

**How a Sociotechnical approach can help
NPfIT deliver better NHS patient care¹**
by Malcolm Peltu², Ken Eason³ and Chris Clegg⁴
May 2008

Can the NHS IT juggernaut be steered onto a better course?

It is the largest civilian IT project in the world (Brennan 2005). on a ten year journey starting in 2002. But many warnings bells have been sounding from the medical professionals who will use it (e.g. Medix 2006; Royal College of Nursing 2006). technical experts who have studied it (e.g. NHS23 2007a, b; Randell 2007). social scientists with experience of this and similar projects (e.g. Clegg and Shepherd 2007; Eason 2007) and politicians and others scrutinising its progress (e.g. House of Commons Health Committee 2007; House of Commons Public Accounts Committee 2007; National Audit Office, 2008).

Their main warning message is that this project – the National Programme for Information Technology (NPfIT) for England – could be heading for failure unless a broader vision and a more local set of action plans are developed (e.g. BMA 2007). However, the juggernaut has gathered momentum, propelled by substantial political prioritisation and organisational pressures to install IT systems in the hope of delivering tangible results as soon as possible. In this context, can those with concerns about the Programme's direction do more than rearrange the deck chairs on what could become a cyber Titanic? Or can a new course be steered towards meeting its widely approved objective of using modern digital technologies to help deliver better patient care?

¹ A copy of this paper is available at <http://lubswww2/COSLAC/index.php?id=54> and <http://www.bcs.org/server.php?show=nav.9932>

² Independent Editorial Consultant

³ Emeritus Professor at Loughborough University and Senior Consultant, Bayswater Institute

⁴ Professor, Leeds University Business School, University of Leeds and Chair, BCS Sociotechnical Specialist Group

The meeting that was the trigger for this paper⁵ sought to develop answers to these questions by exploring lessons learnt from experiences in NPfIT. A key lesson was that many potential problems could be avoided if those closest to healthcare delivery are able to have a greater say in shaping NPfIT implementations to specific local requirements. Furthermore, examples of the successful application of sociotechnical methods illustrated how this can be achieved in the diverse contexts encompassed by the NHS, whilst also sustaining core national requirements.

Such a view was more than special pleading by the sociotechnical specialists involved in the meeting. It is endorsed from many other perspectives. For instance, the vital importance of sociotechnical issues in healthcare projects has been emphasised by Brian Randell (2007). Emeritus Professor of Computing Science at Newcastle University, and one of the 'NHS23'⁶ IT expert group examining NPfIT: 'Ill-chosen imposed medical IT systems impede patient care, are resisted, result in lots of accidental faults, and lose user support and trust. All these points are attested to by rigorous studies [e.g. see NHS23, 2008] involving expertise from the social sciences (psychology, ethnography, etc.) as well as by technical (medical and computer) experts – much more attention needs to be paid to such studies, and more such studies encouraged.' (See also recent detailed empirical evaluations by Car et al, 2008; Greenhalgh et al, 2008).

This paper seeks to show how sociotechnical thinking and practice can be of practical benefit within NPfIT – provided the programme adopts a more holistic overall strategy that places social and organizational issues alongside technology concerns at the heart of its work. The methods recommended are based on sociotechnical design principles which have been successfully applied in many environments over more than fifty years. The optimists at the meeting claimed there are opportunities to use this knowledge to improve outcomes in many NPfIT

⁵ The authors acknowledge the contribution of all speakers and participants at the meeting on 7 February 2008 as one source for the report, even where specific individuals have not been credited. However, the authors take sole responsibility for the interpretation of this material and their other sources. The views expressed therefore do not claim to represent the views of the BCS, its Specialist Groups that organised the meeting or the speakers and other participants attending the meeting. The authors thank Brian Randell, Jean Roberts and Di Millen for their comments on an earlier draft.

⁶ A group of 23 computer science, informatics, information system and security engineering professors who are studying NPfIT and disseminating information about it (see <http://www.nhs-it.info>).

implementations, although others expressed doubts about the extent to which this would happen.

This paper starts by summarising the nature of NPfIT's current strategy and the main problems it has encountered. It then identifies key sociotechnical design principles relevant to overcoming such problems, explaining why the sociotechnical view is well positioned to address key barriers to the success of NPfIT. Guidelines on applying these principles offer a way of realising the enormous potential benefits which are made possible by the use of IT capabilities in delivering healthcare.

The NPfIT strategy and services⁷

How NPfIT evolved

The roots of NPfIT lie in the Department of Health's (1998) Information for Health strategy. This committed the NHS to goals which remain central to NPfIT:

- lifelong electronic patient records (EPRs). also known as electronic health records (EHRs). that bring together birth-to-death data on NHS patients throughout England;
- round-the-clock online access by all NHS healthcare professionals to patient records and information about best clinical practice;
- seamless care for patients through GPs, hospitals and community services sharing information across the NHS information highway;
- fast and convenient public access to information and care through online information services and telemedicine; and
- effective use of NHS resources by providing health planners and managers with the information they need.

The developments that subsequently led to the establishment and evolution of NPfIT are outlined in Figure 1 overleaf.

⁷ See CFH (2007c) for more detail.

Figure 1. NPfIT milestones

| | |
|------------------|---|
| September 1998 | Information for Health strategy (Department of Health 1998) |
| July 2000 | NHS Plan published (Department of Health 2000) |
| January 2001 | <i>Building the Information Core</i> (Department of Health 2001) outlines information and IT systems for delivering the NHS Plan |
| 18 February 2002 | High-level meeting in Downing Street with Tony Blair culminates in government preparations for a new programme to make a 'step change' in NHS IT, with the Prime Minister urging ambitious targets to deliver substantial tangible benefits within three years (Collins 2008). |
| April 2002 | An independent review for government, <i>Securing Our Future Health: Taking a Long-Term View</i> (Wanless 2002). examines trends affecting the health service in the UK. Its key recommendations for IT in the NHS include: doubling and protecting IT spend; stringent, centrally-managed national standards for data and IT; and the better management of IT implementation in the NHS, including a national programme. |
| June 2002 | First steps towards NPfIT for England unveiled in Department of Health's (2002) report <i>Delivering 21st Century IT Support for the NHS – A National Strategic Programme</i> . |
| October 2002 | NPfIT formally established to develop an infrastructure to support standard interoperable systems to be used by all NHS Trusts to help deliver an efficient 'patient-led' health service. |
| December 2003 | Contracts worth £6.2 billion awarded to a small number of consortia to develop and implement standard systems, some nationally and some by local service providers, initially divided into five regions. |
| 1 April 2005 | NHS Connecting for Health established as the single national IT provider for the NHS, delivering the NPfIT. |
| July 2007 | NPfIT Local Ownership Programme finalises preparations for transferring responsibility for local implementations to Strategic Health Authorities. |
| 2008 | Completion of the transfer of responsibility for local implementations to Strategic Health Authorities, with Trusts paying for implementations. |

NPfIT infrastructure and management

NPfIT consists of a set of interlinked systems, some provided at national level throughout England and others offered by local service providers (LSPs). Initially, these systems were to be delivered by suppliers contracted directly by Connecting for Health (CFH). An important recent development in opening opportunities for sociotechnical shaping of NPfIT applications came in 2007, when the NPfIT Local Ownership Programme (NLOP) was launched. This was part of the process of devolving accountability for NPfIT implementations to the Strategic Health Authorities

(SHAs) with the aim of achieving greater local responsibility for implementing the national programme.

From 2007, this has led to the establishment of a new operating framework and new governance and financial arrangements. These involve the CFH, as the prime NPfIT provider, working closely with SHA Programme Directors and SHA Chief Information Officers to deliver the national and local programmes. The ten SHAs in England and the numerous Trusts they coordinate have been grouped into three regional 'Pan-SHAs', with NHS Programme for IT Management Boards covering: the South; London; and North, Midlands and East (CFH 2008).

Decision making in this new structure involves SHA Chief Executives as the Senior Responsible Owners for their Authorities. The SHA Programme Directors perform a crucial coordinating role as members of the CFH Programme Delivery Team. A Service Implementation Capacity and Capability (C&C) programme is seeking to support related organisational readiness, management effectiveness and successful health informatics development.⁸

NPfIT services offered

The main NPfIT systems and applications include:

- National Network for the NHS (N3). the basic networking infrastructure;
- the NHS Care Records Service (NCRS). including:
 - two separate main EPR systems: a national Summary Care Record (SCR) containing basic information, and local Detailed Care Records (DCRs) with more comprehensive clinical information,
 - a Secondary Uses Service (SUS) of the NCRS, providing access to aggregated data for management, research and other 'secondary' purposes,
 - the Data Spine, a central national database where summary patient records are stored and, when fully implemented, used to enable local records to upload important information to the summary patient record on the Spine;

⁸ For more on the C&C Programme, see: www.connectingforhealth.nhs.uk/systemsandservices/capability

- Choose and Book, making it easier and faster for GPs and other primary care staff to select, book and make repeat hospital and clinic appointments;
- Picture Archiving and Communications System (PACS). enabling the flexible digital storing and viewing on screen of X-rays and scans;
- Electronic Prescription Service (EPS). allowing GPs, practice nurses and other medicine prescribers to send prescriptions electronically to a pharmacy or other dispenser chosen by a patient;
- GP Systems of Choice (GPSoC). offering funds for clinical IT systems as chosen by GP practices; and
- NHSmail, providing free emailing within the NHS.

How well has the programme been implemented?

For better and worse: some indicators

NPfIT has had a mix of successes and failures. For instance, a National Audit Office report (NAO 2006) praised particularly its procurement approach and programme management. Positive feelings towards the Programme goals are also reflected in the Medix (2006) survey conducted among over 1,000 doctors towards the end of 2006. This found that the majority recognised its potential long-term value in creating opportunities for improving clinical care⁹; most also supported the objectives of the main NPfIT services¹⁰. In addition, there has been praise¹⁰ for particular applications and policies, such as PACS (e.g. Eason 2007) and GPSoC (e.g. BMA 2007).

However, the NAO's praise was balanced by its identification of a substantial increase in the initial cost estimate to about £12 billion and the late running of some core systems. The estimated cost of the Programme is currently £12.7 billion (at 2005-05 prices) (see NAO 2008). The 2006 Medix survey also found that the realities of NPfIT implementation had led to a strong degree of disillusion among doctors¹¹, offsetting their broad support for NPfIT goals. In an online poll of 3,000 doctors (Hawkes 2007). 72 per cent recorded that they did not believe NPfIT money had been well spent.

⁹ 58 per cent of GPs and 69 per cent of non-GPs, mainly hospital doctors recognise the long-term value of NPfIT.

¹⁰ For example, 64 per cent regard the Care Records Service as important, with 51 per cent of GPs and 65 per cent of non-GPs agreeing it will help clinicians make better decisions.

¹¹ Medix found that support for NPfIT as an important NHS priority fell substantially in the four years after the Programme was launched: from 67 per cent of GPs in 2002 to 35 per cent in 2006.

The more pessimistic view of NPfIT progress has been reflected in some of the conclusions of Parliamentary investigations into the Programme. For instance, the House of Commons Public Accounts Committee (2007: 6) noted: 'At the present rate of progress it is unlikely that significant clinical benefits will be delivered by the end of the contract period'. The House of Commons Health Committee (2007: 7) warned that the delivery of the NHS Care Records Service 'has in general been hampered by unclear communication and a worrying lack of progress on implementing local systems'.

A CFH website section presenting the NHS case for NPfIT¹² seeks to provide statistical evidence and views to counteract these types of criticisms. For instance, a status summary (CFH 2007b: 7) gives examples of NPfIT activity on a typical day in February 2007, including: 100,000 prescriptions transmitted electronically; 16,000 Choose and Book electronic bookings made; and 50,000 unique authenticated users gain access to the NHS Care Record Service.¹³ However, *Computer Weekly* journalist Tony Collins, who has reported in-depth on NPfIT, argues that such statistics without context are 'meaningless' (Collins 2007b). For instance, he quotes a paper by a senior manager at an NHS Trust who pointed out that 78 per cent of GP practices in his Trust were not yet actually using electronic prescription services, although there had been an official claim that 87 per cent had 'technically' gone live with a basic version of the EPS system.

Examples of practical problems encountered

Problems have been experienced at a national level with the NPfIT roll-out, as illustrated by the withdrawal in September 2006 of Accenture as a supplier (CFH 2007a). the recent cancellation of the Fujitsu contract for the south of England (*Computer Weekly*, 29.05.08). and delays in suppliers' delivery of important software, such as iSoft's Lorenzo which is a core element in NPfIT's patient record and administration systems (CFH 2006; Kablenet 2006).

Widespread complaints have highlighted local difficulties arising from the initial plan to implement NPfIT applications in the standard form in which they are supplied, as this is often not appropriate to specific needs. For example, the Mental Health Trusts

¹² www.connectingforhealth.nhs.uk/about/case/index.html

¹³ For periodic updates of these figures, see: www.connectingforhealth.nhs.uk/newsroom/statistics

in London found the EPR system they were offered had been designed for use in acute hospitals, and did not contain facilities to deal with certain special issues in mental healthcare (e.g. handling statutory Mental Health Act provisions, such as arrangements for sectioning patients). As a result, London Mental Health Trusts have been allowed to implement an 'interim' system specifically designed for patients with mental health conditions.

Some other types of Trust already having well-developed EPR systems, especially those with teaching hospitals, have found that the NPfIT system they have been offered is less sophisticated and less well suited to their needs than their existing equivalent system. For example, Frank Burns, former Chief Executive of Wirral Hospital Trust, has complained that: 'What is eventually produced by NPfIT won't be as sophisticated as the system we introduced 17 years ago' (Merrick 2007). This illustrates how 'raising' everybody to a common standard can have the effect of lowering the standard of those who already have a long history of developing these systems. For example, the Royal Marsden Cancer Hospital (Milan 2005) concluded that the standard NPfIT system did not enable it to maintain the cancer records it needed for research; it therefore plans to continue with its own advanced system.

Frequently, the 'devil lies in the detail' of NPfIT implementations. For instance, in many contexts the prescribed common user interfaces are too rigid to allow for necessary local variations in many systems (e.g. with nurses unable to input precise descriptions of a patient's care when the standard categories on the screen do not match the specific condition being dealt with). Insufficient flexibility in the range of locations where patient data can be collected is another common criticism. Such information is often naturally obtained at locations other than where an NPfIT terminal is available (e.g. during a home visit from a GP, nurse, care worker or midwife).

In one hospital, mentioned by a participant in the meeting on which this paper is based, delays arose in an A&E department because of difficulties in inputting and accessing information from NPfIT terminals. Individuals were supposed to use their smartcards for each interaction. But when staff found this slowed their work, they worked round the system by using a single card to keep the system open and available to them. This side-stepped the data security system by allowing staff to use

the card allowing the greatest security access, which seemed the easiest one to use operationally.

Patterns of response by healthcare professionals

There have been five main types of response from healthcare professionals to NPfIT applications (Eason 2007):

1. *Successful adoption*: The most clear-cut instance of this seems to be the implementation of PACS for X-rays and scans, which was under development for many years in the NHS and was not originally part of the NPfIT programme. Benefits of such a system are generally clear to users and its adoption does not seem to lead to major organisational problems.
2. *Partial use*: Applying some facilities of the system but ignoring many others is a very common response, especially by users who have discretion in how they work. This is illustrated by what many perceive as the relatively low level of use of Choose and Book and the frequent non-entry of clinical data into the electronic healthcare records. In such cases, clinical staff typically have other existing mechanisms for accomplishing their tasks.
3. *Workarounds*: Another frequent response occurs when the system is intended to be used in a way that local users deem to be inappropriate for the work they are undertaking. Some users then find a route to bypass the difficulty, for example in side-stepping restrictions in accessing records using a security smartcard (e.g. Collins 2007a).
4. *Stress, failure and delay*: There are also many examples where implementation has been problematic, such as when the Nuffield Orthopaedic Centre hurried some data migration and lost the records of people who were scheduled for clinic appointments (Health Direct 2006). The implementation of a Patient Administration System in Queen Mary's Sidcup NHS Trust was seriously delayed when it was found to be incompatible with the Choose and Book system (Clark 2006).
5. *New forms of organisation*: Where NPfIT usage is growing, there is some evidence that new forms of work organisation are beginning to emerge. Offering

patient choice by using Choose and Book, for example, is not just a role for the GP but involves other members of the practice. Getting clinical data into electronic records may also not be a task only for clinicians, as it may involve sharing tasks with administrative staff.

Summary of local problems

Figure 2 summarises some of the typical local problems encountered with the use of NPfIT, as discussed above.

Figure 2. Examples of problems as NHS Trusts adopt NPfIT applications

| <i>Trust</i> | <i>Issue</i> |
|-----------------------------|--|
| London Mental Health Trusts | Care records not fit for mental health – interim system needed |
| Royal Marsden | Care records will not support research |
| Nuffield Orthopaedic | Outpatient records lost |
| Queen Mary, Sidcup | Delaying patient care |
| West Midlands | Smartcards not usable in the prescribed way in A&E |
| Wirral Hospital Trust | New system meant a step back in sharing records |

The need for a sociotechnical focus

A failure to learn lessons

As described above, NPfIT has scored some notable successes. At the same time, there is evidence from a variety of sources – most importantly from users – to indicate there have been some serious flaws. One of the underlying problems has been a failure to learn lessons from previous IT projects in general, and public sector and healthcare projects in particular. For example, the NHS23 group found it ‘quite remarkable’ that all of a lengthy list of generic system problems identified from previous IT failures¹⁴ appear to exist in NPfIT, showing that ‘none of the lessons’ had been learnt’ (NHS23 2007b).

Many who have studied and been involved in NPfIT have identified a root cause of its major problems as being its techno-centric focus (e.g. Clegg and Shepherd 2007). This was also highlighted by the House of Commons Public Accounts Committee

¹⁴ The NHS23 included such a list of reasons for IT failures in its Dossier on NPfIT submitted to the Public Accounts Committee (NHS23 2007a).

(2007: 6): 'We are concerned that leadership of the Programme has focused too narrowly on the delivery of the IT systems, at the expense of proper consideration of how best to use IT within a broader process of business change.' This narrow focus lies at the heart of the failure to adopt a broader, more holistic perspective to steer the Programme, as advocated by the sociotechnical approach. Similar points have been made in recent detailed independent empirical investigations by Car et al (2008) and Greenhalgh et al (2008). Thus Car et al (2008). in one of the main findings of their review of the impact of eHealth more generally on the quality and safety of healthcare, point to the 'inadequate attention being paid to socio-technical-cultural considerations'. Greenhalgh et al (2008) in their evaluation of the summary care record early adopter programme also offer a critique of the emphasis on technology-push and the need for, and difficulty of, adopting a more socio-technical emphasis involving new ways of working, job roles, values, metrics and the like. Thus 'we suggest that the NPfIT National Programme Board consider carefully the finding of this evaluation (which confirms previous observations by academics and policy analysts) that 'technology push' is being prioritised at the expense of attention to wider socio-technical change and that this is, in the opinion of the evaluation team, a major risk to the success of the NPfIT' (Greenhalgh et al, 2008).

Mills (2006) captures the essence of what a sociotechnical focus can bring to an endeavour as large and complex as NPfIT. Drawing on over 35 years experience of military and civilian IT projects, he explains that the sociotechnical approach offers an 'integration of two essentially different sub-systems, the socio (people-related) sub system and the technical (equipment) sub system. Only when optimised and working seamlessly together is the required overall capability delivered to the end-user's satisfaction.'

Mills describes NPfIT as 'the socio-technical problem of socio-technical problems', because of its complexity, scale and the way it has human and organisational interactions at its heart. He illustrates this graphically, explaining that NPfIT encompasses 'hundreds of thousands of employees in different, and sometimes competing, departmental structures, comprising thousands of diverse specialisations, each with its own cultural baggage, not only being required to share common data but required to inter work with each other in new, and as yet to be

designed and developed, ways of doing business not only amongst themselves but across departmental boundaries. In addition, thousands of public servants will also need to interact with large swathes of the 50 or so million citizens comprising the general public.'

Key sociotechnical principles

The sociotechnical approach to modern IT-based organisation and work systems (e.g. Coakes et al 2000; Klein 2005) has its main origins in studies in the 1950s by the Tavistock Institute of Human Relations. The most influential of these related to changes to the traditional social and working practices that were introduced to optimise the benefit of installing automatic 'long wall' coal cutting equipment in British coal mines (Trist and Bamforth 1951; Trist and Murray 1993). Enid Mumford developed this approach in IT contexts, with an emphasis on techniques that enable users, such as nurses and secretaries, to participate in helping to design the computer-based systems with which they work (Mumford 1993; 1997).

The main sociotechnical design principles that anchor much discussion in this field were articulated by Albert Cherns (1976; 1987). Broadly, these emphasise system design criteria that prioritise adaptability to change through local control and the creation of an environment that seeks to nurture and harness the creative capacities of individuals and groups to help maximise the benefits of using a particular technical system. Since then, the rapid growth in the use of digital technologies and networks has been used in transformational ways by many public and private enterprises to change how they work, and how people inside and outside the organisation communicate and interact with each other. This has led to a broadening of sociotechnical approaches to encompass wider organisational, business and social developments, including more emphasis on service delivery and business process design to support the changing work practices needed to make optimum use of technological innovations (Clegg 2000).

Various sociotechnical principles have been enunciated. Figure 3 summarises some of those most commonly highlighted. As discussed in the remainder of this paper, these are of direct relevance to NPfIT management, design, implementation and use.

Figure 3. The main sociotechnical principles

| | |
|--------------------------|--|
| A systems view | Identify and address goals for organisation (e.g. aims and objectives). human (e.g. motivation) and technology dimensions. |
| Social shaping | Understand that system design, implementation and use are extended, socially-shaped and political processes. |
| Core process integration | View organisations as a number of core service-delivery and other processes that typically cut laterally across different functions. |
| Local adaptability | Meet planned and unpredicted change through as much local shaping as possible, with variances controlled at their local source using the combination of system elements most appropriate to a given context. |
| Boundary management | Organisational and work boundaries are crucial and frequently highly political, so should be managed carefully to promote the sharing of knowledge and experience. |
| System incompleteness | Ensure design and adaptation is ongoing, as requirements are likely to be continuously evolving. |
| Holistic evaluations | Regularly review progress and adjust course as necessary, bearing in mind the 'system incompleteness' principle. |
| Multistakeholder needs | Take account of the needs of the enterprise, the system's users and those affected by its use. |
| User ownership | Build strong ownership of systems and their design by those who use and manage them in their working environments. |
| User participation | Support meaningful, not token, inputs to system design and implementation from all users and other key stakeholders. |
| Social support | Establish systems in an environment that supports and encourages desired behaviours. |
| Resource support | Provide education and financial resources to underpin effective design, implementation, review and ongoing evolution. |

Sources: Adapted from Cherns (1976, 1987). Mumford (1997). Clegg (2000). Lin and Cornford (2000)

Addressing the main barriers to NPfIT success: the sociotechnical solution

Many of the difficulties encountered since the Programme was launched could be addressed by the adoption of a sociotechnical approach. These embrace four main areas:

- moving away from a too-narrow focus on IT;
- developing a better balance between national requirements and local flexibility for grassroots adaptability;
- establishing the capacity and capability to support effective handling of critical human and organisational issues; and

- undertaking systematic reviews and evaluations.

Overcoming NPfIT's techno-centric mindset

From a sociotechnical view, the very name 'National Programme for IT' can be seen to embody a narrow techno-centric focus on 'getting in the IT'. This 'technology push' has propelled NPfIT forward and has been difficult to slow down to allow for review, reflection and course adjustments. The momentum has also been sustained by strong pressures affecting the NHS externally and internally, such as the political desire to produce results as quickly as possible¹⁵ and the resultant management and organisational anxieties about being seen to deliver progress in adopting IT healthcare systems. Figure 4 summarises the reasons why a techno-centric approach can appeal to some when they are faced with a change as complex as NPfIT, as well highlighting key arguments against this approach.

Figure 4. Pros and cons of the current NPfIT strategy

| <i>Pro techno-centric</i> | <i>Anti techno-centric</i> |
|--|---|
| Simplifies goals and problem scope. Focuses on a limited set of problems, with clear responsibility lines. | Does not learn from history of failed IT-driven projects because difficult organisational and work issues are excluded or minimised. |
| May be the only way NPfIT can be done, as the NHS is so large, complex and differentiated that it is difficult to get users to lead and agree a project. | Longer-term outcome is unlikely to provide optimal service delivery because a mish-mash of unplanned variations is likely to emerge as the system evolves. |
| Could speed up the process initially, leaving difficult decisions about service delivery to be made later. | It is not clear how the developing infrastructure will influence current organisational processes and practices |
| Builds on previous experience because 'managing IT projects' is how professional project managers often perceive their job. | Users may become disillusioned and feel no sense of ownership, or little scope to shape developments and outcomes of the system. |
| Can help to get developers 'off the hook' later, as users can be blamed for ineffective service delivery, with developers claiming they met their contractual obligations. | If not dealt with initially, organisational aspects may not get funded or managed, thereby reducing opportunities for joint systems thinking and optimisation |
| <i>Benefits accrue mainly to developers</i> | <i>Disadvantages fall mainly on users</i> |

Source: Adapted from Clegg and Shepherd (2007)

Our criticism of the dominant technical focus in no way represents an argument for marginalising the technology. On the contrary, an underlying sociotechnical principle

¹⁵ As shown for example by Prime Minister Tony Blair's pressure to deliver NPfIT results in time for the 2005 general election (Collins 2008).

is that technology is a vital central issue – but is just one element of a system that reverberates across wider related social and organisational factors. A key aim is therefore to replace the technology push with a ‘user pull’.

Perhaps the most interesting aspect of the pros and cons summarised in Figure 4 lies in the claim that the advantages of the existing techno-centric approach accrue to the developer community, whilst the disadvantages are experienced by the user communities. This is not a good recipe for a change programme. In particular a major disadvantage of the techno-centric approach is that the needs of patients, NHS professionals and other healthcare staff are not given as much weight as they should in NPfIT planning, implementation and evaluation. The danger of this narrow focus compared to the wider changes within the NHS that are needed to make best use of the technology was encapsulated by a senior executive of one of the IT suppliers to NPfIT (Collins 2007c): ‘There is a belief that the National Programme is somehow going to propel transformation in the NHS simply by delivering an IT system. Nothing could be further from the truth.’

In some cases, what may seem like a primarily technical issue can have crucial human and organisational dimensions. For example, Randell emphasised to the meeting on which this paper is based: ‘Most security failures are not due to inadequacies in the security mechanisms employed, but to software bugs and other failures in the IT system in which they are employed, or through the actions of people involved with the system. Experience to date makes it evident that huge systems of the type planned, with very large numbers of authorized users, are likely to lead to patient records being frequently divulged (or corrupted, lost or rendered inaccessible). on occasion on a grand scale. It is therefore critical in determining what services are to be provided by a system to consider how the surrounding organisation will manage to cope when the system fails.’

Jean Roberts of the BCS Health Informatics Forum pointed to the need for more priority to be given to establishing professional health informatics standards¹⁶. In

¹⁶ The UK Council for Health Informatics Professions (UKCHIP). of which the BCS Health Informatics Forum is a founding member, promotes professionalism in this field, including a voluntary register of professionals who meet clearly defined standards.

addition, she emphasised the importance of utilising widely available relevant expertise to support clinicians and managers in using real-time information effectively, thereby reducing the risks to patients and health organisations from failures of IT-enabled systems (e.g. BCS HIF 2006; UKCHIP 2007). A significant informatics issue she highlighted is the need to address the way patient data may come from many locations and sources. These are not linked at present and will need to be integrated and collated in the future. Ensuring there is a Chief Information Officer (CIO) in each local Trust would be a key step in this context.

Nevertheless, many people involved in NPfIT believe that the existing techno-centric approach is the only way in which changes on this scale could have been attempted. Their rationale is that the NHS is a uniquely large, complex, political and differentiated organisation, quite unlike any private sector company. In this view, NPfIT is a Trojan Horse which will, in due course, promote and enable the transformation of services. While the authors have some sympathy for this view, they disagree for three main reasons. First, this was not the initial commitment, either to the users or the funders. Second, this approach entails enormous risks, most obviously that huge sums of money are spent but that service delivery fails to improve commensurately; the unique complexity of the health service makes this risk more likely to occur. Thirdly, alternative ways of undertaking service improvements were available. For example, in Germany regional trials are in place based on access to patient records via a voluntary personal smartcard owned and held by the individual (www.ehealthurope.net/Features/item.cfm?docId=189, www.ehealthurope.net/Features/item.cfm?docId=190). The national association of doctors in private practice in Germany is advocating the use of encrypted USB-sticks handed over to patients and carrying all their relevant data (www.e-health-insider.com/News/3384/). In Switzerland any records are owned by the patient who has a range of constitutional rights regarding the information, its accuracy and correction, and access by third parties (www.aerztekasse.ch/fr/p12001968.html).

Nurturing local flexibility within a national framework

Over-centralisation that has unnecessarily constrained the local shaping of solutions to meet diverse practical needs has been one of the most frequent complaints against NPfIT. For instance, the House of Commons Public Accounts Committee

(2007: 6) urged: 'The Department [of Health] needs to improve the way it communicates with NHS staff, especially clinicians. ... It should ask the heads of the clinical professions, such as the Chief Medical Officer, to review the extent of clinical involvement in the specification of the systems, and to report on whether they are satisfied that the systems have been adequately specified to meet the needs of clinicians.' A main theme of British Medical Association (BMA 2007) recommendations to the Department of Health was for 'renewed engagement' with NPfIT users, as exemplified by the way in which the GPSoC service was negotiated to maintain flexibility for GPs in their choice of system for their own practices.

Although the NHS in England is often viewed as a single organisation, its differentiated nature means it actually operates more as a kind of federation of smaller enterprises. Randell (2007) notes that 'it is sheer folly' to specify and design a complex IT system such as a large electronic health record system 'with inadequate consultation and commitment from the various classes of people who will affect and be affected by it'. This is particularly important for NPfIT, given the great diversity of local requirements within the NHS.

A more decentralised, 'federation' concept has been at heart of US approaches to creating a national framework for the use of IT in healthcare (e.g. Markle Foundation 2006). For instance, Charette (2006) says the US government acts as a 'technology coordinator and adoption catalyst': instead of funding the building of a single, integrated networked system with a central EHR database, the government is facilitating the definition of standards to allow the interoperability of commercially available EHR systems.

Establishing a greater sense of ownership by users, not just Trusts and higher organisational levels, is a key way of gaining and sustaining service improvements. Achieving such improvements is therefore a key challenge. As Joe Psaila, a Surgeon at Doncaster Royal Infirmary has commented on the CFH (2007d) website: 'Ownership is everything and that's why I became involved with NHS CFH. I lead a group of clinicians and other professionals who want early influence on the design, build and test stages of the new NHS CFH systems.' However, getting this sense of ownership has been hampered by the NPfIT emphasis on what Eason (2007)

describes as ‘the delivery of standard solutions into large numbers of existing sociotechnical workplaces that will show huge diversity’.

The local ownership trend within NPfIT, supported by the Service Implementation C&C (capacity and capability) programme, has moved towards giving greater responsibility for implementation to SHAs and Trusts. This could help to create more opportunities for local shaping of outcomes through the application of sociotechnical approaches, as the C&C programme addresses key sociotechnical principles highlighted in Figure 3 (e.g. social and resource support).

However, NPfIT still has a complex IT and service delivery structure that cuts across organisational, professional and geographical boundaries, frequently with poor coordination between levels. There is also much concern that there are inadequate local powers and financial and skills resources to avoid the danger articulated by Charlotte Atkins MP, a member of the Health Select Committee: ‘Local ownership and local buy-in are very important, but responsibility without power has little benefit’ (e-Health Insider 2007).

Connecting for Health remains in charge at a national level, but the local implementations have shifted from five regional clusters to the three Pan-SHAs. Within this, grassroots decisions and direct funding come from hundreds of trusts of different types: acute and foundation hospitals; primary; mental health; ambulance and care (combining health and social care). Each has its own medical specialisations, sociotechnical and IT capacities, organisational cultures, structures, budgetary problems and other crucial influences on actual outcomes. The strong external political pressures to which the NHS is subject add to the complexity of introducing NPfIT infrastructure and applications because changes to goals and policies can be triggered for reasons outside the control of NHS and NPfIT managers.

Focusing on service delivery and work and organisational processes

Many in the NHS feel ‘change shock’ at the continuous alterations of structure, policy and targets to which the NHS has been subject. Previous high-profile failures in government IT projects (e.g. RAE and BCS 2004) and health informatics risk areas

(e.g. UKCHIP 2007) have also created a sceptical culture in the NHS towards IT innovation (Department of Health 1998: 87).

Dealing effectively with the introduction of yet another innovation on the vast scale of NPfIT, again associated with the language of 'change management', requires a strong visible commitment to demonstrating that the technology will genuinely be used to improve healthcare outcomes, organisational effectiveness, and professional and work satisfaction and motivation. This is also central to the sociotechnical concern with improving overall outcomes.

The introduction of significant new IT capabilities requires changes elsewhere in the organization if the technology is to be used effectively. This means rethinking: the processes used; work practices; relationships between different professional work groups; and roles, skills and other capacities of the system's users (Clegg and Shepherd 2007). This issue appears to be receiving increasing levels of recognition (see, for example, NAO, 2008). Maggie Morgan Cooke, a Lead Associate at the NHS Institute for Innovation and Improvement, told the meeting on which this paper is based that NPfIT could achieve this for the NHS by being 'built around clinical values, with space provided for interpretation at team level', based on the organisation's ability to mobilise and sustain the changes. 'If we want different performance, we must change the system. And to change the system, we must think in fundamentally different ways,' she observed.

Unfortunately, such a process-oriented concept has been tarnished by some unfulfilled promises made in the 1990s for Business Process Reengineering (BPR) enabled by IT (e.g. Hammer and Champy 1993). These initiatives failed typically because insufficient account was taken of vital human and organisational dimensions. Process improvement initiatives are more likely to be successful within an integrated sociotechnical system's view (e.g. Mumford and Hendricks 1996).

The way this could be achieved was demonstrated by Leicester Royal Infirmary when, in the 1990s, it used IT as part of a process-oriented approach to redesign how patients were examined, tested and treated. This resulted in patients in certain departments being examined, having a number of tests, getting the results, receiving consultation and beginning treatment within one visit to the hospital – rather than

involving several visits spread over several months (Bevan 1996). Morgan Cooke observed that these improvements were not sustained, which emphasises the sociotechnical ‘incompleteness’ principle: design and adaptation should be seen as a continuous, never ending process of improvement.

Sociotechnical work on NPfIT implementations has clearly demonstrated that opportunities to do local sociotechnical planning are available in most circumstances, although policies and practices in the implementation process are not likely to encourage this to happen (e.g. Eason 2007). The features of NPfIT making local design difficult are not directly a property of the technology. They are the result of implementation policies, contractual issues between CFH and its suppliers and ‘best practice’ imperatives that the NHS is promoting throughout Trusts (e.g. in offering patient choice).

However, the complex NHS organisational structure within which NPfIT is being introduced can create some difficulties, even where modifications to the technical system are feasible. For instance, a change in a system in one Trust could mean agreeing changes with others using the application. This could mean a long delay before they are implemented. Wider pressures for change in the NHS also have an impact, for example making it harder to get staff interested in an NPfIT application when they may be preoccupied by the implementation of other NHS initiatives.

Undertaking timely reviews against broad criteria

NPfIT is a very large and lengthy project (currently planned over ten years). involving many complex interactions in a field where medical advances and patient needs are in continuous flux. Opportunities to reflect on progress are therefore vital, both at local implementation levels and nationally. One of the strongest recommendations of the NHS23 group has been for an open, independent review of the Programme in general, and the EPR system in particular (Thomas 2007). Local management priority, time and resources are needed to ensure appropriate levels of ongoing evaluation and reflection are provided to help implementations stay on course to achieve their healthcare goals.

People are often strongly driven in their behaviours and priorities by the metrics that are used to evaluate and manage them. The criteria applied to reviews and

evaluations should take human and organisational needs into account by going beyond quantified statistics that focus on factors such as the numbers of users and transactions or suppliers' cost and time performance. When the delivery of better patient care is the focus of change, a more balanced performance measurement would include: the performance of new practices and processes; the quality, timing and costs of service delivery; and criteria concerning the satisfaction of staff and patients (Clegg and Shepherd 2007: 219; Mumford 1996). An agreement among stakeholders on such a broader range of metrics could become a focus around which a wide range of activities could be coordinated.

How a sociotechnical approach can be of benefit to NPfIT

The centrality of social and organisational issues to the barriers outlined in the previous section highlight the relevance of sociotechnical principles to the future of NPfIT. The sociotechnical approach is essentially about taking a holistic view of all relevant factors, for example in systematically undertaking the 'joined up thinking' needed to integrate the threads of patient care that cut across multidisciplinary, organisational and geographical boundaries. Figure 5 summarises how the sociotechnical principles outlined in Figure 3 can be applied to assist the design, implementation, use and management of NPfIT.

Figure 5. Benefits to NPfIT of a sociotechnical approach

| <i>Sociotechnical principle</i> | <i>Contribution to overcoming NPfIT barriers</i> |
|---------------------------------|--|
| A systems view | Broaden narrow techno-centric focus to encompass the changes necessary in service delivery and other organisational processes and work practices. |
| Social shaping | Foster a 'user pull' rather than 'technology push' momentum. |
| Core process integration | Design and implement new ways to work, communicate, manage and deliver services using IT and appropriately designed 'joined-up' processes. |
| Local adaptability | Take account of highly differentiated needs within different NHS units and locations by allowing as much flexibility as possible in arranging local processes and practices within a coordinated national framework. |
| Boundary management | Prioritise management focus on external and internal political tensions at organisational and work boundaries. |
| System incompleteness | Allow time to reflect on experiences with NPfIT systems to learn lessons and make adjustments to how IT system capabilities are developed and supported to enable appropriate new ways of |

| | |
|------------------------|---|
| | performing tasks and delivering services. |
| Holistic evaluations | Plan regular reviews with criteria reflecting a full sociotechnical scope, using qualitative as well as quantitative metrics based on service delivery. |
| Multistakeholder needs | Ensure views of clinical professionals, other healthcare workers and patients are seriously elicited and considered. |
| User ownership | Nurture a strong sense of ownership, motivation and commitment among deliverers of healthcare by allowing them greater local control in improving services to their patients. |
| User participation | Enable users to have a say in the design and implementation of NPfIT applications to help avoid potential operational problems, such as those caused by poor user interface designs. |
| Social support | Pay attention to organisational culture to address anxieties (e.g. 'change shock' and scepticism about IT innovation in healthcare) and to encourage applications of the system that improve patient care, work satisfaction, responses to inevitable failures and protection of patient privacy. |
| Resource support | Ensure SHAs and Trusts have appropriate funds and expertise to build capacities and capabilities among all users and managers to enable the effective deployment of sociotechnical approaches to systems design, development and ongoing use. |

Conclusions: seeking opportunities for local sociotechnical NPfIT solutions

It is debateable whether NPfIT has gone 'off course', or whether it is on its planned – but misguided – course. However, its troubled progress raises serious concerns about its ability to meet the important healthcare and effectiveness aims it was set. The approach adopted so far has generally emphasised a 'change management' strategy that prioritises a rapid 'roll out' through technically-focused implementations, prescriptive 'good practice' guidelines and, crucially from a sociotechnical view, limited support for the design and adoption of new working practices.

This existing technology-push model of change may have become ingrained to the point that any advice for improvements could be ineffectual. Nevertheless, there are also 'reasons to be cheerful', as alternatives are still possible. These centre mainly on negotiating greater flexibility for tailored solutions at a local level, thereby opening opportunities for users to work through local issues to discover how they can benefit from new ways of working.

Such optimism was supported recently by David Nicholson, Chief Executive of the NHS, when he acknowledged that the Programme had become too centralised to support a health service based on plurality and far more locally-based decision making (Hoeksma 2008). He said that NHS management has been listening to the views of clinicians and patients on experiences with NPfIT applications and are reshaping the Programme to achieve a more integrated and devolved service.

Figure 6 outlines a strategy that could help NPfIT deliver genuine service improvements, for instance to meet key recommendations by NHS clinicians (e.g. by contributing to the creation of the BMA's proposed NPfIT implementation checklist¹⁷).

Figure 6. A local sociotechnical strategy to meet national healthcare goals

- Treat NPfIT as a 'service delivery' project, underpinned by sociotechnical thinking and principles – not as a 'technical change' project.
- Focus on service improvement through changes to delivery processes and to working practices, supported by the new informatics systems.
- Recognise the intrinsic diversity within the NHS. Exploit the flexibility of technical systems to support local customisation and interpretation.
- Improve healthcare outcomes by engaging all stakeholders in ways that extend to users a sense of ownership of the new ways of working.
- Phase implementation to provide time and space for shared learning and to help plan the configurations of working practices and technology that are most appropriate locally.
- Develop and use new evaluation metrics based on service delivery and user responses.
- Support independent reviews of key safety-critical and strategic systems. Embed processes that review progress continuously, in order to understand why things have gone well or badly – and what adjustments need to be made.
- Develop and provide the appropriate capacity and capability, including the necessary funding, to ensure any necessary additional work is properly supported and delivered. The nurturing of expertise may require widespread education, which may need to be backed by substantial funding locally.
- Help local staff to:
 - identify specific benefits they can realise through the creation of a 'user pull';
 - create a local design plan to realise local benefits and minimise costs and risks;
 - find an evolutionary path to progressive exploitation of new capabilities;
 - focus on creating 'transitional opportunities' to experiment with new healthcare practices; and
 - evolve and sustain new ways of working that exploit the technological potential effectively and safely.

¹⁷ See BMA 2007

Source: Adapted and developed from Eason (2005; 2007)

Changes of the kind represented in Figure 6 involve a substantial shift in thinking and practice. They can be successful only if they are supported by appropriate resourcing that ensures there is an appropriate level of organisational readiness, capacity building and opportunities for exercising local responsibilities.

Some optimism has therefore been generated by initiatives triggered by NLOP, such as the way the CFH's Capacity and Capability programme aims to address the 'C&C' issues that are also key sociotechnical priorities. The hope is that this will broaden opportunities to foster the opening of more local spaces where the sociotechnical approach could flourish. If this expectation is realised, it would widen the range of stakeholders who influence NPfIT's detailed course, including the users and managers whose professional expertise and commitment are essential to delivering improved patient care. And this is the prime reason why NPfIT was launched on its journey.

References

- BCS HIF (2006). *The Way Forward for NHS Health Informatics*, London: British Computer Society, Health Informatics Forum. Available at: <http://www.bcs.org/upload/pdf/BCS-HIF-report.pdf>
- Bevan, H. (1996). *Managing Today while Creating Tomorrow: The Paradox of a Re-engineering Journey*. Working article HWP 9630, Henley, UK: Henley Management Group.
- BMA (2007). *BMA Recommendations on the National Programme for IT (NPfIT)*. London: British Medical Association, August. Available at: www.bma.org.uk/ap.nsf/Content/futureofnpfit
- Brennan, S. (2005). *The NHS IT Project: The Biggest Computer Programme in the World Ever*, Oxford: Radcliffe Publishing Ltd.
- Car, J., Black, A., Anandan, C., Cresswell, K., Pagliari, C., McKinstry, B., Procter, R., Majeed, A. and Sheikh, A. (2008). *The Impact of eHealth on the Quality and Safety of Healthcare*. A report for the NHS Connecting for Health Evaluation Programme. Available at: http://www.pcpoh.bham.ac.uk/publichealth/cfhhep/pdfs/NHS_CFHEP_001/NHS_CFHEP001_eHealth_report_Full_version.pdf
- CFH (2006). *Response to Media Reports about LORENZO Software Development*, Leeds: Connecting for Health, 28 September. Available at: www.connectingforhealth.nhs.uk/newsroom/media/lorenzo_statement_210806?searchterm=lorenzo
- CFH (2007a). *Changes to delivery of NHS National Programme for IT*, Leeds: Connecting for Health, 28 September. Available at: www.connectingforhealth.nhs.uk/newsroom/news-stories/npfit_delivery?searchterm=accenture

- CFH (2007b). NHS National Programme for IT Status Summary, Leeds: Connecting for Health, February. Available at:
www.connectingforhealth.nhs.uk/about/case/npfitstatus.pdf
- CFH (2007c). The National Programme for IT Implementation Guide, Leeds: Connecting for Health. Available at:
www.connectingforhealth.nhs.uk/systemsandservices/implementation/docs/national_programme_implementation_guide.pdf
- CFH (2007d). Views of Clinicians, Leeds: Connecting for Health, February. Available at: <http://www.connectingforhealth.nhs.uk/about/case/clinicians>
- CFH (2008). Programmes for IT, Leeds: Connecting for Health. Available at: www.connectingforhealth.nhs.uk/itprogrammes?searchterm=NLOP
- Charette, R. (2006). Inside Risks, *Communications of the ACM*, 49(6). 192.
- Cherns, A. B. (1976). The Principles of Socio-Technical Design, *Human Relations* 29(8). 783–792.
- Cherns, A. (1987). Principles of Socio-technical Design Revisited, *Human Relations* 40(3). 153–162.
- Clark, L. (2006). Trust Feels Pain of IT Roll-Out, *Computer Weekly*, 7 November www.computerweekly.com/Articles/2006/11/07/219625/trusts-feel-pain-of-nhs-it-roll-out.htm
- Clegg, C. (2000). Sociotechnical Principles for System Design, *Applied Ergonomics*, 31(5). 463–477.
- Clegg, C. and Shepherd, C. (2007). ‘The Biggest Computer Programme in the World Ever!’: Time for a Change in Mindset?, *Journal of Information Technology*, 22, 212–221.
- Coakes, E., Willis, D. and Lloyd-Jones, R. (2000) (eds). *The New SocioTech: Graffiti on the Long Wall*, London: Springer.
- Collins, T. (2007a). NHS Security Dilemma as Smartcards Shared, *Computer Weekly*, 8, 30 January. Available at:
www.computerweekly.com/Articles/2007/01/30/221461/nhs-security-dilemma-as-smartcards-shared.htm
- Collins, T. (2007b). Statistics and the NPfIT “success”, *Computer Weekly* blogs, 6 November. Available at:
http://www.computerweekly.com/blogs/tony_collins/2007/11/statistics-and-the-npfit-succe.html#more
- Collins, T. (2007c). Supplier Sets Out Risks Facing NHS IT Plan, *Computer Weekly*, 13 February. Available at:
www.computerweekly.com/Home/..%5CArticles/2007/02/13/221746/supplier-sets-out-risks-facing-nhs-it-plan.htm
- Collins, T. (2008). Secret Papers Reveal Blair's Rushed NPfIT Plans, *Computer Weekly* blogs, 18 February. Available at:
http://www.computerweekly.com/blogs/tony_collins/2008/02/secret-papers-reveal-blairs-ru.html
- Computer Weekly (2008). NHS Connecting for Health terminates Fujitsu's NHS contract, 29 May. Available at:
<http://www.computerweekly.com/Articles/2008/05/29/230851/nhs-connecting-for-health-terminates-fujitsu's-nhs-contract.htm>
- Department of Health (1998). *Information for Health: An Information Strategy for the Modern NHS 1998–2005; A National Strategy for Local Implementation*, London: Department of Health. Available at:

www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4014469.pdf

Department of Health (2000). The NHS Plan: A Plan for Investment; A Plan for Reform, London: The Stationery Office Ltd. Available at:

http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4002960

Department of Health (2001). Building the Information Core – Implementing the NHS Plan, London: Department for Health. Available at:

www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4066946.pdf

Department of Health (2002). Delivering 21st Century IT Support for the NHS: National Strategic Programme, London: NHS Confederation. Available at:

http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4008227

Eason, K. D. (2005). Exploiting the Potential of the NPfIT: A Local Design Approach, *British Journal of Healthcare Computing & Information Management*, 22(7). 14–16.

Eason, K. D. (2007). Local Sociotechnical System Development in the NHS National Programme for Information Technology, *Journal of Information Technology*, 22, 257–264. Available at: www.palgrave-journals.com/jit/journal/v22/n3/full/2000101a.html

e-Health Insider (2007). Government Says No Plans to Devolve CfH Power, Health Insider, 15 November 2007. Available at: www.e-health-insider.com/News/3220/government_says_no_plans_to_devolve_cfh_power

Greenhalgh, T., Stramer, K., Bratan, T., Byrne, E., Russell, J., Mohammad, Y., Wood, G., and Hinder, S. (2008). Summary Care Record Early Adopter Programme: An independent evaluation by University College, London. London: UCL. See also:

www.pcpoh.bham.ac.uk/publichealth/cfhhep/pdfs/NHS_CFHEP_002/CFH002-SCRIE_Final_Report_2008.pdf

Hammer, M. and Champy, J. (1993). Re-engineering the Corporation: A Manifesto for Business Revolution, London: Nicholas Brierley Publishing.

Hawkes, N. (2007). Disillusioned Doctors Say Labour Decade of Reform has Failed NHS, *The Times*, 19 February. Available at:

www.timesonline.co.uk/tol/news/uk/health/article1403738.ece

Health Direct (2006). NHS Care Records IT Roll-out Raises Patient Safety Fears, Health Direct blog, 17 March 17. Available at:

www.healthdirect.co.uk/2006/03/nhs-care-records-it-roll-out-raises.html

Hoeksma, J. (2008). ‘NHS boss says NPfIT “was not in right place”’, e-Health Europe, 12 March. Available at:

http://ehealthurope.net/news/3551/nhs_boss_says_npfit_'was_not_in_right

House of Commons Health Committee (2007). The Electronic Patient Record. Sixth Report of Session 2006–07, London: The Stationery Office Limited. Available at:

www.publications.parliament.uk/pa/cm200607/cmselect/cmhealth/422/422.pdf

House of Commons Public Accounts Committee (2007). The National Programme for IT in the NHS, London: House of Commons Committee of Public Accounts, London: The Stationery Office, 11 April 2007). Available at:

www.publications.parliament.uk/pa/cm200607/cmselect/cmpublicacc/390/390.pdf

Kablenet (2006). Review Criticises Software for NPfIT, Kablenet, 22 August.

Available at: www.theregister.co.uk/2006/08/22/npfit_software_criticism/

- Klein, L. (2005). *Working Across the Gap: The Practice of Social Science in Organizations*, London: Karnac Publications.
- Lin, A. and Cornford, T. (2000). Sociotechnical Perspectives on Emergence Phenomena, in Coakes et al, 51–60.
- Markle Foundation (2006). *The Common Framework: Overview and Principles*, New York: Markle Foundation/Connecting for Health. Available at: <http://www.connectingforhealth.org/commonframework/docs/Overview.pdf>
- Medix (2006). *Medix Survey (Q1066) of Doctors' Views about the National Programme for IT (NPfIT) – November 2006*, Steeple Morden, Herts: Medix UK. Available at: <http://ixdata.com/reports/106620061121.pdf>
- Merrick, R. (2007). NHS Chief Attacks Computer Project, *Liverpool Daily Post*, 15 June. Available at: http://icliverpool.icnetwork.co.uk/0100news/0100regionalnews/tm_headline=nhs-chief-attacks-computer-project&method=full&objectid=19300297&siteid=50061-name_page.html
- Milan, J. (2005). The NPfIT in London: A Case Study, *British Journal of Healthcare Computing & Information Management*, 22(2): 26–29.
- Mills, M. (2006). *System Design or Social Change*, London: PITCOM, 24 April. Available at: www.pitcom.org.uk/reports/Malcolm-Mills-talk.doc
- Mumford, E. (1993). *Designing Human Systems for Health Care*, Rotterdam: 4C Corporation.
- Mumford, E. (1997). *Systems Design: Ethical Tools for Ethical Change*, Basingstoke: Macmillan.
- Mumford, E. and Hendricks, R. (1996). *Business Process Re-engineering RIP, People Management*, May.
- NAO (2006). *The National Programme for IT in the NHS*, London: National Audit Office, The Stationery Office, 16 June. Available at www.nao.org.uk/publications/nao_reports/05-06/05061173.pdf
- NAO (2006). *The National Programme for IT in the NHS: Progress since 2006*, London: National Audit Office, The Stationery Office, 16 May. Available at: www.nao.org.uk/pn/07-08/0708484.htm
- NHS23 [Anderson R. and 22 others] (2007a). *The NHS's National Programme for Information Technology (NPfIT): A Dossier of Concerns*, 18 January 2007. Available at: <http://homepages.cs.ncl.ac.uk/brian.randell/Concerns18Jan2007.pdf>
- NHS23 (2007b). *Our Submission to the EPR Inquiry*, 15 March 2007. Available at: http://editthis.info/nhs_it_info/Our_Submission_to_the_EPR_Inquiry
- NHS23 (2008). *General Warnings and Advice*. Available at: http://editthis.info/nhs_it_info/General_Warnings_and_Advice#System_Failure.21.282_Mar_2007.29
- RAE and BCS (2004). *The Challenges of Complex IT Projects*, London: The Royal Academy of Engineering and the British Computer Society, London.
- Randell, B. (2007). A Computer Scientist's Reactions to NPfIT, *Journal of Information Technology*, 22(3). 222–234. Available at: www.palgrave-journals.com/jit/journal/v22/n3/full/2000106a.html
- Royal College of Nursing (2006). *Nurses and NHS IT developments – Results of an Online Survey by Nursix.com on behalf of the Royal College of Nursing*, London: RCN. Available at: www.rcn.org.uk/publications/pdf/nurses_and_NHS_IT_developments_survey_2006.pdf

- Thomas, M. (2007). Our Supplementary Evidence to the EPR Inquiry on Independent Reviews. Evidence on behalf of the NHS-23. Available at: [www.editthis.info/nhs_it_info/Our Supplementary Evidence to the EPR Inquiry on Independent Reviews](http://www.editthis.info/nhs_it_info/Our_Supplementary_Evidence_to_the_EPR_Inquiry_on_Independent_Reviews)
- Trist, E., and Bamforth, W. (1951) Some Social and Psychological Consequences of the Long Wall Method of Coal-Getting, *Human Relations*, 4, 3–38.
- Trist, E. and Murray, H. (1993). The Social Engagement of Social Science: A Tavistock Anthology, Volume 2: The Socio-technical Perspective, Philadelphia, PA: University of Pennsylvania Press.
- UKCHIP (2007). Broadening Horizons: Developing the Health Informatics Workforce, July. Available at: www.ukchip.man.ac.uk/Home/broadeningthehorizons07
- Wanless, D. (2002) Securing Our Future Health: Taking a Long-Term View, London: HM Treasury. Available at: [www.hmtreasury.gov.uk/Consultations and Legislation/wanless/consult_wanless_final.cfm](http://www.hmtreasury.gov.uk/Consultations_and_Legislation/wanless/consult_wanless_final.cfm)

www.ehealthurope.net/Features/item.cfm?docId=189

www.ehealthurope.net/Features/item.cfm?docId=190

www.e-health-insider.com/News/3384/

www.aerztekkasse.ch/fr/p12001968.html