickly. The difficult bit is getting everybody to agree what data, what format and what code sets are going to be used. (Interviewee 13)

Once up and running these interfaces still require monitoring and occasional manual intervention to sort out errors. In the IT department this was considered an even more important part of interfacing work than developing new interfaces as these existing ones were supporting patient care. Furthermore, upgrades and changes to systems mean that once in place interfaces often have to be modified to accommodate these. Interfacing is therefore less than ideal being complex, time consuming and having potentially safety issues.

Within the Trust-wide EPR programme it was acknowledged that this created something of a dilemma. If pushed to its logical conclusion, then the argument that retaining specialist systems and building interfaces to them is less than ideal suggests that the NPfIT approach was right after all. It was therefore acknowledged that there was a need to strike a balance between interoperability and usability. The desire for a single source of patient data is compromised by the inability of any single generic EPR such as Alert to match all the functionality of multiple specialist systems. If those specialist systems are to be retained but not exist as isolated silos of data they will have to be integrated with Alert but this is a less than perfect solution due to the difficulties with interfacing just discussed.

The replacement or integration of these specialist systems by Alert, and the replacement of paper records, are all related to another actor, the EPR programme's implementation schedule. The Trust opted for a phased implementation. Given the experiences reported by Jones (2003) in study of one Trust that opted for a 'big bang' EPR implementation this may well be a sensible approach. Jones (2003) reported participants in their study describing this 'big bang' implementation as "the worst experience in my 27 years in the NHS" and "a nightmare...the worst time of my working life" (2003: 411). There are, however, some drawbacks, chiefly that Alert will be added to the current mix of paper and other electronic record systems and that this mixture will continue for an extended period of time.

The implementation plan itself is complex and a negotiated compromise between the needs of multiple actors. Clinical documentation formed part of the overall EPR programme and followed on from A&E and Order Comms. Within clinical documentation the aim was to roll out basic functionality gradually across all specialties and then later on to roll out the more advanced functionality, such as care pathways, decision support and the health information exchange module. One of the considerations in determining the order in which specialties would get clinical documentation was to go firstly with those with lots of activity so as to maximise financial benefit. Here, once again, there is quite literally a financial or economic 'mode of ordering' being employed. The need for the EPR programme to pay for itself out of efficiency savings was acting in determining the implementation schedule. Another determinant was the desire to leave until later in the programme those areas, such as the SKU, which had their own specialist systems.

There are several problems with this implementation approach from the point of view of achieving 'One Patient One Record' with Alert. Firstly, the replacement or integration of specialist systems is left until the later stages of the plan. Should the plan not be seen through to completion for financial or any other reasons, which the history of IT implementations in NHS secondary care suggests is at least a possibility, then this replacement or integration may not take place. The rolling out of the basic Alert functionality across all specialities was intended to take 3 years but right from the start it had fallen behind schedule. Secondly, until all specialities are using Alert the only common record across all of them remains the paper record. Where healthcare professionals have limited time to devote to patient record keeping it may therefore be that maintaining the existing medical paper record is prioritised over entering data on the new EPR. In these situations there may develop a vicious circle in which the continuing use of paper records leads to the non-use of electronic records and the non-use of electronic records leads to the continuing use of paper records.

There are further complications to 'One Patient One Record'. The first of these concerns the boundaries of the record. For unless there is to be a single record of everything that has ever happened to a patient, anywhere, at any time and from any healthcare provider then it is necessary to decide what is to be included and what excluded. The Trust's 2010 *Information Strategy* states that the "electronic patient record will be the single source of information about the patient and **the care being provided by the Trust**" (2010: 15 emphasis added). The boundary that is implicated here is the Trust and the solution the Trust has gone for might be thought of as one that is aimed at dealing with how the Trust treats patients with co-morbidities. However, the Trust is only one source of care provision for patients and there are many others such as GPs, community services, hospices and other secondary care Trusts.

In fact in many specialties the care of patients is shared between BSUH and other organisations. In renal services some Brighton patients receive dialysis treatment at a neighbouring Trust in Worthing. In cancer services, Brighton is a regional specialist centre, some patients may be operated on and receive chemotherapy at a neighbouring Trust but come to the Brighton cancer centre for radiotherapy or some more specialist surgery. The dermatology department are part of a shared 'community of service' with other local Trusts. Paediatric surgeons operate on patients from across the south east of England. In these cases the idea of an EPR which is 'a single source of data you could go to and have all the information you need to manage the patient properly' may be problematised differently to how it is in the Trust-wide EPR programme.

The vendors of Somerset, for example, have a vision of their product as a single electronic source of data about cancer patients. They acknowledged that it was open to debate as to whether this could be called an electronic cancer patient record or summary but described the objective as being for Somerset to be, from a clinician's perspective, a 'one stop shop' to go to for their cancer information. This would appear to be something that would be welcomed by clinicians in cancer services where very similar data is sometimes entered into specialist radiotherapy and chemotherapy information systems. The desirability of improving the integration

between these three systems was mentioned by clinical and non-clinical interviewees alike.

There have also been calls for all the Trusts in Sussex to share a single Somerset system and the Sussex Cancer Network was often asked why it wasn't possible to have this. The answer stems in part from one of the technical properties of Somerset. Somerset does not contain a 'master patient index'. That is, it does not hold the master copy of a patient's demographics and unique hospital number. Instead it must interface with a Trust's PAS in order to get these details. As Knaup et al. (2007) have noted "unambiguous patient identification is often an underestimated difficulty" (2007: 35). As Somerset was designed to only interface with a single PAS this effectively rules out a shared system. In the light of this the Sussex Cancer Network had looked to more pragmatic solutions such as enabling electronic tertiary referral between Trusts in the network.

When a patient gets referred from an MDT at one Trust to an MDT at another, instead of sending an e-mail, they wanted to be able to package up key bits of information about the patient in one Trust's Somerset system and then import it directly to the others. This was something which they had been waiting a long time for. It was not the Sussex-wide cancer information system that some wanted but it was described as being a kind of 'stepping stone' which would reduce having to enter the same data twice and enhance information sharing. There have also been steps taken to enable MDT members from neighbouring Trusts to be able to access one another's Somerset systems. This is something which will be picked up again later in this chapter.

In conclusion, it can be seen that although problematisations of EPR as a single source of patient data are common this is still a source of controversy. Sometimes this is thought of as an ideal, at other times as an essential quality without which a system cannot properly be considered an EPR. The motto 'One Patient One Record' can be seen as an attempt to enrol those visions into the Trust's Alert EPR programme however in practice achieving this vision is beset with difficulties. However, the Alert programme is a Trust-wide solution but much care provision is shared between the Trust and partner organisations. Here a different problematisation of a single record can be seen, one which is bounded by the condition being treated rather than the organisation delivering the treatment. Such problematisations are inextricably linked to the next source of controversy which concerns who can access EPRs.

5.5 Access

Greater accessibility compared to paper records is one benefit commonly ascribed to electronic patient records. Examples can be found across a wide range of academic literature and policy documents for example in Currie and Guah (2006), Currie and Finnegan (2011), Fitzpatrick and Ellingsen (2012), Greenhalgh et al. (2008) and Knaup et al. (2007). Similar views were expressed in this study. One clinician talked of the importance of freeing the Trust from the physical constraint of having to transport paper records across a split site organisation which is also a regional specialist centre where a great deal of outpatient activity takes place at

remote sites. This is the case in both renal and cancer services as well as other areas of the Trust such as the provision of vascular care. The ability to facilitate remote access to patient records at satellite clinics was one of the reasons for the kidney unit acquiring CV5.

Accessibility issues with paper records can cause problems for patients. One patient spoke of their frustration at delays and missed appointment slots when their notes failed to arrive on time. They also pointed to the expense incurred if Trust had to get a motorbike courier to bring them over. In the kidney unit CV5 is already helping to overcome such problems. One clinician explained how, now that they had CV5, if a patient attended a clinic but their notes hadn't turned up the consultation wasn't really affected. They contrasted this to the situation before the arrival of CV5 when, if a similar thing had happened, they would have been completely lost with no information about the patient.

Furthermore, as electronic records do not have to be pulled from a medical record library and transported, they are accessible more quickly. A Somerset user talked of how important this timeliness aspect of access was to them. They liked to be able to telephone a patient, having read their notes, within 48 hours of receiving a referral. This they could do with Somerset but not paper notes due to the time taken to get hold of these. Somerset was also useful for dealing with telephone enquiries for the same reason.

I had a patient ring me this morning and say 'Have you done my prescription?' Well I can look on Somerset and see I typed the letter and I faxed it that day while I'm just sitting on the phone in front of them, well otherwise I'd be going to paper notes, I'd again be recalling notes and you know it just feels more live. (Interviewee 6)

These are examples of how, in this case study, EPRs are imagined as having the potential to, and in some cases are already enacted as, improving access to patient records across space and time. These are two important dimensions of access and the controversy here lies in the work necessary to make them happen. Actors such as computing equipment, networks, licencing and even building ownership cannot be ignored and these will be examined in detail shortly. However, there are other important dimensions to this source of controversy including who gets access to electronic records. One clinician highlighted how EPRs can allow a wider range of people to access patient records than is possible with paper and equally importantly give greater control and flexibility over that access. They stated:

I think one of the good things about EPR is access to it, or the spectrum of people who can have access to it, can be expanded or contracted as much as you like ... I think as many people as necessary should have access to it, the consultant, anybody in the multi-disciplinary team who looks after that patient, nurses, physios, administrators, secretaries and the patient as well. (Interviewee 3)

The reasons for the current disparity in how paper records are accessed may be partly logistical but they are also partly associated with historical distinctions

between different healthcare professions. As has already been seen, not all healthcare professionals have access to all forms of paper records. For example, physiotherapists in outpatient clinics do not have access to medical records and doctors do not have access to outpatient physiotherapy notes. Some cancer nurse specialists do not normally have access to patients' paper medical records but do have access to the records on Somerset. The principle of 'One Patient One Record' discussed earlier brings with it the promise that eventually all healthcare professions within the Trust will access the same electronic record. Some members of professions who currently experience restricted access to patient records described how they were looking forward to greater equality of access in the future. One interviewee talked of how:

I'm aware at the moment some of the consultants do have limited access to other systems in the hospital that I don't so hopefully this EPR will enable **all** of us who are looking after patients with co-morbidities to access other records which will make a huge difference. (Interviewee 11)

This person placed great emphasis on the word all. As it happens they worked in renal services where doctors, nurses and AHPs already access a common departmental electronic record in CV5. In cancer services as well a range of different professions access a common electronic record in Somerset although neither Somerset nor CV5 are available outside their own specialist areas.

Berg (2001) and Berg and Bowker (1997) have noted that altering who can access a patient's records in this way can cause controversy and may have an impact on professional identities. Berg (2001) states that:

Electronic patient records ... raise questions about who will get access to whose data, under which conditions ... such changes inevitably trigger subtle (and sometimes not so subtle) social and political processes about who gets to fill in what parts of the record, who 'owns' what information, and who gets to check on whose work. (2001: 147)

However, there was little apparent evidence in this study of any group of healthcare professionals expressing concern about opening up access to other groups of healthcare professionals within the Trust. Rather, as shown in the quotes above, this seemed to be something for which there was general support.

Over the course of the fieldwork for this research a great many people were encountered who had an interest in accessing patient records. Many of these such as medical secretaries and other administrators are not healthcare professionals but perform an important role in the provision of care services. It was mentioned in interviewee how consultant's secretaries, for example, were often the first point of contact when a patient phones up. Others are not directly involved in providing care to patients but nevertheless perform important tasks. Clinical coders, for example, play an essential role in generating income for the Trust and Trusts are important centres of medical research. Moving from paper to electronic records has the potential to affect these peoples' access and this is something which did not appear to have been fully considered in the Trust's EPR programme. It was mentioned that

it was not known exactly at that time who everyone was who might come into casual contact with patient records and no thought had been given as to whether such people would need to be trained in using Alert. It was recognised within the Trust that there was the potential that a move to electronic records might have some unintended consequences as far as access was concerned but it was also hoped that the new EPR would in fact make the jobs of people such as clinical coders easier.

The potential to expand access to patient's records beyond those who have historically accessed paper records may lead to further controversy. One aspect of this, already touched on previously, is the ability of management to audit the work of healthcare professionals. This is something that previous studies have shown to be problematic and which will be examined further in section 5.6 of this chapter. Another potential area of controversy is the privacy of patient records. Currie and Finnegan (2011) and Greenhalgh et al. (2008) observed that this was raised as a concern during the NPfIT. Generally this is not something which was widely encountered during this study although it did occur on a couple of occasions. One interviewee in cancer services questioned how well-informed patients are as to what happens to their data which is collected electronically and in one ALG meeting it was mentioned that there was a lack of public debate about sharing lab results. Concerns about privacy were largely dismissed by one patient who commented that they were not a person who worried about people getting access to things although they did acknowledge that it might be a concern for others such as celebrities.

Patients themselves are another group who may want to have access to electronic records. Patients already have a legal right to see their medical records which cannot be refused unless a consultant has reason to believe they might experience harm by seeing them but they have to write and request a copy. EPRs open up the possibility of making patient access a more routine occurrence and giving patients electronic access to their records is now a matter of government policy. The two patients who participated in this study were enthusiastic about this although it was mentioned by some interviewees that there are some groups of patients, those with a poor cancer prognosis for example, who may not wish to have access.

Many of the healthcare professionals who participated in this study were also generally in favour of patients having some form of access. They saw this as having several potential benefits, one talked of how:

I think patient involvement is crucial because it gives the patient the opportunity to take some control over their care and that's particularly pertinent in people who have got chronic diseases like kidney diseases...The patient gets to look at what's actually going on with their healthcare by seeing results for example, seeing reports. They get to see what people think of them and think what's going on by looking at what people have written down. They can enter data themselves, which would be hugely helpful. An obvious example is blood pressure. There's a hundred reasons why things like that would be abnormal but if they could do readings like that in the home, put them on the patient record system it would make a huge difference to how we manage them in clinic. (Interviewee 3)

It was also felt that if patients could see what has been written about them it might affect how they thought about their care. In particular it might impart on patients the idea that it isn't just the medical team who are responsible for their health but that they, the patient, also had a responsibility to look after their own health.

However, at the time this study was undertaken no patients at the Trust had direct access to their electronic records. The Trust has purchased the MyAlert patient web portal as part of the implementation programme but this was not scheduled to be implemented until later on in the programme. At the time fieldwork was undertaken the nearest any patients got to accessing their records electronically were those in the kidney unit who could indirectly view some test results via the Renal Patient View third party web interface. There are several reasons why this is the case.

The information needs and desires of patients with long term conditions like chronic kidney disease and diabetes may differ from those with other kinds of diseases such as cancer. One renal patient spoke of how they used RPV to monitor the gradual decline in their kidney function so that they could prepare emotionally and logistically for the changes to their lifestyle that future treatment options would bring. In contrast a cancer specialist stated that they had 'never known of anybody' wanting to access their Somerset record. This view was corroborated by another interviewee working in cancer care who imagined that 'it happens very rarely'. At the time this study was undertaken the vendors of Somerset had no plans to develop any kind of patient access.

One issue here, it was explained by a cancer specialist, is that cancer patients sometimes do not want to know their prognosis but there is a need for the health professionals involved in their care to be aware of this. This person stated that they were very happy to share data with their patients but that this had to be prepared especially for the patient so that it was in language they understood. They were concerned that data in an EPR would not be constructed in this way and might reveal things they had stated they did not want to know. The appropriateness of the language used in medical records to a patient audience, the unnecessary concern this might cause patients, the time that it would take to explain what some technical language meant and the risk of inadvertently revealing bad news, particularly if it was suspected that a patient might have cancer, were all concerns expressed by other healthcare professional when it came to giving patients access.

As well as healthcare professionals within the Trust, EPRs may enable healthcare professionals from different organisations to access a patient's records at this Trust. This may be especially useful in shared care arrangements. Within cancer services as has already been seen there have been some calls for a Sussex-wide cancer record which for reasons already discussed has not happened. One pragmatic way in which this has been overcome has been for Trusts to open up access to their Somerset record to healthcare professionals in neighbouring Trusts. Some healthcare professionals at BSUH had access to the Somerset systems at two neighbouring Trusts and some healthcare professionals in other Trusts had access to the BSUH Somerset system. In some MDTs, head and neck for example, it was the case that all MDT members, whichever Trust they worked for, use Brighton's Somerset system. In renal services consultants at a neighbouring Trust who are

contracted to look after Brighton patients who dialyse at that Trust have access to CV5. Access may also extend outside of the NHS. In cancer services some hospices, which are charitable organisations, now have access to Brighton's Somerset system. In renal services some patients receive dialysis from a private sector provider. Current government policy that focuses on opening up the provision of services to 'any qualified provider' may lead to more examples of care and patient data being shared with private sector suppliers.

One actor that cannot be ignored when attempting to grant access to patients' records held at the Trust to external organisations either NHS or non-NHS, or indeed by Trust staff wishing to access patient records from home, is information governance. The significance of this was cited frequently during this study. Information governance applies to paper as well as electronic records but the potential ease with which access can be granted to electronic, rather than paper, records makes them more of an issue. Some idea of the complexity of information governance procedures for sharing data outside of the Trust was provided by documents in cancer services. There is no blanket access instead it is governed on an individual level. The type of access, whether read, write or delete, depends on the patient being seen, an individual's job role and where they hold employment contracts with different governance protocols, such as the BSUH Confidentiality Agreement for Partner Organisations and the Sussex Cancer Network Inter-trust Read Only Access Policy applying in different cases.

Another set of actors which cannot be ignored in controversies about access, are the technological architectures of the systems themselves, and the infrastructure that connects the various parts of these systems together. This includes the electronic interfaces discussed in the previous section. For people to be able to readily access electronic records there also need to be sufficient numbers of computers, be they PCs, laptops or other devices, available in the right places. This is especially the case if Alert is to be used, as intended, to input data 'at the point of care'. During EPR programme meetings concerns were raised about the current lack of computers and the old and slow nature of much existing IT equipment.

The Trust was well aware of this and was making a considerable investment in buying new equipment and upgrading their existing IT kit in a desktop renewal programme which was part of the overall EPR programme. Currently on a typical ward there were likely to be workstations on reception, in admin offices and the nursing stations, but not in every cubicle or every clinical area. Therefore new equipment was being purchased so that the recording of patient data could take place right at the point of care.

New IT equipment was also purchased as part of the CV5 programme including computers on wheels (COWS) for use in the dialysis unit. There were, however, significant delays in receiving some hardware which only became available to use a year after the go-live date and issues with IT equipment continued in the SKU long after this. Partly this has been attributed to the Trust's desktop renewal programme for Alert which includes an upgrade to the operating system from XP to Windows 7. It was found in the SKU that some older PCs were not able to run Windows 7 and some digital dictation software couldn't run on Windows 7. The move to Windows 7

has also meant a new email system and a need to either migrate or archive e-mail from the existing system. This was not an insignificant undertaking given the vast amounts of data held on the existing system and was an area where the SKU felt they were not receiving adequate support from the Trust's IT department.

The architecture of the EPR software is also important to how easily accessible they are. All three of the EPRs in this study now have a web based architecture which allows them to be remotely accessed via the internet instead of having to be connected directly to the Trusts internal network. This was an important change to CV5 from its predecessor CV4 which was client-server based. However, the machines on which these EPRs run still have to connect to the internet and as was pointed out at various EPR programme meetings some Trust activity takes place in buildings which lack network connectivity. Mention was also made at one EPR workshop of a building that was built under the Private Finance Initiative (PFI) which meant that it would be too expensive to mount computers on walls in those buildings.

There are also further information governance regulations about the security of the networks over which patient data is sent so that having an internet connection alone is not sufficient in and of itself. The Trust and others within Sussex are connected together via a secure network, the Sussex COIN¹⁸ but not all BSUH activities take place on NHS premises. Some physiotherapy clinics for example take place in local leisure centres, and therefore it may not be possible for people working at these locations to connect to Alert.

In conclusion it has been seen in this section that Electronic Patient records bring freedom from the physical constraints of having to transport paper records bringing the potential to make patient records more accessible across space and time. However, the move from paper to electronic records enrolls new actors into networks of record keeping practices. Easier physical access also brings with it the potential to expand the range of people who can access records and this is closely linked to a previous site of controversy, that of EPRs as a single source of patient data. This is particularly relevant where care is shared between different NHS (and potentially non-NHS) organisations and makes more prominent the role of an existing actor in Information Governance. The ways in which EPRs may interfere with established practices concerning access may also alter relationships between healthcare professionals and between healthcare professionals and patients.

5.6 New Ways of Working

Authors such as Currie and Finnegan (2011) point to how, within the NHS, IT has often been linked with transforming or re-engineering the way hospitals operate in order to bring about improvements in both efficiency and the quality of the care they provide. In this study too similar transformative goals have been attached to EPRs. The economic 'mode of ordering' in which EPRs are seen as a way of saving money and increasing income has been encountered several times already throughout this chapter. This relationship where IT is seen as a means of improving efficiency

¹⁸ COIN = Community of Interest Network

through transforming working practices is present in the Trust-wide Alert EPR programme. The timing of the Trust's decision to acquire Alert was put down, in part, to their being a realisation at the Trust that it wasn't possible to go on cutting costs whilst still working the same way. There was a need to change the way the organisation worked and the new EPR was seen as a means of effecting that change.

There was however more to the programme than just efficiency savings, particularly from the point of view of clinicians. One interviewee recounted how, in one of the programme's monthly meetings, a consultant dismissed attempts to talk about the financial benefits that were in the business case. As far as that consultant was concerned the financial benefits were unimportant. Implementing an EPR was 'the right thing to do' and they didn't care about the money. The notion of implementing an EPR being 'the right thing to do' is rather vague but nevertheless seems to reflect a kind of belief in a transformative potential without being very specific as to what this entails in practice. Another interviewee, a clinician, whilst acknowledging the importance of the financial benefits stressed that this was not the 'be all and end all' of it. They too were looking to change the way the Trust worked but again there was vagueness to this. The way the Trust used information technology was thought to be lagging behind other walks of life. To this clinician it did not make sense that the technology that they and other healthcare professionals used to communicate with each other socially far outstripped what they were able to do within the hospital around things which were much more significant.

Such a vague belief in the transformational potential of IT might appear rather naïve and at odds with medical practice where new drugs for example must be rigorously tested for effectiveness and safety and then subject to cost-benefit analysis before being made available on the NHS. However, the work of Berg (2001) perhaps points to this not being such a strange idea and this will be picked up again in the following chapter.

The Trust had undertaken preparatory work for implementing an EPR as part of the NPfIT. This system was never implemented but the preparatory work, such as process mapping, did apparently have an impact in giving those involved in it an idea of what the Trust could gain by doing some of those processes electronically. There was a sense that the Trust needed to 'move forward' and EPR was the tool which would enable it to do so. The message was that the Alert EPR programme was about change and this was frequently repeated. 'Current process workshops' were rapidly followed by 'future process workshops'. At these and other meetings it was stressed that the programme was about changing the way people worked not just introducing some new software.

The introduction of CV5 in the kidney unit was also associated with an intention to change how that unit worked and again this was linked with modes of ordering concerning both efficiency and improving care. This was evident in the Trust's first SRIP programme update pamphlet:

The upgrade will provide the clinicians and management team with more accurate and timely data that can be more easily analysed, enabling a more

efficient management of the service and improving the quality and efficacy of patient care. (BSUH, 2010b)

CV5 was acquired as part of the Sussex Renal Innovation Programme, an arrangement which was described in this pamphlet as something which “will enable the processes within the renal service to be remodelled” (BSUH, 2010b). As part of the programme, an Action Learning Group was established to analyse how the unit worked and how ways of working would change with the introduction of CV5. Action learning sets got those involved to really think about what they wanted from a new EPR and how they were going to change their behaviour when they got one.

With both CV5 and Alert, therefore, there was a deliberate intention to use an EPR as a means of initiating changes to working practices. In this respect, however, there appears to be a contrast between the way these two systems have been problematised and the thinking that led to the decision to acquire Somerset. Phrases such as business change and service remodelling are noticeably absent from the cancer information systems business case and from interviewees who worked in cancer services. The intention in acquiring Somerset was primarily to meet existing data collection obligations and to enrol in existing MDT working. That is not to say that in practice Somerset has not changed the ways in which some people work rather that it was not primarily brought in with that intention. The fact that Somerset had actually brought more function and structure to MDT meetings which were previously run using paper was described as a by-product rather than something that the Trusts were particularly looking to address.

Arguably, Somerset has brought changes to the ways some people work because they have been innovative and found ways to use it which they have found beneficial. The Alert and CV5 programmes also provided opportunities for users to find their own innovative ways of using these systems and where appropriate, change their way of working. Indeed the process workshops and ALG approach appear to be intended to encourage just this. This is explored further in the following chapter. However, even before the process change workshops were undertaken there is one major change in working practices which the Alert programme was intended to bring about and which may be fundamental to this programme. It is also one which is a major source of controversy; this is the principle of data entry at the point of care.

The clinical documentation project was seen within the Trust-wide EPR programme as being their biggest challenge, but also the part of the programme which would ultimately bring the biggest benefits. This was because this it was a part of the programme which depended on changing the way clinicians work; getting them to write directly into the record there and then, at the point of care, instead of going away and writing it up afterwards. This was seen as something that a lot of clinicians couldn't quite get their heads around. The stumbling block here was the perception that this would mean clinics took longer. The challenge for the EPR-team was to convince these clinicians that although this might well be the case in the short term it was necessary in order to realise the benefits of having a single patient record and would ultimately be worthwhile.

That data should be entered at the point of care was mentioned on the introductory presentation PowerPoint shown at process workshops and stressed by members of the programme team during meetings. The team appeared to be right in thinking that achieving this would be challenging. Entering data, especially in the presence of a patient, especially if the same data has to be entered onto multiple systems, came across as the biggest single challenge to EPRs encountered in this study. Here the challenge faced by the EPR programme team in getting healthcare professionals to change their behaviour and enter data at the point of care may be likened to the challenge, described by Callon (1986), faced by scientists in of getting scallop larvae to anchor in newly introduced collectors. It is an obligatory point of passage in the EPR programme team's problematisation of Alert replacing the paper medical record.

Berg (2001), citing a number of previous studies, writes of how "data entry by professionals is a well-known bottleneck" (2001: 152), a view supported by Walsh (2004) when writing about clinician's perspective on electronic records. Within this study there was little evidence of Somerset or CV5 being used to input data at the point of care, in fact quite the opposite appeared to be the case. A renal patient stated that when they visited the kidney unit clinicians did not use a computer in their presence; notes were written on paper instead. Doctors did not necessarily enter data onto CV5 themselves; sometimes they dictated notes which were then entered by someone else. A Somerset user talked of how they did not enter data when a patient was present as to do so seemed rather rude to them. In some cancer MDT meetings data was input there and then into Somerset by a clinician as a patient was being discussed, but patients themselves are not present at these meetings. Similar reservations surfaced in process workshops with at least one doctor wanting to carry on making paper notes to be entered onto Alert afterwards, exactly the 'going away and writing it up afterwards' that the EPR programme team didn't want to happen.

There seem to be a number of reasons why this is an issue. As already seen there is the idea that it is impolite to use a computer in the presence of a patient. Then there is the suggestion, echoed by Haland (2012) and Jensen and Aanestad (2007), that some healthcare professionals, especially perhaps more senior ones, view data entry as a clerical task and for them to be entering data in some way diminishes their professional status. There was little evidence to support such an assertion in this study although suggestions along these lines were hinted at on a couple of occasions. However, on neither occasion were those about whom the suggestion was being made present to confirm or refute it. This may also have been a consequence of a study design where limitations placed on the recruitment of interviewees tended to mean these were almost exclusively people who were EPR enthusiasts.

Other concerns centred on the time it takes to enter data and the fit between work processes as codified in an EPR's user interfaces and the actual ways that people work in practice. In the renal ALG meetings (when no doctors were present) there was a definite feeling expressed that doctors, especially consultants, were less good at inputting data into CV5 than nurses. This was partially blamed on time issues and doctors were said to consider that screen layouts were not well-

designed. This view was supported by one CV5 user who felt that, whilst overall it was a great system, the user interface was not as user friendly as it could be and that it took a long time to go through all the elements that might be needed in a consultation. This could add between five and ten minutes to a consultation depending on how much there was to write down.

The vendors of CV5 and Somerset seemed well aware of the importance of an intuitive user interface to the usability of their products. CCL spoke of future intentions to enhance the CV5 user interface by simplifying it and making it 'less clicky'. In Somerset they talked about how, in order to gain clinicians' engagement with their product, the screen design needed to flow in a way which was logical for them. It was recognised that if getting into a screen took a long time, and then that screen wasn't laid out in a logical format and was difficult to navigate, then clinicians wouldn't bother to capture the information on it. The aim was to make life easy for the user.

During Alert EPR process workshops concerns were also raised about the amount of time data input would take. The Alert user interface was generally considered to be one of its strongest features. It makes use of configurable templates which were seen in the selection process as making the product more flexible than its competitors. Nevertheless some clinicians appeared less than convinced that Alert was customisable enough for the way they worked, pointing out that the work they did was not standardised and did not fit in with a template way of working. It was very apparent whilst observing the EPR programme workshops that even within a single speciality there seemed to be vast variations in practice and it was easy to imagine the EPR programme experiencing similar difficulties in tailoring templates to those observed by Bjorn et al. (2009). In their study of a Canadian emergency department triage system the differences between the requirements of adult and paediatric services made negotiating common templates an extremely arduous task.

The use of templates in the Alert interface links back to an earlier controversy, that of the balance between EPRs as an audit tool and an operational tool. With both the CV5 and Alert projects the intention is that thinking about change does not stop once the EPR has been implemented. Rather it is an ongoing process driven in part by management information provided by the EPRs themselves. This can be seen in the SRIP newsletter quoted earlier, CV5 would provide data that could be 'more easily analysed'. It was also mentioned by one interviewee that Trust audit teams are looking to Alert as a source of evidence of what the Trust does. They talked about how the use of templates, rather than free text, is integral to this:

Some people come at it more from an audit perspective and just see the benefits that it will be able to bring and knowing that if you don't rely on free text and go with the templates and things then you can report on it all and I think people see that as a real benefit. (Interviewee 20)

The use of free text also makes the job of interfacing systems more complex. The importance of interfacing to how EPRs are problematised as a single source of patient data and to how that data is accessed has already been discussed. However there are also drawbacks to the use of templates. Some clinicians, on seeing Alert

demonstrated, observed that there were too many tick boxes and they would simply end up using free text. Tensions between the use of coded data and free text were also a topic of discussion at the EPR discussion day organised by the renal unit and CCL and there seemed to be general agreement there that most clinicians preferred to use free text. Similarly Walsh (2004) discusses the importance of narrative to clinicians' understanding of what is happening to patients and observes that recording data in coded form is a particularly poor way of capturing this narrative.

To conclude this section, it has been shown how two of the EPRs studied, CV5 and Alert, are associated with transforming working practice in the hope that they will improve patient care and lead to efficiency savings. However, the details of exactly how these EPRs are to achieve these goals are rather vague. In the Alert EPR programme the principle of data entry at the point of care has been problematised as an obligatory point of passage in this transformative process but evidence of how Somerset and CV5 are used in practice, and evidence from other academic studies, suggests this may be difficult to achieve for both social and technical reasons. This may be partly due to well-established professional modes of ordering in which data entry is seen as a clerical task which undermines doctors' professional identity and partly due to the time which data entry takes. Here, technical design considerations, particularly the layout of data entry screens, are seen as being of the utmost importance. Screen design is itself partly a compromise between the competing priorities of audit and operational functionality discussed previously. The ability to tailor screen designs to best fit the way users work is also compromised by the huge variation in working practices within the Trust suggesting the specialist systems such as Somerset and CV5 may be better able to enrol users than the more generic Alert system.

5.7 Conclusion

In this chapter controversies have been used as an analytical device to explore how EPRs are problematised and enacted in this case study. CV5, Alert and Somerset can all be understood as an assemblage of heterogeneous actors as diverse as clinical staff, product vendors, patients, diseases, business cases, IT equipment, screen designs and Information Governance. The ways in which these actors are assembled can be seen as partially reflecting different modes of ordering which are prevalent within the NHS and the world beyond. The ways in which the two specialist systems, CV5 and Somerset, are ordered owes more to the requirements of treating specific diseases, or groups of diseases than the more generic Alert system. Hence, the focus on the complex reporting requirements in cancer services and the greater focus on remote working and patient access which can be seen in renal services.

Neither CV5 nor Somerset have been burdened with the same degree of financial pressures which face the Trust-wide EPR programme and show less evidence of an economic mode of ordering. Both Somerset and CV5 can be seen as being 'patient-centred' in the sense that there have been efforts to improve the communication of patient records across all those involved in the treatment and care of an individual patient even when some of them are not employees of BSUH. However, in another sense they can be considered to be 'specialty-centred' as the

patient data in both these systems is isolated from healthcare professionals in other specialties who might be treating the same patient for co-morbidities. Consequently, neither has replaced the medical records in their orange folders as the statutory patient record. Largely as a result of this the legitimacy of both CV5 and especially Somerset to be considered as electronic patient records has sometimes been called into question.

The new Trust-wide EPR is intended to overcome these drawbacks to specialist EPRs by being accessible to all specialties across the Trust and replacing the orange folders of medical records, but it has many difficulties to overcome before this is achieved. At the time of writing it had only just started to be implemented and this process which was always intended to take several years was already behind schedule. Questions have been raised over whether sufficient commonality of processes exist within the Trust that a single system can match either the functionality or comparative ease of use of existing specialist systems. The system is intended to be used by healthcare professionals to enter data at the point of care yet data entry by healthcare professionals especially in the presence of patients is notoriously difficult to achieve and the less specialist a system, the less 'slick' it is likely to be to use.

Whilst each system can be considered an actor-network in its own right they do not exist in isolation from one another and can each be considered as parts of wider actor-networks. What happens in one may have implications for the others. The Trust-wide EPR programme has adopted the slogan 'One Patient One Record' yet it is somewhat off of achieving this in practice. If Alert is unable to replace systems such as CV5 and Somerset then potentially it will have to compete with these for clinicians time. If clinicians continue to use their existing specialist systems at the expense of Alert then it may lose one of the principal qualities which sets it apart from these, the ability to be a single source of patient data. If it loses this quality it is even less likely to be widely used and if it is not widely used it may fail achieve the efficiency savings necessary to pay for it.

6 Reassembling

6.1 Introduction

In the previous chapter the analytical device of exploring controversies was used to answer the first two research questions posed in this thesis, concerning problematisations and enactments of EPRs in NHS secondary care. These controversies suggest that EPRs are complex and messy objects which are difficult to understand. Even within this single case study there could be found many different approaches to what an EPR could or should be. Dominant amongst these was the new Trust-wide EPR programme in which the problematisation of EPR as a single system which could be used across all specialties within the Trust arguably resembles the 'one size fits all' approach of the NPfIT, albeit scaled-down to a single Trust. The Trust-wide EPR programme is in tension with the various existing smaller specialist departmental systems which already exist within the Trust. Some of the ways in which this programme problematises EPR, as a Trust-wide single source of patient data which will replace the paper-based medical record, delegitimised the status of these existing specialist systems as EPRs and threaten their continued existence at the Trust. Yet the Trust-wide EPR was not, at that time, in a position to replace these specialist systems. Their continued presence prevents the Trust-wide programme from translating the vision of an EPR which is a single source of patient data into reality. This tension suggests a paradox in which none of the systems that feature in this study can properly be considered to be an EPR. In this, the final analytical chapter of this thesis, this paradox is addressed by answering the third and final research question posed in this thesis: how might changing the way EPRs are problematised effect how they are enacted?

Law and Singleton (2005) argue that there are different approaches to understanding complex and messy objects. They distinguish between two strategies for 'knowing mess' which they refer to as the *epistemological* and the *ontological*. The epistemology strategy works by saying that objects look messy because people have different perspectives on them:

Looked at in this way, then, messy objects are interpretatively complex objects, and if we want to understand them we need to take this into account. We need to *explain* (and in some cases explain away) the different perspectives, and so retrieve the real object behind the interpretations. (2005: 333)

This is one way Trusts could approach the controversies discussed in the last chapter. They might need to explain or explain away the differences to be found at these sites of controversy and thus arrive at what an EPR 'really' is. Arguably, this kind of approach has been tried by policy makers in the past. The 1998 strategy document *Information for Health* for example sets out a six level model of EPRs defining the functionality required for each level and setting a target that 35% of acute Trusts should have achieved level 3 by April 2002 (DoH, 2002; Jones, 2004).

In this case study it would be possible to sift through each of the controversies previously discussed and attempt to adjudicate what an EPR really is and whether it had been achieved. Arguably, this is what some of the participants in this study were doing in response to interview questions about EPRs. One participant said Somerset was not an EPR because it had not replaced the paper medical record folders and for them getting rid of paper was what defined an EPR. Another had disputed that Somerset or CV5 could be considered EPRs because they are stand-alone systems and for them an electronic patient record had to be a complete clinical record of a patient's care. Something similar was found in the business case for the Alert EPR which identified specific cost savings that had to be achieved. The EPR being used to record patient data in place of paper records was one of the 'success criteria' listed in the Project Initiation Document for the Clinical Documentation component of the Trust-wide EPR programme. All these might be seen as examples of attempts to get to know what a real EPR is and whether it can be said to be in place.

Arguably, if one follows this approach to build up a picture of what an EPR really is then none of the systems in this study can yet, or probably ever can, be viewed as real EPRs. At the time the field work in this study was undertaken none of the three systems had replaced the medical records in the orange card folders and it is doubtful that any can be said to be a complete record of any patient's clinical details. Within the Trust, as well as the split between electronic and paper records, patients with co-morbidities can have records on multiple electronic systems. Added to these are the records held by GPs and by other Trusts that a patient may be being treated at. It is therefore unsurprising that when attempts are made to know and evaluate EPRs epistemologically, the incidence of 'failure' is, as discussed at the beginning of this thesis (section 2.2), so high. As Jones (2004) notes, only 3% out of a target of 35% of Trusts had achieved 'level 3 EPR' in the time frame specified by *Information for Health*.

This chapter therefore follows the alternative approach to knowing mess suggested by Law and Singleton (2005). They suggest that in order to know complex and messy realities it is necessary to take an ontological approach, that is "to think more carefully about the nature of the objects in the world - about what counts as an object" (2005: 334). Sections 6.2 and 6.3 of the chapter therefore build on the findings of Chapters 4 and 5 and use the lens of ANT to 'reassemble' EPRs at an ontological level. The final section (6.4) then examines what implications the findings in Sections 6.2 and 6.3 might have in terms of new ways of working for those responsible for EPRs in different contexts.

6.2 Performativity and its Consequences

Law (1999) describes how in ANT ontology is understood to be not only relational but also performative, that is entities achieve their form as a consequence of the relations in which they are located but are also '*performed* in, by and through those relations' (1999: 4). The accounts of EPRs given in the previous two chapters are therefore not only accounts of relationships between actors but also accounts of how EPR objects are performed. It is argued here that three types of object were being performed, each of which is inseparably intertwined with the others. These

three objects being: *imagined EPRs*; *instantiated IT systems*; and *EPRs in effect*. The third of these, EPRs in effect, being a product of the first two.

The first object, the *imagined EPR* is enacted through strategy documents, business cases, implementation plans, demonstration systems and workshops etc. It may be highly idealistic or eminently pragmatic. It *may* correspond to, or be informed by, instantiated IT systems but it is not itself an instantiated working IT system and its existence does not depend on the presence of one. The second kind of EPR object are *instantiated IT systems* such as Somerset or CV5 which electronically store clinical data about patients. Unlike the imagined EPR, to exist they must have a physical presence assembled out of and performed by hardware, software, users etc. These instantiated IT systems do not always correspond to imagined EPR objects, but when and where they do they produce the third EPR object which is identifiable as an *EPR in effect* (Figure 11).

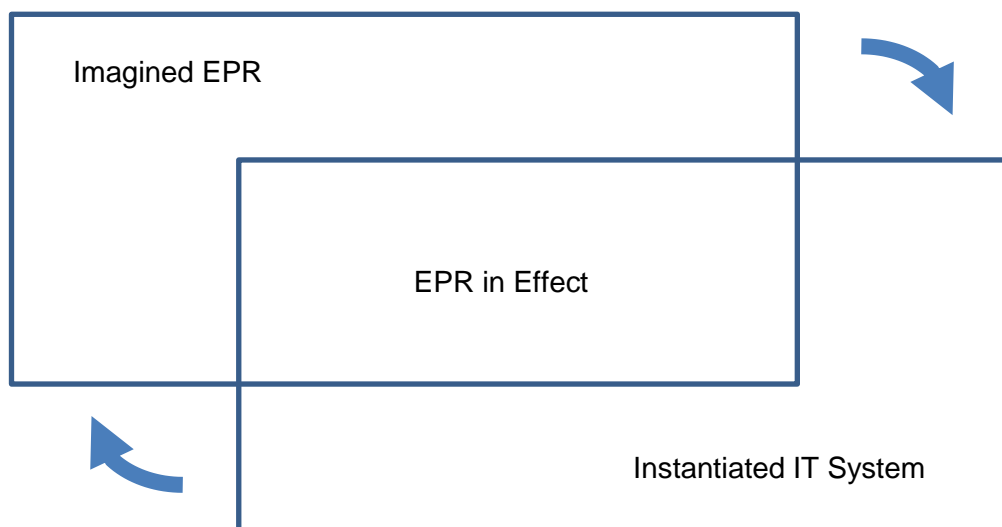


Figure 11 *EPR in Effect* is produced when *Instantiated IT Systems* and *Imagined EPRs* overlap.

This situation is further complicated because each of the first two EPR objects is performed in a variety of different ways at different times and places by different combinations of actors. Different problematisations of EPR have produced imagined EPRs which differ in, for example, who should have access to them and whether their main purpose is to support interventions in patient care as it is happening, or to record what has happened after the event. In some practices CV5 and Somerset have replaced paper notes whereas in others they have not. *EPR in effect* therefore exist as patches of practice in time and place which depend on both the performances through which EPR is imagined and the performances through which instantiated IT systems are enacted.

A particular performance of an *instantiated IT system* may simultaneously be both an *EPR in effect* and not an *EPR in effect* depending on how EPR is imagined. CV5 is an *EPR in effect* when EPR is imagined as being accessible only within renal care but not when, as in the Trust-wide EPR programme, EPR is imagined as being accessible throughout the Trust. Likewise, if *how* EPR is imagined remains constant

but the *performance* of an instantiated IT system differs, for example where Somerset is performed as a paperless system by some healthcare professionals but not others, then the instantiated IT system is simultaneously both an *EPR in effect* and not an *EPR in effect*. If either the performance of an imagined EPR object or an instantiated IT system changes then an existing patch of EPR in effect may disappear or a new patch be created.

When field work was being undertaken Somerset and CV5 were already instantiated at the Trust as working IT systems. Each was enacted by assemblages of heterogeneous actors and, crucially to the arguments that follow each was being performed in multiple, sometimes contrasting, ways. The case of the Trust-wide EPR programme was somewhat different. The Alert system was still in the process of being instantiated and had not yet 'gone live'. But whilst this programme had not yet enacted an instantiated, working, IT system at the Trust it played a role in producing the second kind of EPR object, the imagined EPR. This is not an object with a physical presence in the form of an instantiated IT system but it nevertheless leaves traces which make it knowable. In the Trust-wide EPR programme these could be observed in process workshops and implementation progress meetings and were present in documents such as the business case, project initiation documents and implementation schedules.

In interviews some people spoke of what an 'ideal' electronic patient record would be in terms of imagined functionality, whilst others listed what an EPR was not. This was especially informative when the status of CV5 and Somerset as EPRs was disputed in interviews and documentary data sources. These imagined EPRs were not pure flight of fancy but often grounded in and informed by experience of instantiated, working, IT systems, at BSUH and elsewhere, whether these were considered to be EPRs or not. The EPR imagined in the Trust-wide EPR programme, for example, was based partly on Alert having been observed as an instantiated, working, IT system in other (overseas) hospitals. The *imagined EPR* and the *instantiated IT system* are thus not the same, but they are related and each informs the other.

At each of the sites of controversy discussed in the previous chapter different actors enacted different imaginings of what an EPR could or should be. In doing so they are defining conditions of possibility (Law, 2008 after Foucault). The reminder issued with Somerset login details was performing EPR as something that supports patient care as it is happening rather than a post-event record for audit purposes. The EPR programme team's exhortations that Alert must be used to document activity at the point of care did something similar. The slogan 'One Patient One Record' on EPR programme documentation and in statements from various interviewees defined EPR as something which is a single source of data about a patient. The success criteria in the clinical documentation project's project initiation document, and the referencing of government targets for the NHS to be as paper light as possible by 2018, define EPR as something which replaces paper records. But sometimes EPR was thought of in altogether much looser terms, such as by the Somerset user who observed that, however one chose to define EPR, Somerset was clearly an electronic record of some of the important things that happen to a patient. Each performance imagines a different EPR, one which is operational, one

which is paperless, one which is a single source of data etc. These may coincide but not *necessarily*, there are multiple realities of imagined EPR. It is the same with each of the instantiated IT systems. For example, in some enactments the reality of Somerset and CV5 is that they had replaced paper records whilst, simultaneously, in others they had not.

Both of the first two EPR objects, *imagined EPRs* and *instantiated IT systems*, have been shown to have multiple realities. Each of these EPR objects is related and interferes with the other. Experience of instantiated working IT systems act, in some ways, to define how EPRs are imagined, and imagined EPRs act to define whether or not an instantiated IT system is considered to be an EPR. It is this last interference which it is argued produces the third EPR object, the *EPR in effect*. EPR in effect occurs when performances of instantiated IT systems coincide and overlap with performance of imagined EPRs. For example CV5 replacing nursing notes coincides with EPR imagined as a replacement for paper notes and Somerset being used in MDT meeting coincides with EPR imagined as supporting interventions in patient care as it is ongoing. There are also occasions where the performance of these instantiated IT systems do not overlap with how EPR is imagined, for example, CV5 and Somerset are still silos of data, not a complete record of care. They are still being performed and producing effects but it was argued by some participants in this study that these are not EPR. Where *imagined EPRs* and *instantiated IT systems* do overlap *EPR in effect* is produced in patches, akin to the 'patches of order in a sea of disorder' described by Law (2008 after Serres) but patches of EPR in a sea of non-EPR.

Performativity has other implications besides multiplicity for the understanding of EPRs. The first of these is that reality is precarious; translation is a process that is never really complete. Actors have to keep acting or the realities which they perform may fall apart or change; performances alter as new actors join networks or existing ones are displaced. Each of the EPR objects discussed above is precarious to a greater or lesser degree. There were many examples of this in the case study and in the literature on EPRs. Mandatory data sets for audit and reporting purposes are major actors in both of the instantiated IT systems. These change constantly with new data items and sometimes entirely new data sets being added. This was particularly apparent in cancer services, the new lung audit being one of the reasons for BSUH acquiring Somerset, but there were also planned changes to the renal registry data submission. Unless Somerset and CV5 are updated to keep in step with these changes then an important part of their usefulness will be lost.

Changes in technology may also act to destabilise the EPRs. Microsoft's updating of the application development software, Classic ASP¹⁹, which the Taunton team used to build Somerset, lead to them feeling the need to rebuild the system in the newer ASP .net. It was explained that this was because the older version of the development software would, in future, be unsupported by Microsoft therefore to advance the Somerset product further they needed to be using the latest version of the application development software. This change process for a variety of reasons

¹⁹ Active Server Pages a programming language used to develop web-based applications.

proved more difficult and took longer than anticipated. The knock-on effect of this was that for a substantial period of time the development team were working on two versions of the software until they got the new version up to the same level as the old one. This absorbed development resources and led to a backlog of changes building up.

The enthusiasm of staff and their willingness to continue using an EPR cannot be taken for granted. Jensen and Aanestad (2007) wrote of how the initial hospitality of a group of orthopaedic surgeons towards a new EPR in a Danish hospital eventually turned to hostility. The new EPR was perceived as challenging their professional identity, acting as a control mechanism and forcing them to undertake tasks such as data entry which they didn't consider to be their responsibility. In this study issues with data entry were also encountered. In the kidney unit in this study there was talk of a 'glass ceiling' in terms of clinicians inputting data into CV5. With the Trust-wide EPR programme although overall there appeared to be a great deal of enthusiasm for a new EPR in various meetings it was noticeable how this began to change as the programme unfolded. Once the specifics of how it might, or more pointedly might not, fit in with how clinicians currently worked, and, as people began to speculate on the possible consequences in terms of potential job losses required for the programme to pay for itself, a distinct cooling of that enthusiasm was observed. There were many other examples of precariousness which were encountered and later in this chapter these will be returned to (in section 6.4) when questions of how to bring stability and durability to EPRs are addressed.

There is another implication of performativity besides precariousness which is tied up with what Mol (1999) has called ontological politics.

If the term 'ontology' is combined with that of 'politics' then it suggests that the conditions of possibility are not given. That reality does not precede the mundane practices in which we interact with it, but is rather shaped within these practices. So the term *politics* works to underline this active mode, this process of shaping, and the fact that its character is both open and contested. (1999: 74)

Mol (1999) herself points out the idea that reality can be intervened in is not new, it is she says the point of technology and indeed politics. Rather, what is new according to Mol is that ANT (although not ANT alone) has "robbed the *elements* that make up reality – reality in its *ontological dimension* – of its alleged stable, given, universal character" (1999: 75). What is new is not the idea that the world that we live in can be altered but rather that the truths that are taken to determine the possibilities that limit how we might alter that world have been challenged. Crucially, the notion of performativity challenges the ideas that reality is fundamental and that it is singular.

In this study, by working with the ideas of ANT and its successor projects, understandings of EPR are reassembled in ways which challenge how they are thought about (particularly with regards to success and failure) and intervened in. This however is only part of what ANT brings to this study as others who have worked with it have more to say about how these assemblages hold together (if

indeed they do), and how the objects they define, in all their realities, relate to one another.

6.3 Immutability, Fluids and Fire

Throughout its history Actor-Network Theory and its successor projects have unsettled and recast prior understandings of what ‘the social’ is understood to be. One of the ways they have done so is to explore the forms and behaviours of what may be variously described as ‘social spaces’ (Mol and Law, 1994) or ‘objects’ (Law and Singleton, 2005). These may be physical objects, such as the ships described by Law (1986) that the Portuguese used to project power as far as Goa, but also more abstract objects such as diseases like anaemia (Mol and Law, 1994, Mol 1999) or alcoholic liver disease (Law and Singleton, 2005). Considerable attention has been given by those working with ANT to how these objects are configured such that the various actors from which an object is assembled hold together (or fall apart) as that object moves over time or place.

Three forms of assemblage are of interest here in exploring the nature of electronic patient records, networks, in particular networks which behave as *immutable mobiles, fluids* and *fire*. These may be thought of occupying a roughly chronological order, each a response to perceived weaknesses in previous understandings. Early ANT studies, such as Law’s (1986) study of Portuguese imperial power, theorised objects such as sailing ships as rigid actor-networks which were *immutablely* mobile. As ANT has developed those working with it began to theorise other types of object behaviours. De Laet and Mol (2000) liken a type of Zimbabwean water pump to a *mutably* mobile fluid, which held together not by being rigid and unchanging but because it was adaptable and open to gradual change. More recently Law and Singleton (2005) have thought of alcoholic liver disease as an object which behaves like a fire in that it is brought to presence by absence. The idea of objects as heterogeneous and performativity networks which are at the heart of the early work in Actor-Network Theory may be seen as incompatible with earlier essentialist ontologies. However, the subsequent theorising that these assemblages sometimes resemble fluids or fires should be seen as building on, complementing and extending the possibilities of networks rather than supplanting them. As Mol and Law (1994) put it “We won’t spill blood, disposing of the old in favour of the new. Our plea is for topological multiplicity rather than uniformity” (1994: 644).

Within the three EPR objects already discussed, *imagined EPRs, instantiated IT systems* and *EPRs in effect*, it was possible in this case study to identify characteristics of some of the different object configurations just described. Several of these stood out as being of particular importance. They are summarised in Figure 12 below.

Object Characteristics	EPR Object	Example
Immutable Mobile – object maintains shape as it moves across space and time because relationships between actors in network don't change.	Imagined EPR	EPR imagined as transportable from overseas healthcare system to NHS.
	Imagined EPR	EPR imagined as transportable across multiple specialties within Trust.
	EPR in Effect	CV5 in use at satellite locations e.g. Bexhill dialysis unit
	Instantiated IT System	Somerset installed in approx. 90 NHS Trusts
Fluid – object holds together despite, or perhaps because, relationships between actors slowly change as the object moves across space and time.	Imagined EPR	Phased implementation plan imagines Alert gradually being implemented in one speciality after another and new modules gradually being phased in.
	EPR in Effect	Laboratory analyser machines being gradually interfaced to CV5
	Instantiated IT System	Changes in Somerset's underlying technology from Access through Classic ASP to ASP.net
Fire - object brought to presence by making other objects absent.	Imagined EPR	EPR imagined as replacing paper records.
	EPR in Effect	CV5 replaces nursing notes.
	Instantiated IT System	Somerset used to record MDT outcomes and patient notes when patients not present.

Figure 12 Different characteristics of object assemblage and their applicability to EPR objects.

The first characteristics of interest were several obligatory points of passage, these are actors which cannot be ignored by other actors in a network assemblage and are a feature of immutable mobiles. These included the Trust's existing patient administration system with its patient master index, information governance restrictions on sharing data outside of the Trust, and the financial requirements of the business case for the Trust-wide EPR programme. Secondly, in several important ways all of the EPR objects can be thought of as having a fluid topology. The boundaries of what defines an EPR are not always clearly delimited and enactments of the instantiated IT systems may gradually change over time so that they more closely correspond to how EPRs are imagined. Lastly EPRs have sometimes been imagined and performed in terms of absences rather than presences, a characteristic of fire objects. These included absences of paper, of inefficiencies, of certain unsafe practices, and in some circumstances of patients.

Each of these object configurations is discussed more fully below. This is followed, in the final section of this chapter, by a discussion of the significance of these findings for how EPRs are practiced within the case study Trust and elsewhere.

6.3.1 EPRs as Immutable Mobiles

An entity such as a text or a device is immutable when its elements do not change and the relationship between them is not altered. It holds itself stable wherever it goes. And it is mobile because, from the point of view of a regional topology, it displaces itself from one place to another. (Mol and Law 1994: 649)

Of the three EPR objects in this study there is some evidence to be found of immutable mobility, particular in EPR as it is imagined. Alert was imagined in the Trust-wide EPR programme as being, more or less, immutably mobile in that it could be exported from Portugal to Brighton and still function. It was recognised that work would be required to make this happen, to 'Anglicise' the software, but it seems that the extent of the work required was somewhat underestimated. Alert is also imagined as transporting a common patient record around the Trust so that everybody had got the same information about a patient; eventually the patients themselves might also get access to these records. There are echoes here of the vision of the NPfIT, albeit on a reduced scale. It might no longer be the case that the EPR imagined here is immutable between different parts of the country²⁰, but it should be immutable between different departments within the same Trust.

CV5 was imagined in the Sussex Renal Innovation Programme as helping to make the practices of caring for renal patients immutably mobile, transporting outpatient clinics from the kidney unit in Brighton to remote locations around the county. This has to some extent been achieved in practice, for example with CV5 instantiated in the Bexhill dialysis unit. Here, the imagined EPR and the instantiated IT system overlap so there is a patch of EPR in effect which behaves like an immutable mobile. The Brighton Somerset system is instantiated in many departments throughout the Trust and available to some MDT members outside of the Trust. Here again the instantiated system is arguably immutably mobile, and, as some of these practices correspond to imagined EPRs, here too are patches of EPR in effect. As Somerset is instantiated in some 90 Trusts across the NHS this is further evidence of immutable mobility.

However, there were also many realities of the three EPR objects which were not immutably mobile. Performances of the instantiated Somerset system had not travelled well between MDT meetings and surgeons' post-operative record keeping practices. Neither had performances of CV5 travelled well from outpatient clinics to the renal ward. EPR as imagined in the Sussex Renal Innovation Programme, as a renal-specific specialist system, differed from how it was imagined in the Trust-wide

²⁰ In a 1998 speech Prime Minister Tony Blair declared "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" (cited in Greenhalgh et al. 2008)

EPR programme or in the Somerset development team in Taunton. EPR might sometimes be imagined as being immutably mobile, but not always.

Interestingly whilst the detail of how EPR is imagined changes over time and place, the fact that it is imagined has persisted for many years and in many different places. The Trust had previously imagined receiving a (regionally standard) EPR as part of the NPfIT. When the NPfIT stalled and then was then dismantled the Trust did not stop imagining having an EPR, it just imagined a different one (Alert). In the kidney unit there had been a previous EPR, CV4 but there was dissatisfaction with this so through the Sussex Renal Innovation Programme and the Action Learning Group a new EPR was imagined and a new system eventually procured. That system, CV5, and Somerset too, have an instantiated presence in the Trust which has remained durable over time. Whilst both only partially correspond to imagined EPRs, and therefore enact limited patches of EPR in effect, neither has fallen apart nor fallen into disuse in the same way that the domestication of scallops in Brittany (Callon 1986) did. It therefore appears that all three EPR objects sometimes change shape as they move around in time and space without necessarily falling apart. In these realities they appear to behave like fluids being mutably, rather than, immutably mobile.

6.3.2 Fluid objects

Actor-network theory and its successor projects recognise that not all objects that move across space or time have to hold themselves rigidly together in networks of invariant relationships or fall apart. Accounts such as those of the clinical performance of anaemia (Mol and Law 1994) and the Zimbabwean Bush Pump Model B (de Laet and Mol 2000) suggest a different, more fluid, type of object. These objects are able to hold together even if the relationships between the actors of which they are made up are not constant. Instead of being immutable mobiles they can be thought of as mutable mobiles (Mol and Law, 1994; de Laet and Mol, 2000; Law 2008).

De Laet and Mol (2000) argued that the Bush Pump is partly fluid because its design has change over time. In this sense CV5 and Somerset can certainly be seen as fluid and probably Alert too. CV5 is a continuation of a product line which included CV4 and before that Proton. It has also undergone periodic updates to new versions and more were in the pipeline. Likewise Somerset has changed from the original Access database, through the version developed in Classic ASP, to the current version developed in ASP .net. There are frequent updates to keep it in line with dataset changes and there are new screen designs on the way. Alert is being 'Anglicised' to fit the NHS market. These planned changes show too that EPRs are also being imagined as objects which change over time, the phased implementation plan for Alert is another example of this. The patches of EPR in effect produced by CV5 and Alert in this case study setting have also changed over time, for example the gradual connecting up of laboratories to CV5 and the gradual replacement of nursing notes by CV5.

The Bush Pump was also considered to be fluid because its purpose was not clear cut. There appear to be some parallels here with the imagined EPRs and

instantiated IT systems in this study. There are not always clear dividing lines between these. Where CV5 and Somerset are instantiated in the Trust they serve multiple purposes and the boundaries between these are not always distinct. CV5 enables remote clinic working which benefits patients through reducing the time, expense and stress of having to travel to Brighton. It also saves the Trust money by reducing patient transport costs. Sometimes and in some places the ways in which CV5 and Somerset are enacted corresponds with how EPRs are imagined and sometimes not. The dividing lines between *imagined EPR*, *instantiated IT system* and *EPR in effect*, are not always clear. Arguably, then these objects all have fluid characteristics.

De Laet and Mol's (2000) also discuss how 'success' is a fluid concept when it comes to the water pump. This too has implications for the EPR objects in this study and links back to the point Jones (2003) made about the EPR he studied. It was difficult to call it a failure as it was implemented and working but difficult to call it a success as clinicians didn't like it. In fluid objects which have multiple realities arguably judging success or failure in absolute terms becomes meaningless.

There is one more sense in which De Laet and Mol (2000) argue that the Bush Pump is a fluid object which is of interest here. This concerns defining an object in terms of its constituent parts rather than its purpose or functionality; whether the object is composed of 'obligatory points of passage' that are required to hold it together or whether it still holds together when one or more of its constituent parts are taken away. An actor-network in the sense that Law (2008) calls actor-network theory 1990 may be thought of as a set of relationships between entities which create an agency. The agency of the Bush Pump depends not just on the bits and pieces of the pump, but also on a drill to make the bore hole, instruction manuals, spanners and teaching children not to throw stones down the bore hole. The Bush Pump is fluid because not only is it not entirely clear where its boundaries are (are the drill, the instruction manual etc. actually part of the Bush Pump or not?) but also because when pieces the pump may continue to work or they may be easily replaced with other things. This behaviour looks quite similar to the way in which Mol and Law (1994) distinguish a fluid from a network.

For in a network things that go together depend on one another. If you take one away, the consequences are likely to be disastrous. But in a fluid it isn't like that because there is no 'obligatory point of passage'; no place past which everything else has to file; no panopticon; no centre of translation; which means that every individual element may be superfluous. (1994: 661)

But by this definition of fluid many of the realities of the three EPR objects start to look more like networks again. In each of these objects there are, or so it is argued here, dependencies, obligatory points of passage, places past which everything else has to file, panopticons and centres of translation and their existence says something about power relationships. Take as an example the Patient Administration System and its Master Patient Index. In order to work in the context of BSUH CV5, Somerset and eventually Alert, all have to be interfaced to this. In some senses it is registration on the Master Patient Index which defines someone as being a patient of BSUH. As has been seen in the discussion on EPR as a single

source of patient data in the previous chapter (section 5.4) it is this which prevented all the Trusts in the Sussex Cancer Network from sharing a single installation of the Somerset Cancer Register.

To the EPR programme, the finance department must seem like a panopticon always checking that the financial commitments made in the business case are being adhered to. User change requests for Somerset must be voted through by the Change Advisory Board and will always take second place in the queue for development time behind changes needed to meet mandatory reporting requirements. If the renal ALG wants to raise a change request with CCL it must be approved by one of the senior clinicians and the IT department first. That not all surgeons could be persuaded to record their operative notes in Somerset shows it is necessary to get the approval of powerful clinicians or they will not use a system.

The EPR objects therefore do not fit exactly either of these configurations, they have some characteristics which definitely appear fluid and change over time or place but in other respects they appear more like rigid networks of immutable mobiles. Some elements are superfluous but others not, depending on the EPR object in question. In some imagined EPRs, replacing paper notes is an obligatory point of passage. If an instantiated IT system does not do this it is not considered an EPR, but this does not stop CV5 or Somerset from being used as working systems. Somerset has fluidly developed from a simple Access database for recording audit data to a far more sophisticated system which has increasingly come to resemble an EPR as they are imagined and yet it must interface with PAS or it would no longer work. Furthermore, there is a third configuration type which has been more recently theorised in ANT and its successor projects, that of the fire object, and there are characteristics of this that can be found in the three EPR objects identified in this study.

6.3.3 EPRs as Fire objects

So far in this discussion EPRs in their various enactments have been conceptualised firstly as immutable network objects made up of rigid sets of relationships between other objects/entities which may, or as it sometimes turns out may not, be mobile and secondly, as mutably mobile fluid objects. However, ANT/post-ANT theorising about objects did not stop there. Law and Singleton (2005) proposed another object type which they referred to as 'fire objects'. Whilst the notion of fire as a type of object configuration has been considerably less well developed academically than either that of immutable mobiles or fluids it is argued here that it is nevertheless important to making sense of accounts of EPR gathered in this study, particular those in which EPR were imagined rather than those of how EPRs were enacted in practice. There are several ways in which EPRs as they were imagined are suggestive of fire objects.

In common with the history of how EPRs have often been imagined by policy makers the Trust-wide EPR and, perhaps to a lesser extent the vision for the renal EPR, were seem as having transformative potential. These transformations were often imagined in terms of absences: transforming the Trust into an efficient an technologically up-to-date organisation by making paper absent or 'other';

transforming patient care by making silos of data absent; making 'other' the transport misery of renal patients having to come into Brighton for a clinic; making 'other' a need to develop in-house cancer audit solutions; and as making unsafe and inefficient practices absent. Tied up with the last point, they are also seen as potentially making members of staff, such as those who 'pull' the paper records who would become absent through redundancy. The presence in the Trust of CV5, Somerset and the Trust-wide EPR programme owes much to another absence, that of an NPfIT solution. Somerset was initially brought into the Trust as a temporary solution until such time as Connecting for Health delivered the desired functionality as part of an integrated EPR solution. Similarly, the Trust-wide EPR programme was only undertaken, and undertaken as a Trust-wide rather than regional or even national project, because of the absence of the previously anticipated NPfIT solution.

There is also another absence, or series of absences which were largely present throughout this study, and these concern patients²¹. With the exception of the renal Action Learning Group, which had a patient who regularly attended their meetings, and a cancer awareness course, attended by staff in Taunton at which patients talked of their experiences of cancer, patients seemed to be largely absent from having any input into either the imagining of EPRs or the development and implementation of CV5, Somerset and Alert at the Trust. There was no patient representative present as part of the Alert implementation programme. Patients often seem to be absent when the systems are being used in the Trust. In fact the absence of the patient may, in some cases, be seen as an important requirement for their use. At least one Somerset user didn't use the system when patients were present in the room as they considered it rude to do so.

Patients are not present when they are discussed in cancer MDT meetings nor pre-dialysis patients present at monthly reviews which occur in between outpatient appointments and for which CV5 is used to generate a report on their current condition. Both of these practices puts one in mind of comments made by van der Ploeg (2003) in which it is observed that "an EPR can become a stand-in for the embodied patient in the context of diagnosis, consultations, decisions, progress evaluation etc." and that:

More than *patient-centredness*, an all-encompassing use of EPRs such as dreamt about in some of the more ambitious plans and designs may actually become *EPR-centredness*. The need to actually see the patient on a regular, face to face basis, engage with them in a material, embodied fashion, for instance may decrease with increasing reliance on the decontextualized, digitized, telecommunicable version of the patient that is the EPR. (2003: 479)

Whilst patient data is a constant presence within all three EPR objects, the imagined EPR, the instantiated IT systems and the EPR in effect, there is little sign of

²¹ This does not refer to participation in this study, two patients were kind enough to agree to participate in the study as interviewees and gratitude to them for doing so is duly recorded here.

embodied patients being physically present in many of the practices which enact these objects.

Finally, there is one last point to make about fire objects which echoes one made above about the relative nature of success in respect to the Bush Pump as a bringer of improved health. Law and Singleton (2005) argue that if alcoholic excess is set up against a job, a failing liver or an acute hospital admission then abstinence from alcohol is seen as a good thing. However, for some alcoholics their misuse of alcohol keeps absent worse alternatives such as heroin addiction. A similar, although not exact, comparison can be made with regards to specialist EPRs which act as data silos. When compared to EPR which is imagined as a single source of patient data the existence of these data silos are seen as a problem especially when caring for patients with co-morbidities. However, if translating the vision of EPR as a single source of patient data into reality involves having to sacrifice the specialist functionality that comes with these data silos then the reality of an EPR which is a single source of patient data may be seen as a bad thing. Whether a particular reality is 'good' or 'bad' depends not just on that particular reality but also on any alternative realities which have to be made 'other' in order for the first reality to be brought into existence.

6.4 Interventions and Durability

The preceding discussion of the forms and behaviours of EPR objects have various implications for those responsible for EPRs, whether as they are imagined or enacted as instantiated IT systems, at BSUH and beyond. They call into question the wisdom of problematising EPRs in ways that require them to be performed in uniform fashion across a Trust and which, in order to be brought to presence, need to make absent already durable objects, such as paper records, existing IT systems and existing ways of working, such that they have a radically transformative effect on the ways in which the activities of a Trust are performed. Instead they suggest that in order to translate visions of EPR into effective, and durable, working systems, EPRs need to be problematised and enacted in ways more resembling fluid patches of practices and which seek to enrol existing durable practices rather than make them absent. In fact there were a number of examples of this already happening with the EPRs in this study that might, with suitable adaptation, provide a template for different ways of working for those responsible for EPRs in different contexts. These are summarised in Figure 13 below.

In the SKU parallels can be drawn between the ways in which they developed a new approach to working with their departmental EPR and the way the Portuguese developed a maritime network which held together to dominated half the world for 150 years (Law, 1986). Law (2008) argued that the Portuguese ability to do this was partly because they made it a matter of deliberate strategy to add durability to this network, for example by the explicit royal policy of creating a system of celestial navigation. In the SKU there is also evidence of a deliberate strategy to create a durable EPR in CV5. They had learned lessons from their experiences with a previous EPR, CV4, and measures were put in place to build in durability when they set about acquiring its replacement.

Desirable EPR Characteristic	Examples
Strategic durability	Sussex Renal Innovation Programme establishes Action Learning Group and super users/power users.
	Restructuring of Somerset development and support operations in Taunton.
Translating in existing durability	Alert, CV5 and Somerset all intended to interface with rather than replace the Trusts Patient Administration System.
	Somerset screens can be printed off and added to the paper medical record.
Multi-discursive ordering	Coding diagnosis on CV5 helps with patient care and income.
Going with the flow	Using Alert to identify cost savings after it has been implemented.

Figure 13 Characteristics which add fluidity/durability to EPRs.

CV5 was acquired as part of an overall programme to improve the provision of renal services in Sussex through the Sussex Renal Innovation Programme. As part of this programme an Action Learning Group (ALG) and system of super/power users was set up to strengthen the EPR on an ongoing basis. It was recognised that the kidney unit's relationships with the vendor of their previous EPR, had not been as good as it could have been. Therefore they deliberately set about forging a better relationship with the vendor of the new EPR by having a representative from them attend the ALG. This seems to have been a successful tactic. Staff from the kidney unit found it invaluable to have someone from the EPR vendors present at ALG meetings who could answer their questions straight away. It was considered that that the relationship was two-way with both parties benefitting by being able to jointly work through issues and developing the product together. This could be observed in meetings when, for example, changes in screen layout were demonstrated enabling staff from the unit to instantly feedback their thoughts.

There are several aspects of the kidney unit's experience here which may be of interest to those undertaking other EPR projects. The first concerns the enthusiasm for and engagement with EPR within the unit. This, as previously discussed, is something that has sometimes proven difficult to maintain in other EPR settings yet, some two years after 'go-live' with CV5, the ALG was still meeting monthly, it was still well attended, by members who were not under any obligation to do so, and those present still appeared enthusiastic about the project. It would therefore appear that, in this respect at least, it has proven possible to build in durability by following a deliberate strategy to do so. However, doing so is by no means a quick and easy undertaking, rather one that requires patience and dedication.

The second point of interest concerns the membership and leadership of the ALG. The setting up of the ALG and indeed the whole CV5 project seem to have been largely driven by one individual within the unit who happened to be a doctor. They were talked of as having been there all along the way to make sure the project was successful and it was acknowledged that without them it would not have had the same outcome as it had. To be so reliant on one individual could be seen as being a source of precariousness, for if they became an 'obligatory point of passage' to the

success of the project then without them it might fall apart. However, one of the strengths of the ALG appeared to be the diversity of its membership, not least having by having a patient representative on board. Interestingly that particular doctor, in fact no doctors at all, attended the ALG meetings that were observed in this study and the leadership of the ALG appeared to have passed to others. Whether this was a deliberate strengthening strategy or not, lessening the reliance on a single individual arguably made the ALG both more fluid, and more durable, as a result. This and the makeup of the group membership, particularly the presence of a patient and the absence of doctors, seems to be something worth reflecting on should those responsible for other EPR projects consider setting up similar groups elsewhere.

The final point arising from the kidney unit and their strategies for adding durability to EPR which may have implications for the way those responsible for EPR elsewhere work in future concerns the CV5 users day jointly organised by the SKU and CCL. This was an event to which CV5 users from the SKU and other Trusts were invited and which proved to be well-attended. This is an example of the potential benefits of a closer relationship between the vendors and users of EPR. It provided CCL with an opportunity to gain feedback from multiple users and to talk about the future direction of the product and for members of the kidney unit an opportunity for mutual learning with users from other Trusts. What is also of interest here is that it demonstrates how ALG members from the kidney unit, members of staff who used CV5 in their day-to-day jobs rather than specialist project managers brought in from outside, were developing more sophisticated approaches to getting what they wanted from EPR vendors. They saw this event as a means of promoting closer ties with CV5 users from other Trusts so that they could potentially co-operate in the future in raising joint change requests to CCL thus increasing their ability to influence the future direction of the product.

The pursuit of a strategy to add durability was also observed in the case of the Somerset system although, in contrast to CV5 in the kidney unit, this is something that was not planned from the outset but developed in a more ad-hoc fashion. Somerset is a relatively small system developed in-house by a single NHS Trust. It was originally intended to capture cancer wait times only but has now grown into a much more comprehensive cancer information system. The mainstay of the system has historically been capturing data sets for audit and reporting purposes and, as has been seen, these change very frequently. This configuration would appear to be fraught with precariousness and there would seem to have been some doubts over its future, not least as software development is not a core activity for an NHS hospital Trust. This together with its increasing use for operational purposes poses something of a risk to those who rely on it. The user community therefore, through the Change Advisory Board and national cancer groups have put pressure on Taunton to bring in more developers and testing resources in order to keep up with all these changes.

In Taunton the response to this pressure was to put in place a strategy to enhance the products durability. There is now a clear vision for the future of the Somerset product as a 'one stop shop' for clinicians to go to for all their cancer data. At the time field work was conducted the development team had just been re-organised

and expanded to enable this to be achieved and this seems to have been well-received by their customers. However, before they could make these changes the Taunton team had to put forward a business case for them. Although Somerset is developed within the NHS it still has to be financially justifiable. Somerset can thus be seen as a case where a working IT system with some of the characteristics of EPRs as they are frequently imagined came about almost by chance. A Trust developed an in-house IT system with initially very limited scope and functionality which rapidly spread throughout the NHS. From these rather haphazard beginnings a deliberate strategy has been put in place to further the development of the product in ways such that it becomes both more durable and continues to more closely resemble EPR as it is frequently imagined.

The fact that this product has managed, with virtually no organised attempt at marketing, to be so widely adopted across the NHS is quite remarkable and suggests that it has characteristics which could be of interest to those responsible for other EPR systems. There are several that seem to be particularly worth highlighting. As previously discussed Somerset started out as an audit system to which operational capabilities have been gradually added. This combination of audit and operational can be seen as an example of what Law (2008) describes as multi-discursive ordering. Law (2008) argued that discourses, also sometimes described as modes of ordering or logics, “define conditions of possibility, making some ways of ordering webs of relations easier and others difficult or impossible” (2008: 149). The discussion of sites of controversy (Chapter 5) showed how different actors look for different things from EPRs which may be seen as fitting in with particular discourses, logics or modes of ordering. These ranged from improving and supporting the ongoing care of patients, to identifying efficiency savings, changing the way clinicians work, improving communication, providing research data, meeting various government policy objectives, making it easier for staff to do their jobs, encouraging patients to become more actively involved in their own care, making a return on software suppliers investment and even ‘keeping up with technology’. Arguably, EPR practices which are able to translate in multiple modes of ordering enhance the durability of these EPRs.

The Somerset system owes its origins to an audit mode of ordering but arguably has only been able to evolve into the product it has become because it also fits in with other modes of ordering such as supporting the ongoing care of patients and contributing to the economy of the Trust. For example, some (although not many) surgeons wrote their operative notes on Somerset. This increased the visibility of these notes, which not only assists other healthcare professionals such as pathologist, but also assists with coding and therefore income. There are similarities here with the coding of diagnosis on CV5. One clinician spoke of how this not only enabled people to know what is going on with a patient, but also helped with income. With the NHS under severe financial pressure, the ability to reduce costs or increase income is increasingly important to EPR programmes, yet unless this is combined with other modes of ordering, such as supporting patient care, they may not gain the support of clinicians. The Trust-wide EPR programme was under pressure from the finance department to achieve savings but elsewhere a clinician dismissed attempts by the programme team to discuss financial benefits as they

weren't interested in this aspect of the programme. Thus it can be seen that if an EPR programme is perceived as being only about saving money it runs the risk of being rejected by clinicians who want a system to enhance patient care; however, an EPR that can't justify itself financially might never get a business case approved. An EPR that is able to do both therefore stands a greater chance of forming a durable network.

The history of the Somerset system can also be seen as displaying certain characteristics related to intentionality and fluidity which chime with arguments made by Berg (2001) and Morgan, the inventor of the Bush Pump Type B discussed in de Laet and Mol (2000). Berg (2001) argued that:

The uncertainty and unpredictability of PCIS²² implementation processes is an *inherent* characteristic of such processes, which should be accepted and even nurtured rather than 'overcome'. Attempting to impose controls to weed out surprises is a sure route to disaster; unexpected problems should be taken as instances to *learn from* and *adapt to* rather than as obstacles to overcome. Similarly, unforeseen spontaneous alternative uses of the system should be investigated carefully as possible unexpected ways to draw out unforeseen benefits from the system. (2001: 150)

Likewise Morgan is quoted by De Laet and Mol (2000) as noting that he was unable to predict which variations to the pump would prove to be popular, commenting that "sometimes you just cannot tell" (2000: 250). De Laet and Mol (2000) expand on Morgan's comment and reflect that sometimes it may be important to avoid wanting to be able to tell, to predict:

He [Morgan] is firm about the necessity of abandoning control. Implementation, he maintains, depends on involving those who will use the pump. It therefore requires room for their methods and insights. Without this, any pump is bound to fail. (2000: 251)

There seem to be elements of the origin of the Somerset system, the fact that there was, at the outset, no grand plan for what the system should ultimately become, coupled with the simplicity of the initial product of design and relatively low development costs which meant that it was inherently more fluid and adaptable than the other systems in this study. The EPR like qualities of the system, and the ways in which some staff at the Trust use it as a kind of de-facto EPR, were arrived at almost by accident. It is almost that not setting out to create a particular design which corresponds to a pre-imagined definition of what an EPR should be gave the product the flexibility that has allowed it to become what it has.

Interestingly there are also arguably elements of flexibility, abandoning control and going with the flow in the Trust-wide EPR programme. Flexibility is something that clinicians were said to have wanted from the Trust-wide EPR programme and one of the reasons for choosing Alert was that its template-based design appeared to offer this.

²² Patient Care Information Systems

The reason why the clinicians chose this product against other ones that they saw was they liked its flexibility. They liked the fact that it was template based but that there was flexibility to say well we need those templates to look like this that and the other sort of thing so they could work with the supplier to get what they wanted. (Interviewee 20)

However, unlike Somerset, Alert had almost no existing install base within the NHS at the time the Trust chose it but the Trust felt there wasn't a system on the market that did and exactly met their requirements, so, if they were to go for the sort of system they wanted it could only be that way. This represents something of a rather expensive gamble, or leap of faith, which might seem an anathema to the medical profession where new medicines and treatments are rigorously trialled and tested before going into general use. Additionally the programme had to pay for itself from efficiency savings but with many other efficiency programmes going on within the Trust at the same time there was the possibility that the savings identified in the business case might be claimed by other programmes before them. In these circumstances, given the Trust's desire a new Trust-wide EPR, they seem to have had no option other than to, willingly or not, embrace the abandonment of control advocated by Berg (2001) and Morgan (de Laet and Mol 2000).

Another interesting characteristic of how the Somerset system was being performed concerns some of the ways it related to existing ways of working. There were several slightly different examples of this, some of which were also present in the performances of CV5 and the Trust-wide EPR, which are significant because of the durability, or otherwise, of other objects. The first of these concerns Patient Administration Systems (PAS). These are extremely durable objects which are critical for Trusts because they drive payment by results. At Taunton they were quite adamant that Somerset should not come into conflict with Trust PAS systems. It was recognised that these systems were the core business for the Trusts and it was stated that the Somerset product would never be in a position to compete with that just as it would never be a scheduling tool for outpatient appointments. Instead of competing with PAS systems by providing alternative scheduling or Master Patient Index functionality the Somerset product is designed to be used in conjunction with a PAS therefore translating in some of the PAS objects existing durability.

Similarly, at CCL there was recognition of the need for specialist EPRs to co-exist with Trust's PAS systems, and indeed with more generic Trust-wide EPR systems. Perhaps in the cases of CV5 and Somerset it is unsurprising that the suppliers of specialist systems have taken the view that other specialist tasks, such as billing and appointment scheduling should be left to other specialist systems. What is rather more intriguing is the approach the Trust is taking with the new Trust-wide EPR. In a marked contrast to the approach of the NPfIT none of the EPRs in this study are intended as a PAS replacement. The Trust's 2010 *Information Strategy* whilst discussing the intention to acquire an integrated EPR makes clear the intention to retain the existing PAS which is described as "the mission-critical system and the basis for the majority of activity returns and Trust income" (BSUH, 2010: 19).

A further example of how Somerset, and CV5, translated in existing durability concerns paper. In the discussion on sites of controversy (Section 5.2) it was noted how, in this and other studies of EPRs, paper records and other forms of paper such as clinic letters have proved to be remarkably durable. This may be seen as an example of the material durability described by Law (2008) whereby “social arrangements delegated into non-bodily physical form tend to hold their shape better than those that simply depend on face-to-face interaction” (2008: 148). Whether as an intentional strategy or simply as a case of making a virtue from a necessity it can be argued that in some practices both Somerset and CV5 have been able to translate the material durability of paper into their own networks. Instead of seeking to replace the paper medical records,

Somerset and CV5 are sometimes the source of the paper that goes into the orange folders. The outcomes of cancer MDT meetings are printed off Somerset and put in the paper record and, recognising that having to dual enter data - electronically and on paper – is unpopular, there have been moves to make a lot more of the Somerset screens printable. In the kidney unit, whilst clinic letters are not yet available to patients electronically, those letters are produced using CV5. Having had EPRs in the department for a long time they have mature systems for handling documentation, particularly letter templates. Staff in the unit considered this capability to be more advanced than in the rest of the Trust. These examples indicate that it is perhaps possible that EPRs which accept that paper cannot easily be replaced altogether and find ways of working in conjunction with that medium may prove more durable than EPRs which attempt to sweep paper away and fail to do so. They also suggests that an interesting area for future research might exist in exploring the extent to which building in the means to accommodate the process of moving to new ways of working is a consideration in EPR software design and the choices Trusts make when procuring EPR systems.

A slightly different angle on the theme of using material durability to add stability to an EPR is to better leverage elements of their network which already possess durability, particularly the data which they contain. This is especially the case for legacy systems which might be threatened with replacement by a newer system. Systems take time to fill up with data and in some respects, especially for audit perhaps more than operational purposes, the more data there is the greater its collective value becomes. For example, in cancer services there is a demand for data to assess survivability at 1, 5 and 10 year intervals which necessarily takes years to build up. As previously discussed with respect to electronic interfaces (Section 5.4) between systems, seemingly similar data items are often held slightly differently in different systems. A consequence is that transferring data from one system to another can be complex. The difficulty of migrating data was one reason why the database structure of Somerset was left unchanged during the upgrade from Classic ASP to ASP.net.

Both CCL and the Taunton teams have attempted to add value to their products by offering add-on data mining functionality designed to enable clinicians to explore the existing data within those products’ databases. This, it is hoped, will also make EPRs more attractive to clinicians, creating a virtuous circle whereby greater use of and engagement with the EPRs should bring in more data and improve its quality,

leading to greater use, greater value and greater engagement. In Taunton, it was talked of how making the data in Somerset more transparent to clinicians would lead to 'buy-in' and 'ownership' because they would get to see where issues with the data are. This also happens to fit neatly with government thinking around publishing performance data about individual clinicians, another example of the multi-discursive ordering discussed above.

However, in both cases the provision of this functionality in and of itself has not been enough, as Law (2008) points out regarding Bentham's panopticon, "in the end it is the configuration of the web that produces durability" (2008: 148). For in the case of DataViews it was found by the Taunton team that, despite this functionality having been available for a couple of years, users in the Trusts often did not know that it existed. Indeed these weren't mentioned by any of the Somerset users interviewed for this case study. For the functionality to be of any use there needs to be an effective mechanism for communicating its existence and its capabilities to those it is intended to benefit. In the renal unit the issues were slightly different. They knew about the add-on to CV5, the analytics module, and had even purchased several licenses for it but it was not being used. This appeared to be down to a combination of poor data quality and a lack of training for the clinicians in some of the technical aspects of how the product worked.

There is one final feature of the growth of the Somerset system which potentially suggests different ways of working for those responsible for EPRs. As previously discussed the amount of work performed in the Trust using Somerset, and the pool of data about cancer patients and their treatment held on it, increased as Somerset replaced various smaller 'grey systems'. Arguably this was possible because it involved replacing a task that already involved electronic data entry with another and that, unlike the paper medical record, these 'grey systems' were not particularly durable objects. This suggests that, in contrast to the approach adopted by the BSUH Trust-wide EPR programme, Trusts might be better able to expand their EPR working if they focussed first on areas of the Trust which already used electronic systems to record patient data rather than areas with no existing EPR systems. Taken together with other with the other findings discussed in this chapter it is argued that this also suggests more of the emphasis when developing an EPR strategy should be on the process or processes by which the change to electronic working is accomplished, rather than starting by deciding upon a particular desired EPR specification and then working on the means to accomplish this. These suggestions potentially have a number of different implications for different actors such as Trust management, healthcare professionals and EPR vendors and vary depending on, for example, whether a Trust has already embarked on a new Trust-wide EPR programme or whether it is contemplating one and the extent to which a Trust already has an existing install base of specialist departmental IT systems containing patient data

Trusts that, like BSUH, wish to move to a system of electronic patient records, that already have an existing install base of specialist departmental EPRs but unlike BSUH haven't yet procured a new Trust-wide EPR system might wish to explore alternatives to the BSUH approach which mitigate the potential risks that are associated with implementing new systems that are unproven within the context of a

particular Trust. One suggestion is to consider whether sufficient commonalities of ways of working exist between different departments of the Trust that more than one department could share a common specialist departmental EPR. Intriguingly BSUH's 2010 *Information Strategy* (BSUH, 2010) alluded to the possibility of something similar by suggesting that, prior to the introduction of the new Trust-wide EPR there might be an opportunity to extent the use of CV5 from the kidney unit to other areas of the Trust that supported the management of other long term conditions however this idea does not appear to have been pursued further.

Whether this involved replacing existing systems in these other areas or simply making one department's specialist EPR available to other departments with no current EPR was unclear. Whilst neither scenario would produce a single source of electronic patient data accessible by all with a legitimate need to access it both would seem to offer potential routes for Trusts to grow increasing patches of EPR in effect. The former would more closely resemble the Somerset experience of growth through migrating multiple existing electronic patient data recording practices onto a common electronic record system, the latter rely more on extending those practices to new actors. Both these scenarios also open up the possibility that an existing specialist departmental EPR might ultimately be extended across an entire Trust and become in effect a Trust-wide EPR. Something similar to this appears to have happened at a Trust one participant in this study had previously worked at. If a Trust were to follow a strategy of gradually growing and consolidating multiple patches of EPR practice around more than one EPR system this would arguably be an example of relaxing control and 'going with the flow' which might increase the chances that one of these EPR systems would emerge as a suitable candidate for a Trust-wide system.

Existing patches of EPR practice based around specialist departmental EPRs may also have some relevance for a Trust like BSUH which has procured a new Trust-wide EPR and then faces the task of getting people to start working with it. Rather than starting by rolling out the system to areas with no existing specialist departmental EPR systems²³ it might be worth exploring the possibility of starting by migrating an existing specialist departmental system in its entirety onto the new Trust-wide EPR. Such a strategy would resemble the one described by Law (2008) by which the Portuguese maritime network was made more durable by translating in 'whole and "black boxed"' other existing durable network configurations such as the art of growing spices.

Whether starting with an entirely new EPR or looking to amalgamate and expand existing ones, Trusts may benefit by looking to what has worked well, and what less well, with existing specialist departmental systems and developing EPR strategies that incorporates those lessons. The kidney unit's ALG appeared to be a useful activity and it might benefit BSUH's Trust-wide EPR programme to reproduce

²³ That a department does not already have its own specialist departmental EPR system might at the very least call into question whether there is anything about that department, and the nature of the patients conditions that they treat, that makes it a less suitable candidate for working with EPRs and therefore perhaps not the best place to start implementing a new Trust-wide EPR.

something similar at a Trust-wide level. One of its key elements was its diversity of membership across many healthcare professions and support staff, the EPR vendor and its patient representative and this should be carried forward into any new equivalent. The membership of the ALG, and some of the evidence from cancer services, would also appear to indicate that, when looking to expand patches of EPR practice into new settings, nursing and the allied healthcare professions and outpatient rather in-patient settings, may be good places to focus on.

Whilst too late to be of benefit to the BSUH Trust-wide EPR programme the Somerset experience also points to the value of procuring EPR technology which is already widely used within the NHS. This means that the cost of maintaining and developing that technology is effectively shared by many users and a large NHS user base, if effectively co-ordinated, is able to wield greater influence on the future direction of that product. That Somerset was owned, developed and maintained within the NHS also seems to be significant and begs the question as to whether the Somerset experience might serve as a model for more NHS led software development in the future. It would seem to be a shame that one of the key actors in the spread of Somerset throughout the NHS which served as an important means of co-ordinating and facilitating communication between vendors and users, the regional cancer networks, were disbanded just at the time the fieldwork phase of this study was commencing.

6.5 Conclusion

In this chapter it has been argued that the controversies discussed in Chapter 5 suggest that EPRs are complex and messy objects and that the high incidence of 'failure' in large EPR programmes may be partly a result of EPR policies which take an epistemological approach to making sense of that mess. When an ontological approach is taken instead then problematisations of EPRs which envisage them as a 'one size fits all' solution which not only can, but in order to be successful must, be uniformly implemented and used across an entire Trust thus transforming how that Trust works, appear fundamentally flawed. To overcome this flaw it is necessary to think about what kind of objects EPRs are and how these objects behave. This in turn may necessitate rethinking what counts as an EPR as well as how instantiated EPR systems need to be enacted in practice.

7 Conclusion

7.1 Introduction

This concluding chapter begins by summarising the theoretical contribution of the thesis. It goes on to describe the contribution that the thesis makes to knowledge of how EPRs are being problematised in NHS secondary care following the demise of the NPfIT. It elaborates on the means through which problematisations were enacted within a hospital Trust and how these problematisations produced normativities that implicitly and explicitly defined what EPR is and by extension, what it is for and how it *should be* performed. An important distinction is made between problematisations that are enacted through two instantiated specialist EPRs, CV5 and Somerset, each with a working presence in the Trust, and Alert a new but, at the time the case study was conducted, still unimplemented Trust-wide EPR, which was imagined or 'being produced' only through strategy documents, business cases, implementation plans, demonstration systems and workshops etc.

The key contribution of the thesis is to take examples of EPRs as they are imagined, but not instantiated, and examples of instantiated IT systems, which contain patient data but are not necessarily considered to be EPRs, and consider where and how these objects overlap to create what I refer to as *EPR in effect*. I argue that the capacity of instantiated IT systems to produce EPR in effect depends on the practices through which EPR are imagined as well as the practices through which the instantiated IT systems are enacted. As Moser and Law (2006) note, in critiquing the sometimes extravagant claims sometimes made in policy about the benefits of healthcare ICT programmes, "these rhetorics are performative: that is they have real consequences" (2006: 60). I argue that when EPRs are ambitiously imagined, but not yet instantiated, as generic Trust-wide systems, this de-legitimises the status of smaller specialist departmental systems as EPRs. This is important as it diverts resources and commitment from maximising the potential to build on these existing instantiated systems to increase EPR in effect. It also means that Trusts run the risk of failing to capitalise on the investments they have already made, both financial and in the development of EPR working practices, in these instantiated systems.

This chapter describes the analytical insights that ANT, through its relational ontology, produces particularly with regard to multiplicity and the *performance* of objects. The thesis contributes three novel conceptualisations of the EPR object derived from the analysis. Each has a distinct existence but the boundaries between them are not always clear; they are all inter-related, mutually interdependent and sometimes overlap. The explanatory power of these concepts is highlighted showing how differences in problematisation relate to and interfere with the sociotechnical enactment of the three EPR systems in the case study. A key finding is that these performances do not act in isolation but instead interfere with each other.

Following the summary of the thesis's contribution to theoretical understanding of the EPR object, the chapter continues by summarising the empirical contribution of

an in-depth case study of EPRs in a single Trust at a particularly interesting juncture in the history of NHS IT. This is achieved through a case study design whereby three sub-units of analysis are embedded within a single case and theorised using ANT. This research design allowed for an examination not only of differences in the problematisation of EPRs within a single Trust but also differences in the enactment of instantiated EPR systems within the Trust.

This concluding chapter ends with a discussion of the thesis limitations, suggestions for areas of further study and some final thoughts. It is noted how this study is limited to a single Trust over a brief period of time and suggested that a comparison with Trusts that have taken alternative approaches to implementing EPRs would be of interest. Moving away from EPRs specifically this thesis suggests that ANT and its successor projects may be developed by further study into objects that exhibit the characteristics of multiple topologies. This chapter ends with some final thoughts on how explicit references to patient-centred care were, unexpectedly, largely absent.

7.2 Theorising the EPR Object

During the field work phase of this research a wide variety of problematisations and enactments of the EPR object were encountered. These were most obviously manifest in the contrasts between the problematisations of EPR enacted in the, as yet un-implemented, Trust-wide EPR programme and the problematisations and practices of EPR enacted in the two implemented and working specialist departmental IT systems. However, just as importantly there were still many variations to be seen within and between the practices and problematisations of EPR enacted through CV5 and Somerset. These variations were explored through the analytical device of 'controversy' taken from ANT and have some significant implications for how EPR is understood as an object.

The basic definition of a controversy provided by Venturini (2010) is that they are situations where actors disagree. Previous studies of EPR have also identified instances of disagreement. For example Jones (2003), in a study of an EPR implementation in another NHS Trust, noted how different actors disagreed about the new EPR. In his analysis Jones (2003: 412) wrote of these disagreements as being differing perspectives and noted how as the EPR in question was operational and in use it was difficult to consider it a failure yet at the same time the dissatisfaction of some clinicians meant it was difficult to consider it a success. In contrast to Jones (2003) the analysis conducted in this thesis has approached questions of disagreement by explicitly drawing on the theoretical concepts of controversy, performance and multiplicity developed in ANT.

Mol (1999), has argued that the insights provided by ANT about performativity suggest that differences should be thought of as being ontological rather than epistemological in nature. She argues that *perspectivalism* represents an epistemological way of seeing difference, different perspectives multiply the eyes looking upon an object but the object they gaze upon "remains singular, intangible, untouched" (1999: 76). In perspectivalism differences exist in how an object is known, that is they are matters of epistemology, not in the underlying reality of the

object itself. In Actor-Network Theory however, reality is understood not to be absolute and given but is performed by assemblages of heterogeneous actors. Mol (1999) built upon this logic to argue that variations in how these assemblages are performed can produce multiple, potentially contradictory, realities.

In this study parallels were observed between performances of EPR and performances of anaemia described in Mol and Law (1994) and Mol (1999). In these works it was argued that anaemia is performed not just in a patient's body but also in the practices through which it is diagnosed, and by actors such as medical textbooks, medical training and the experiences of healthcare practitioners, whether formally trained in western medicine or not, which collectively problematise what anaemia is. By exploring controversies it was shown in this thesis how performances of EPR extend much further than just the hardware and software of an instantiated IT system. They also extend much further than the day-to-day interactions with those instantiated systems enacted by healthcare professionals, administrators and IT professionals. They include problematisations of EPR performed through policy documents and project plans and through experiences of other EPRs in other Trusts. They also extend further still into more general and loosely bounded but all pervading 'modes of ordering' such as economy, professionalism, legality and technology which are repeatedly enacted in everyday life.

It is argued here that attempts to understand EPRs epistemologically as singular objects with knowable set of properties produces a dilemma. Whilst CV5 and Somerset had a working presence at the Trust the problematisation of EPR performed in the Trust-wide EPR programme de-legitimised the status of these specialist systems as EPRs. They were reduced in status to 'data silos' and temporary solutions awaiting eventual replacement by the new Trust-wide EPR. However, the Trust-wide EPR existed at this time only as an object imagined in strategy documents, business cases, project plans and demonstration systems etc. Practical considerations, such as the need to Anglicise Portuguese software, implementation schedules, variations in working practices, data entry and a current inability to match the functionality of existing specialist systems suggest it may never be fully translated into a working system which exactly matches this imagined EPR object.

By taking an ontological rather than epistemology approach this thesis is able to suggest an alternative approach in which EPRs are understood as having multiple rather than singular realities. EPRs are theorised as having three distinct though closely related objects, *imagined EPRs*, *instantiated IT systems* and *patches of EPR in effect* which occur where and *instantiated IT system* overlap *imagined EPRs*. Each of these objects is enacted by heterogeneous assemblages of actors. These assemblages hold together in a variety of ways which may be thought of as behaving like immutable mobiles, fluids and fires. In immutable mobiles the actors are held together in rigid networks of relationships which do not change when they move across space or time. Fluid objects are held together because the relationships between actors are able to gradual change when they move across space or time. Fire-like objects are brought to presence when other objects are made absent.

The ability to generate these theoretical insights into the nature of the EPR object was produced by the combination of an unusual three part qualitative case study research design and the analytical toolkit provided by ANT. This featured three EPR systems which were deliberately chosen for the contrasts they provided, such as: generic and hospital-wide compared to specialist and departmental; instantiated and working compared to not-yet-implemented; originating in the NHS compared to the private sector; designed for the NHS market compared to designed for a foreign healthcare system. Holding these contrasts in the same analytical space created the opportunity to observe controversies which might not have been apparent in a case study of a single EPR.

Five sites of controversy and two further recurrent sources of controversy were identified in which actors have become enrolled in disagreements. These sites were: the relationship between EPRs and paper; EPRs as audit or operational systems; EPR as a single source of patient data; access to EPRs; and EPRs and new ways of working. The two recurrent sources of controversy concerned the technical makeup of each EPR and how potential advantages and disadvantages of EPR are distributed. These disagreements occur in several different forms: through the enactment of different problematisations of EPR; through actors being unwilling or unable to perform the role assigned to them in a particular problematisation of EPR; through problematisations or enactments of EPR which interfere with existing modes of ordering; and when the outcome of one controversy is entangled with and interferes in the outcome of another.

The ability to identify these controversies was further facilitated by using a combination of data collection methods. Seeing systems being demonstrated and being attentive to the different ways in which they are materialised in documentary form, as well as hearing them described in interview allowed the relative instantiated, imagined and in effect conceptual EPR objects to emerge from the data. Arguably, these phenomena would have been hidden by other approaches to theory and if a more restricted set of data collection methods had been employed.

Many of the features of these controversies have been written about in previous studies of EPR but they are not universally experienced as being controversial. It is the particular circumstances of their situation within any given context which affects whether or not they are experienced as a controversy. The first site of controversy, EPR's relationship with paper records, serves as an example. Bruni (2005) observed how an EPR in an Italian day hospital had not removed the need to maintain a paper medical record but this did not appear to be a source of controversy in that case. As in Bruni's (2005) example in many performances of CV5 and Somerset within the Trust and, at the time fieldwork was conducted Alert too, there was still a need to maintain a paper medical record. This, in isolation, is uncontroversial to problematisations of EPR as increasing access to patient data across time and space. What matters to these is that data is recorded electronically not whether or not this is in addition to or instead of recording it on paper. However, it becomes controversial when, as in the Alert programme and in Norway (Boulus and Bjorn, 2010; Ellingsen and Monteiro, 2003), EPRs are problematised as a way of saving money by not having to store, pull and transport paper records.

Bruni's (2005) paper is one of several previous studies of medical records, both paper and electronic, in which the authors have worked with Actor-network theory although not in quite the same ways as described in this thesis. Berg and Bowker (1997) wrote of the multiple bodies of the medical record but they wrote principally of the role the medical record plays in mediating other bodies, those of patients and the 'bodies politic' of medical organisation. They touched on how medical records were mediated in part by the needs of insurance companies but the main focus was on how the record 'feeds into that which it seems merely to represent' (Berg and Bowker 1997). Cresswell et al. (2010) explicitly draw attention to the theoretical work that ANT does in acknowledging the existence of multiple-realities but do not pursue this much beyond observing that they had found that 'the EHR can in itself be multiple as it tends to mean different things to different stakeholders and in different contexts' (2010: 5).

This thesis expands on Cresswell et al. (2010) observation to give a more detailed theorisation of the EPR object or rather objects. It also develops the idea of multiplicity in a different direction to Berg and Bowker (1997). This is done by theorising how multiple patches of EPR in effect are produced by the overlap between multiple enactments of instantiated IT systems with imagined EPRs enacted through multiple problematisations of EPR. A particular consequence of this theoretical move is that it creates the space in which to examine the various configurations of individual EPR objects and how their many realities relate to each other. This enables this thesis to make a further contribution to knowledge in identifying instances where EPRs are imagined as being configured and behaving differently to those found to be present in the instantiated and working IT systems in the case study and equally importantly for informing practice, identifying those instances where these correspond.

7.3 Problematisations and Enactments post NPfIT

As discussed in the literature review there has already been an enormous volume of research into the history of informatics policy and practice within the NHS much of which has examined the role EPRs play in this. This thesis contributes to this research trajectory with a case study conducted at a time which it is argued is of particular significance as Trusts emerge from the shadow of the NPfIT. This programme dominated NHS IT in an unparalleled fashion but following its winding down Trusts have started to regain control of their own IT policy. Within the case study, it could be seen how problematisations of EPR are enacted in a variety of practices which implicitly and explicitly define what EPR is and by extension both what it is for and how it should be performed. Beyond the most basic given - that an EPR should be an electronic (that is computerised) record of patient data - there were a few common themes, and many differences, in these problematisations.

The NPfIT was supposed to have paid for Trusts to receive new EPR systems and provided expert support in managing their procurement and implementation. Not only would the same EPR be used throughout a single Trust facilitating sharing of patient data within that Trust but many Trusts would be supplied with the same EPR software thus facilitating the sharing of patient data between Trusts. Amongst the consequences of these arrangements however were that participating Trusts had no

choice over what EPR software they would receive through the programme and were effectively excluded from direct contact with the vendors of that EPR software through complex contractual arrangements. These were seen as contributing to Trust staff members becoming 'disengaged' with the programme.

Participation in the NPfIT and the eventual non-delivery of an NPfIT EPR solution had two important consequences for the case study Trust. Firstly, a number of individual departments, services and specialties felt unable to wait for an NPfIT delivered Trust-wide EPR and began to independently acquire their own standalone specialist EPR systems. Secondly, preparatory work undertaken as part of the programme played a role in convincing senior staff at the Trust of the benefits that having a single, Trust-wide EPR would bring. The Trust's participation in the NPfIT formed part of a trajectory in which modern information technology was perceived as a means to improve the communication of patient data by ending a reliance on paper records. Giving everyone involved in a patient's care timely access to the same information was thought to be a way to address the Trust's need to raise the quality and safety of patient care whilst reducing costs and inefficiencies in its delivery.

Changing procurement arrangements within the NPfIT, followed by its eventual dismantling, created an opportunity for the Trust to independently acquire a new EPR. This gave the Trust greater freedom to choose from different vendors' EPR offerings and to have greater control over the management of the programme. However, when coupled to the subsequent dismantling of the Strategic Health Authorities in April 2013, it removed almost all the mechanisms for the co-ordination of EPR policy at a regional level. At the same time it created a need for a business case which demonstrated that any new EPR would be self-funding through efficiency savings. Thus, even before the Trust actively entered the procurement process, the new EPR was being problematised as something which was operational, Trust-wide, self-financing and a replacement for paper records. This in turn implied that there were sufficient commonalities in Trust processes that it would be feasible for everyone to use a single EPR, summed up in the programme logo 'One patient One Record', and that clinical practice must change so that data is input to the EPR at the point of care.

This financial requirement had several important implications. It meant that the Trust needed to acquire an integrated EPR which included electronic order comms and electronic prescribing as these could more readily demonstrate financial savings than clinical documentation alone. This, coupled with the need for a user interface which was sufficiently quick and easy to use to facilitate data entry at the point of care, limited the choice of EPRs open to the Trust and led to the eventual selection of the Alert product. At this stage however Alert had yet to be implemented at the Trust, or indeed fully implemented at any other NHS Trust. The future Trust-wide EPR could therefore only be imagined in terms of its problematisation as it became performed through proxies. This was a significant contrast to the problematisations of EPR being enacted through CV5 and Somerset which already had instantiated working presences in the Trust.

At the Sussex Kidney Unit, dissatisfaction with their previous EPR led to a decision to acquire CV5 as part of an overall programme of improvements to the delivery of renal services. As with the Trust-wide EPR programme, there was a desire to improve the quality of patient care and the efficiency of its delivery. However, unlike in the Trust-wide programme, this was tailored to meet the specific requirements of treating a particular group of diseases. There are several characteristics of renal disease which were particularly influential in this. Patients often have a long-term relationship with the disease and those treating them for it. There is a need to frequently measure and record the levels of particular chemicals in a patient's body and adjust diet, medication and/or dialysis in response to changes in these. Some patients who dialyse may need to travel for treatment several times a week for years and years.

As a consequence of these disease characteristics, there was a requirement for an EPR which could support the sharing of information with remote satellite clinics, where patients can be treated closer to home, and enable patients and their carers to access test results on-line. Doing so would reduce the need for patients to travel from across the region to the SKU, not only improving patients' quality of life but saving on the cost of transporting patients to the SKU or paper records to the remote clinics. To do this required an EPR to be able to receive data electronically from expensive laboratory analysing machines. As CV5 would only be accessed in nephrology it could not replace the paper medical records but it had replaced most paper nursing notes in the unit. Staff in the SKU attached sufficient importance to the economic benefits of this that they carried out a research project which demonstrated the financial savings that had resulted.

An important lesson learned in the SKU from their experience with their previous EPR was for a need for an improved relationship between the EPR vendors and those that work with and benefit from the EPR, including patients. Since procuring CV5, this has been facilitated through regular ALG meetings and a system of expert users. Members of the ALG have also been keen to establish closer relationships with CV5 users at other Trusts so that they can benefit from shared learning and, collectively, to be able to have greater influence on determining what is included in future software updates. This is important because CV5 is an international product and its vendors are a commercial company. They need to ensure a commercial return on investment whilst also balancing competing regulatory requirements and client change requests.

Like CV5, the Somerset Cancer register is a specialist system and has not replaced the paper medical record as the statutory record of care. It is, however, performed as a paperless system by some healthcare professionals and is considered by some of those who do not have access to the paper medical records to be their legal record. It differs from CV5 in being available throughout many departments in the Trust and is an NHS rather than commercially produced product. Somerset began primarily as a system for collecting mandatory audit and waiting time data sets of which there are a large number in cancer services. This was an activity which had absorbed significant Trust resources prior to Somerset's implementation and Somerset was recognised as vastly improving these processes. Somerset's vendors devote a lot of effort to keeping the system up-to-date with frequent

changes made to these mandatory data sets and this always takes priority in the allocation of development resources.

Somerset was not originally conceived as an operational system to directly support interventions in patient care as it is happening but it has gradually evolved, through a process of regular upgrades, to acquire more operational functionality especially to support multi-disciplinary team (MDT) working. The extent to which it is performed operationally and the timeliness with which data is entered into the system varies from team to team. Timeliness of data entry was an important part of problematisations of an EPR as an operational system. The move to turn Somerset into a more operational system has been partly driven by user demand. User change requests were made to the development team through a network which included a Change Advisory Board. This had incorporated the regional cancer networks before they were disbanded during the early stages of the field work phase of this research in April 2013. Here, EPR was being problematised as something that slowly evolved in response to user demands to support existing working practices rather than something imposed from above with the objective of radically transforming those practices.

In some MDTs, users now use Somerset as a *de facto* EPR. Although it does not contain the micro level of detail necessary to manage a patient's care on a day-to-day basis, it is nevertheless, as one interviewee observed, an electronic record of some important things which happened to patients. Some healthcare professionals find it a useful source of data about a patient that can be accessed more quickly than paper notes and useful for answering clinical queries about a patient. Somerset does not provide any means for patients to access their records themselves nor is any such access planned for the future. This is counter to the prevailing narrative in policy documents about patient access. It demonstrates an alternative problematisation of EPRs as a means for healthcare professionals to communicate with each other in appropriate professional language which may not be readily comprehensible to patients. It also reflects a common scenario in cancer care where patients may not wish to know their prognosis but it is important that healthcare professionals do.

Somerset is not a single record of all the care a patient receives at the Trust nor is it the single electronic source of all cancer data. There are other specialist chemotherapy and radiography systems. However, the vendors plan to make it the 'one stop shop' for cancer information. Within BSUH, it has already replaced many standalone electronic sources of data about cancer patients, such as spread sheets and ad-hoc databases. Due in part to the existence of a regional cancer network which provided informatics support across Sussex several neighbouring Trusts had also implemented Somerset systems. These are separate to the BSUH system as Somerset was only designed to interface with a single PAS system's master patient index and each Trust has a separate PAS. Nevertheless, having Somerset in multiple Trusts makes it easier to compare data across healthcare providers in the region. This has an important function in driving up standards of cancer care within the region. In some MDTs, all team members, regardless of which Trust they are employed by use the Brighton Somerset system.

CV5, Somerset and Alert each provides examples of the variety of ways in which EPRs are problematised at the Trust. These problematisations are partly governed by different modes of ordering, economic, legal, caring etc. which define conditions of possibility although crucially these conditions do not hold uniformly. For example, the requirements of caring for a renal patient are not always the same as those of caring for a cancer patient. Legal record keeping requirements can differ depending on whether a healthcare professional prescribes medication or not. The necessity for an EPR to generate efficiency savings varies depending on how that EPR was funded. The actions through which these problematisations were performed defined what EPR is and, by extension, both what it is for and how it should be performed but these problematisations did not always correspond with how each EPR was being performed as an instantiated IT system within the Trust.

CV5 and Somerset had each, in certain circumstances replaced paper nursing records, and sometimes they were used instead of the paper medical records but they had not eliminated paper medical records. These still had to be stored, pulled, transported, written and then returned to storage with all the costs those actions entailed. Similarly CV5 and Somerset were both being performed in ways which already joined together a number of previous silos of patient data and extended access to more of those involved in a patient's care. However, neither was a single source of all of patient's data and neither was accessible to all involved in that patient's care. The new Alert system was imagined as corresponding to these problematisations of EPR as replacing the paper medical record and extending access to all involved in a patient's care but it was not yet an instantiated and working system at the Trust.

7.4 Limitations, Further Study and Final Reflections

A research project of this nature is inevitably a compromise in which a single researcher, operating to a timescale, has to balance the opportunities provided by their theoretical and methodological approaches with the limitations imposed by those design choices. Within those overall limitations further limitations are enacted by choices the researcher makes and the opportunities which are present during the conduct of that research. Furthermore, there is a strict word limit for the thesis that shapes the need to provide a balanced account which relates the current study to existing literature and provides an account of, and justification for, the research design as well as explaining the research findings and their significance.

The epistemological limitations of qualitative case studies, particularly the issue of the generalisability of findings, are discussed in some depth in Chapter 3. Here it is worth reflecting on some of the specific ways in which this particular case study site differs from others in relation to the overall research topic. The case study site BSUH has embarked on a programme to implement a Trust wide, generic EPR, with integrated e-prescribing and electronic order comms functionality. This is intended to ultimately replace, or if replacement proves impossible, integrate with the Trust's legacy specialist departmental EPRs. Other Trusts²⁴ have decided to go down an

²⁴ An account of one such hospital Trust, on the Isle of Wight, was given by speakers at the Southern Institute of Health Informatics 2014 conference.

alternative route of providing access to multiple existing systems via a clinical web portal. There were also a limited number of acute Trusts which did receive EPR software as part of the NPfIT. Different Trusts have different portfolios of legacy IT systems including e-prescribing and electronic order comms, the absence of which were significant factors in enabling BSUH to make a business case for clinical documentation. BSUH also had a relatively modern PAS system which there was no pressing need to replace. Different Trusts also serve different population bases to the case study Trust. Some cover larger but more sparsely populated more rural areas, others covering smaller but more densely populated more urban areas.

Within the sociotechnical paradigm within which this study was conducted, where technology is not considered to be neutral and context-independent, it must be accepted that these differences could well lead to different findings if a similar study was conducted at another Trust. Within this case study the Trust-wide EPR programme was contrasted with two specialist departmental EPRs, CV5 and Somerset. There were at least ten other major departmental systems within the Trust which recorded patient's clinical data and including any of these in the study instead may also have led to different findings particularly in respect to the controversies identified.

Working within the necessarily strict parameters of NHS research ethics also placed some limitations on the conduct of fieldwork concerning the recruitment of participants, protecting the anonymity of participants and observing records containing 'live' patient data. The recruitment of research participants for interviews relied upon being introduced to potential participants by established contacts. This is of particular relevance to an ANT study where one of the key principles is to 'follow the actors'. For although the system generally worked well and great generosity was shown by a number of contacts in making introductions it is possible that recruitment of interviewees became to some extent self-selecting with introductions to potential participants being made on the basis of their known interest in and enthusiasm for EPRs. It is possible therefore that there were others at the Trust who were less enthusiastic about EPR. There were some indications in EPR programme meetings and in accounts given in interviews, for example of surgeons' reluctance to write their operative notes electronically in Somerset, that this was the case and it would have been interesting to hear their views at first-hand in interviews.

It may also be significant that all interviewees were people who had a reasonable degree of latitude in managing their own time and were able to find the time to participate. This may have effectively excluded some groups from participating in interviews. It might therefore be that there are particular issues with problematisations and enactments of EPR by individuals in these groups which did not get picked up. Two such groups, which were hinted at in interviews with others, being junior clinicians who rotate between different departments and people, such as consultants' secretaries, who were described as having 'casual contact with the patient record'. Previous studies, particularly by Berg (1999), suggest that healthcare IT systems which do not recognise and allow for the sometimes 'unofficial' work performed by some groups of staff can run into problems.

It was a condition of ethical approval that great care should be taken to disguise the identity of research participants so no reference could be made to age, gender or exact job title. Whilst this was generally not very limiting there were occasions where a few occasions where it was. For example, in the analysis, it would sometimes have been illuminating to highlight a link between an individual's exact job role and how they problematised EPR or enacted EPR. On other occasions some fine grained detail had to be omitted from accounts as this might have made it possible to guess at the identity of a particular participant. This is a weakness for a methodological approach that adheres to the argument made by Greenhalgh et al. (2011) "that immersion in detail is the route to understanding complex cases" (2011: 545) for it necessarily blurred some of that detail.

When applying for research ethics approval it was decided not to seek to observe EPRs being used with live patient data. As this was largely unnecessary to answer the research questions, it was therefore judged at the time to be ethically unjustifiable. To a large extent this reasoning held true throughout the conduct of the research but there were some practices, for example cancer MDT meetings, where to have been able to do so might have added to the richness of the dataset and strengthened the validity of the research findings. Each EPR was visible during fieldwork but only on occasions where they were being demonstrated using test data.

The limitations discussed above suggest a number of areas for further study. Firstly, there are those which relate to understanding EPRs in the post-NPfit secondary NHS. This study was limited in time to a period prior to the go live of the Trust wide EPR. It would be informative to continue this study over time to follow how the relationships between problematisations and enactments of EPR develop as the phased implementation of Alert progresses, if indeed it does. As already discussed the decision of the case study Trust to pursue a Trust wide EPR programme differs from the approaches taken in some other Trust such as those pursuing a clinical portal approach. It would therefore be another informative area of further study to compare the limitations and advantages of these contrasting approaches. Finally, in relation to EPRs it would be interesting to conduct a longitudinal study of how the vendors of specialist/departmental EPRs continue to adapt their products to respond to the challenges presented by more generic hospital-wide EPRs. The vendors of CV5 and Somerset have both already started developing their products by providing data mining add-ons to assist clinicians in deriving added benefits from their existing repositories of patient data. They have also both already established mechanisms for building customer feedback into their products and disseminating product knowledge back to customers. In the renal unit this is already the subject of an ongoing research project.

A final area of further study concerns the development of what Law (2008) refers to as the 'disparate family' of Actor-network theory and material semiotics. Law (2008) and Mol (2010) both make the point that ANT is not a fixed, static theory but one that continually expands as it applies its own logic of analysis to itself. Mol (2010) has written of how one can only 'work with' rather than 'use' ANT. She also states that:

...the ANT-tradition rarely works by adding to what has already been established. Instead it introduces variations, sets up contrasts, and, time and again, proposes shifts. The art is not to build a stronghold, but to adapt the theoretical repertoire to every new case. (2010: 256).

This study has contrasted the characteristics of EPR objects with some of those to be found in previous ANT studies in particular those of Mol and Law (1994), de Laet and Mol (2000) and Law and Singleton (2005). These three studies can be seen as forming a trajectory which has extended ANT's exploration of the ways in which object assemblies hold together or fall apart as they move through time and space beyond the immutable mobiles of earlier studies such as Law (1986). This study has contributed to this body of work by observing how the multiple enactments of EPR objects can simultaneously display the characteristics of immutable mobiles, fluids and fire. Somerset, for example, has to negotiate the obligatory passage points of the Trust's PAS and Information Governance but still acts in a fluid fashion as it gradually acquires more operational functionality. The possibility that complex and messy objects may behave in this way was always allowed for in these previous studies but this seems to be an avenue that is worthy of further exploration, particularly in terms of exploring how it might be possible to adopt deliberate strategies to make an object behave in a particular way. This is of particular relevance to EPRs where problematisations that imagine EPR as behaving like a fire object, depending on making absent other objects, such as the paper medical record and other, more specialist, EPRs, have proved extremely difficult to translate into practice.

One final reflection on this study concerns the relationship between electronic patient records and patients. In the formative stages of designing this research, a review of existing literature suggested that facilitating 'patient-centred' care would feature significantly in problematisations of EPR. During the conduct of fieldwork a large number of participants were at pains to stress that one, perhaps the most, important feature of an EPR is that it should benefit patients. However, the exact expression 'patient-centred care' was seldom, if ever, used by participants without first being suggested by the interviewer. In the documentary data sources gathered during field work it only features very occasionally. This absence may reflect the vagueness of meaning of the phrase and ultimately patient-centredness was not used as a major theme in the analysis presented in this thesis.

Nevertheless, it can be argued that notions of 'patient-centredness' were being enacted in a variety of EPR practices in the Trust. The very notion of a generic, Trust wide, EPR implies a record centred on the patient (within the context of the Trust) rather than on individual specialties. The enrolment of Somerset into cancer MDT working can be considered as another example of a service centred on a patient, especially where this allows healthcare professionals from different organisations access to the same record. Lastly patient-centredness was most clearly visible within the EPR practices of the kidney unit. CV5 was at the time of conducting fieldwork the only system which gave patients some (limited, indirect and read only) electronic access to parts of their record. CV5 supported remote clinics and the Action Learning Group had a patient representative as a member.

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Appendix 1 Sample Interview Schedule

1) Could we start by talking about your job role, what it is you do and how long you have been doing it please.

- Would you describe yourself as a computer savvy person?

2) Can we talk specifically about CV5 now please?

- Do you use it?
- How often?
- Where? In an office? At the point of care?
- Do you just put stuff in or do you also get stuff out? Research? Reports?
- Who else uses it? Doctors? AHPs? Admin? Secondary users such as management? Renal Registry (please explain a little about what they do)?
- What about care across organisational boundaries such as Worthing Eastbourne etc.? Who gets to access the system?

3) Is there anything CV5 forces you to do which you wouldn't otherwise do?

- Work in a particular order (care plan)?
- Input specific data?

4) Is there anything that CV5 prevents you from doing?

5) Were you around when CV5 was acquired and can you tell me about this process?

- Where you involved?
- Who else was?
- What were the drivers for acquiring a renal EPR?
- Where other systems apart from CV5 considered?
- Why CV5 over other systems?
- How was it paid for?
- Did it require new IT infrastructure PCs, servers etc.?
- Were there any legislative, legal or government policy issues behind its introduction?

6) Can we talk about how users request upgrades bug fixes other system changes etc. and the ALG?

- How did the ALG come into being?
- How important is it having a representative of the software vendor there?
- And how important is having a patient representative?
- What about collaboration with other users at different Trusts? (Some talk of arranging a day's meeting with other Trusts)

7) Can we talk about EPR more generally please?

- What do you consider the main reasons for having an EPR are?

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- What should/does EPR functionality consist off? (Just records? What about Order Comms etc.)
- Who should be able to see data?
- What about co-morbidity and sharing data with other departments?
- Problems and drawbacks? Contextual nature of data?
- What about wider world beyond the Trust, government etc.?
- What about influence of past experience of using IT on peoples willingness to engage with it?

8) Can we talk about new hospital wide EPR?

- Has there been any engagement with the SKU?
- How might it affect the SKU in the future?
- Benefits?
- Drawbacks?
- Might it replace CV5 eventually?

9) Can we talk about Patient Centred Care?

- What does it mean?
- Do CV5 and RPV help PCC?
- What about giving patients access to their medical records, benefits and drawbacks?
- Do you thing the level of patient engagement is different for patients with long term chronic diseases such as kidney disease or diabetes?

10) Thank you. Did you want to add anything or ask me anything?

Appendix 2 Research and Governance

Prior to the commencement of fieldwork it was necessary to obtain ethical approval for the project and negotiate access to the research sites. Approval from the university faculty's research ethics committee was obtained in the summer of 2012. Following this NHS research ethics approval was obtained from the NHS Health Research Authority NRES Committee North East- County Durham and Tees Valley on 5th November 2012 REC Reference 12/NE/0372. After gaining ethical approval it was also necessary to obtain R&D approval from the NHS organisations where fieldwork was to be conducted and from the organisation employing any NHS staff who were to participate. Although the case study concerned EPRs at one particular NHS Trust, due to the shared nature of some of services where these EPRs were employed and the desire to interview staff from the EPR vendors which in the case of the Somerset Cancer Register are NHS employees, it was necessary to obtain R&D approval from four different NHS organisations. These were Brighton and Sussex University Hospitals NHS Trust, Sussex NHS Research Consortium, Taunton and Somerset R&D Consortium, East Sussex Healthcare NHS Trust.

Appendix 3 Interviewees

Interview 1	Healthcare professional (Renal).
Interview 2	Non-clinical role in cancer services.
Interview 3	Healthcare professional (Renal).
Interview 4	Non-clinical role in cancer services.
Interview 5	Healthcare professional (Cancer).
Interview 6	Healthcare professional (Cancer).
Interview 7	Healthcare professional (Cancer).
Interview 8	Patient.
Interview 9	Trust IT specialist.
Interview 10	Trust IT specialist.
Interview 11	Healthcare professional (Renal).
Interview 12	Patient.
Interview 13	Trust IT specialist.
Interview 14	Healthcare professional (Other).
Interview 15	EPR vendor.
Interview 16	EPR vendor.
Interview 17	EPR vendor.
Interview 18	EPR vendor.
Interview 19	EPR vendor.
Interview 20	Trust IT specialist.

Appendix 4 Interview Participant/Question Matrix

Participant	Questions
Clinician (Somerset)	1,2,3,4,5,6,7,8,9,10,11,12
Patient (Somerset)	8,13,14,15,16
Administrator (Somerset)	1,2,3,4,5,6,7,8,9,10,11,12
NHS Manager (Somerset)	1,2,3,4,5,6,7,8,9,10,11,12
NHS IT Staff (Somerset)	1,2,3,4,5,6,7,8,9,10,11,12
System Developer (Somerset)	1,2,3,4,5,6,7,8,9,10,11,12
Clinician (CV5)	1,2,3,4,5,6,7,8,9,10,11,12
Patient (CV5)	8,13,14,15,16
Administrator (CV5)	1,2,3,4,5,6,7,8,9,10,11,12
NHS Manager (CV5)	1,2,3,4,5,6,7,8,9,10,11,12
NHS IT Staff (CV5)	1,2,3,4,5,6,7,8,9,10,11,12
System Developer (CV5)	1,2,3,4,5,6,7,8,9,10,11,12
Clinician (Alert)	1,2,3,4,5,6,7,8,9,10,11,12
Patient (Alert)	8,13,14,15,16
Administrator (Alert)	1,2,3,4,5,6,7,8,9,10,11,12
NHS Manager (Alert)	1,2,3,4,5,6,7,8,9,10,11,12
NHS IT Staff (Alert)	1,2,3,4,5,6,7,8,9,10,11,12
System Developer (Alert)	1,2,3,4,5,6,7,8,9,10,11,12

- 1) Please can you tell me what you consider to be the most important features of an EPR system?
- 2) Please can you tell me what were the most important considerations in designing and developing this EPR system?
- 3) Please can you tell me why you think Brighton and Sussex University Hospitals NHS Trust chose to implement this EPR system and any subsequent upgrades to it?
- 4) Please can you tell me about any involvement you have had in making decisions about the design of this EPR system?
- 5) Please can you tell me about any involvement you have had in making decisions about who will use this EPR and how it will be used?
- 6) How do you envisage the hospitals existing specialist EPR systems fitting in with the new generic hospital wide EPR system?
- 7) Can you explain the processes by which the hospital came to choose to procure this particular EPR system and any subsequent upgrades to it?
- 8) Can you tell me what you understand by the notion of patient-centred care?
- 9) How do you see a particular EPR system helping to deliver patient-centred care?

Appendices

10) To what extent do you think work practices are, or will be, shaped by the use of this EPR and to what extent do you think the use of this EPR is, or will be, shaped by existing working practices?

11) How do you see the wider world outside of the Trust environment influencing decisions about EPR procurement and use?

12) To what extent do you feel that past experience with health informatics systems shapes attitudes towards this EPR system?

13) Many hospitals are starting to keep patients' medical records on computer systems known as 'electronic patient record' (EPR) systems. These may eventually replace the paper based medical notes you may have seen on visits to hospital.

Can you tell me what you think about the idea of keeping medical records on computer systems, any advantages or disadvantages in doing so and any experiences you have had in your care which suggest record keeping and sharing is working well or could be improved?

14) Have you ever been involved in any discussions with health professionals or other hospital staff about keeping your medical records on a computer system?

15) Can you tell me whether you think patients should be involved in decisions hospitals make about how your medical records are stored and shared and who should have access to them?

16) Current government policy documents call for patients to eventually be given electronic access to their own medical records (perhaps via the internet). This is part of an overall initiative to involve patients and their carers more fully in decisions about their care.

Do you feel that you are as fully involved in decisions about your care as you would like to be and do you think that being able to see your medical records from a computer at home would improve the care you receive?

Appendix 5 Observation Coding Excerpt

Clinician is concerned that the consultation will take a long time using the new EPR. (918)

Clinician notes that lots of diagrams are used when taking consent and they would like to be able to enter these onto the new EPR. (919)

Mentioned how consent is sometimes taken at a different Trust for an operation carried out in Brighton. (920)

Mentioned how consent legally requires an ink signature on paper. (922)

Clinician asks if they will be able to carry on as they currently do with paper then enter it onto the EPR later. They are concerned about how long it will take to enter the data (918) and about the number of tick boxes, and think people will just free text instead. (923) They don't use templates (925) or protocols (926) as their work is too varied.

There is a bit of a clash between the meeting facilitators and the clinicians. The clinicians are not very enthusiastic about the new EPR (928) as they don't think it will fit the way they work, (929) and will take twice as long as the way they currently work. (918)

The meeting facilitators try to sell the idea of templates tailored to the way these clinicians work but the clinicians don't seem very convinced. (930) An unflattering comparison is made to other attempts to change the way the NHS works. (931)

The clinicians say they think the new EPR as a whole is brilliant but they are concerned about the time it will take to enter data into the EPR during a consultation. (932) They are concerned that the work they do is not standardised and doesn't fit with a template way of working. (929)

An admin person now raises issue that some patients are seen at a different Trust and therefore have a different hospital number. (933)

One of the meeting facilitators says that experience with the EPR elsewhere is that it will take longer until they get used to using it (934), another adds that the goal is to make things quicker not slower (935).

Appendices

Code	Description
918	Clinician concern that consultations will take longer using new EPR
919	Lots of diagrams used, doctor wants to know if they will be available in new EPR
920	Sometimes consent for an operation is obtained at a different Trust for an operation performed at BSUH
922	Consent to operate legally requires an ink signature on paper
923	Doctor thinks too many tick boxes on new EPR means they will just end up using free text
925	Clinician does not currently use templates
926	Clinician does not currently use protocols
928	Clinicians not very enthusiastic about using new EPR
929	Clinicians do not think generic EPR will fit the way they work
930	Clinicians not convinced by EPR teams attempts to convince them that templates can be tailored to fit the way they work
931	Clinician concerned new EPR will not work well like some previous NHS initiatives
932	Clinicians think new EPR as a whole is brilliant but that data entry will take too long
933	Concern by admin person that patients seen by BSUH clinicians at another Trust have different hospital numbers
934	EPR team say previous experience is that using new EPR does take longer until you get used to it
935	Goal of new EPR is to make things quicker not slower

Appendix 6 Interview Coding Excerpt

Interviewer: asks a question about concerns that have been raised about future EPR working

Participant: responds that whilst younger doctors are familiar with touch screen technology some older consultants state that it is much easier for them just to scribble a few notes than to enter lots of data electronically. (1788)

They add that there are also concerns about losing the personal connection with a patient when breaking bad news about something like cancer if data has to be entered into an EPR during an appointment. (514)

And also that concerns have been raised that clinics will take longer. (918)

The participant then starts to talk about templates and how they are good if it is known what the issue with the patient is but that feedback had been received that they would need to be quite flexible for initial appointments so that they help clinicians determine what's wrong with a patient but don't guide them in too narrow a way so that they might miss something. Therefore there is a need for a mix of very generic but also more specialised templates. (1789)

Interviewer: asks a question concerning audit data and the use of free text.

Participant: gives lengthy response about the benefits for reporting of trying to move away from writing lots of free text and instead trying to capture that information in tick box form. (1790)

Interviewer: asks whether there have been things that have proved easier than expected.

Participant: responds by talking about how generally positive attitudes to EPR have. (1791)

They then talk about how good it is to meet junior doctors who have used EPRs elsewhere and are extremely positive about them as they can be a positive influence on others who are not so keen on them. (1792)

Appendices

Code	Description
1788	Older consultants seen as less enthusiastic about EPR especially entering data than younger doctors
514	Dislike of inputting data when patient is present
918	Clinician concern that consultations will take longer using new EPR
1789	Templates seen as good when it is obvious what is wrong with the patient but potentially less good when things are less clear cut what is wrong so templates for first appointments need to be generic and flexible
1790	Using templates and tick boxes easier to report on than free text
1791	Attitudes towards new EPR has been generally more positive than might have been expected
1792	Junior doctors who have used EPRs elsewhere can be very helpful advocates of EPR benefits