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[Developing theory and method for studying 'resistance' to big IT programmes in healthcare]

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1. Aims/Objectives:

AIM
To develop theory and method for studying resistance to big IT programmes in healthcare.

STRATEGIC OBJECTIVES
1. Review and extend previous theoretical and methodological work undertaken by our team on this topic.
2. Apply these new approaches to datasets collected in our previous studies.
3. Draw generalisable lessons which can be applied to new projects.

OPERATIONAL OBJECTIVES
1. Define a subset of empirical data for secondary analysis which illustrates the phenomenon of resistance to big IT programmes in healthcare.
2. Engage with, and think deeply about, strong structuration theory and how this theoretical approach may be applied to the defined dataset.
3. Develop and refine a tailored application of strong structuration theory with a view to applying this to new empirical studies in the future.

OUTLINE RESEARCH QUESTION
How might we better conceptualise, theorise and empirically study 'resistance' to big IT programmes in healthcare?

INTENDED OUTPUTS
1. Significant contribution to the theoretical understanding of 'resistance' to technology use by healthcare staff and patients, especially in the context of large-scale networked IT programmes.
2. Practical recommendations for policymakers, professional bodies, healthcare organisations and managers on how to avoid and/or manage 'resistance' of front-line staff to the introduction of new technologies – and also how to learn from resistance.
3. Recommendations for further research in the form of an outline for a future research call.

2. Background:

The greatest challenges facing healthcare providers today include those of storing, organising and aggregating health data; enabling communication between geographically dispersed health professionals; and promoting the "meaningful use" of electronic records to support effective, efficient and co-ordinated care [1]. This matters because [a] healthcare is becoming more complex, more inter-professional and more geographically distributed; [b] more and more patients have chronic illness and comorbidity; and [c] a well-documented threat to patient safety is poor communication within and between
multi-professional teams [2]. It is increasingly common for policymakers to view the solution to these challenges in terms of large-scale IT systems (e.g.

National Programme for IT and Whole Systems Demonstrator in UK; Obama's Health Information Technology for Economic and Clinical Health [HITECH] programme; and the Personally Controlled Electronic Health Record in Australia). Such 'big IT programmes', built on a vision of a modernised health service that is fully networked, integrated, largely paperless, and uses standardised decision protocols, are often seen by policymakers as the key lever for improving the quality, efficiency and safety of healthcare [3]. But they have also been criticised as grandiose, unfit for purpose, ethically naïve, poor value for money, distorted by commercial interests and destined to be plagued by delays and scope creep [4], and they bring the problem of "e-iatrogenesis" [5]. These polarised positions reflect, perhaps, the mismatch between the dream of what large-scale IT systems COULD do and what, in reality, they currently do [6].

Resistance to big IT programmes and the records which form their core components is widespread. As one author put it, "Most CIS [computerised information systems] implementations fail because, despite high investments in terms of both time and financial resources, physicians simply do not use them" [7]. He might have added: neither (in many cases) do nurses, midwives, other health professionals or patients. Resistance is poorly explained by current models. Policy documents tend to present it as a wholly negative and one-dimensional construct roughly corresponding to a combination of luddite attitudes and limited technical skills [8]. Academic papers tend to present resistance as the product of a set of interacting variables – for example, a recent systematic review listed eight: "[A] Financial, [B] Technical, [C] Time, [D] Psychological, [E] Social, [F] Legal, [G] Organizational, and [H] Change Process" [9], though the authors did not attempt to link these variables in an integrated explanatory model. Carl May's theoretically sophisticated normalisation process model, originally developed to explain success and failure in telemedicine implementation, considers four constructs which have a bearing on resistance: interactional workability (how the technology fits with interaction in the clinical encounter), relational integration (how it fits with the network of relationships in which the health professional works), skill-set workability (whether the staff member has the skills to use it) and contextual integration (whether the organisation recognises the technology and allocates human and material resources to its implementation) [10].

Other theoretical approaches relevant to the study of resistance to big IT programmes include actor-network theory [11], material interactionism [12] and the theoretically heterogeneous field of computer-supported co-operative work [13]. We have previously undertaken a systematic review of the diverse and conflicting literature on electronic patient records [14] and another systematic review (funded by SDO) of technological innovation in healthcare [15]. Both those reviews concluded that we need more theory-building research to draw together and extend insights from sociology, philosophy, computer science, information systems and management studies to produce fit-for-purpose theory and method for addressing the personal, social, technical and organisational complexities of technical innovation in healthcare. As explained in more detail in the supplementary material, we have begun to undertake such theory-building work and now seek protected time to continue that work [16]. Briefly, we have used an adaptation of Giddens' structuration theory, combined with selected insights from actor-network theory, to consider the macro-, meso- and micro- influences on the use and non-use of electronic patient records.

3. Need:

Non-use of electronic patient records is potentially a huge waste of money and (even acknowledging the existence of e-iatrogenesis) a serious threat to patient safety. The National Programme for IT was established in 2006 at an official cost to the taxpayer of £12.4 billion [17]. Our own research into the Summary Care Record (see below) showed that even when such records were available as a one-click option, clinicians chose to access them in only 21% of encounters [18]. The introduction of a patient portal for the Summary Care Record was met with an unprecedented level of resistance from
patients and the public: only one in 1000 people invited to open an account allowing them to access this portal did so, and far fewer actually used it to engage with their own care [19].

We need to understand resistance to big IT because it is part of a wider set of changes in the organisation and delivery of health care which are profound and far-reaching. The principal applicant on this bid is a GP: when she qualified 25 years ago the typical patient record was a 'Lloyd George' folder measuring 8" x 5" x ½" which was typically shared between the three GPs in a group partnership and no-one else (ever). Indeed, the role of the GP-held paper record as a unique and closely-guarded 'cradle to grave' account of a person's illness history was almost mythical. These days the typical GP-held
record comprises an electronic data file containing some 2,000 items of coded data, 10,000 words of free text and perhaps 50 scanned-in letters or discharge summaries, stored on a practice-based or remote ('vault') server. The local GP record is now routinely linked to hospital systems (for example, for automated download of blood test results) and accessed by doctors, nurses, managers and administrators in the practice. It is also accessible to selected staff at the Primary Care Trust for auditing and payment. In England, an extract from certain data fields of that record (the Summary Care Record), comprising medication, allergies and adverse reactions, is stored nationally on the central NHS 'Spine'. The Summary Care Record is (controversially) accessible to several thousand NHS staff, subject to role-based access privileges and a 'legitimate relationship' with the patient [18].

The technical complexities of these changes are well-known and have been widely discussed at policy level (see for example http://www.connectingforhealth.nhs.uk/). Their personal and social implications have also been acknowledged by some interest groups – for example, the civil liberties lobby (www.bigoptout.com/) and the 'agile design' lobby (http://agilemanifesto.org/). One message that comes across loud and clear is that privacy is not the minor issue that policymakers originally considered it to be [8], nor can human concerns such as trust or the sensitivity of medical information be resolved through technical fixes to the system [18,19].

Missing so far from this public discussion is a scholarly handle on 'resistance'. In order for stakeholders to engage in informed debate about why staff and patients do not use information technologies introduced with the intention of making care better, safer, more efficient and more patient centred, we need a conceptual and theoretical model which incorporates the nuanced, multifaceted (personal, social, technical, practical) and multi-layered (individual, team, organisational, system) reasons why people choose not to use (or find that they cannot use) technologies.

The latest white paper on healthcare IT, 'An Information Revolution', reveals an interesting policy tension [20]. The new administration is explicitly seeking to reduce central control over healthcare and put power in the hands of local NHS leaders and – importantly – patients. However, the idea of a nationally integrated healthcare IT system remains a compelling policy vision. Almost no detail is given on how the trade-off between (on the one hand) individual choice and local autonomy and (on the other) complete interoperability and a seamless patient experience across the entire NHS is to be achieved. Thus, whilst the heavily centralised and much-criticised National Programme for IT is unlikely to continue in its present form (and whilst a superficial analysis suggests that we are beginning to move away from 'big IT'), a closer reading of contemporary policy suggests that we are poised for several more chapters in the story of resistance to big IT in the NHS.

4. Methods:

THEORETICAL/CONCEPTUAL FRAMEWORK

Using our previous adaptation of strong structuration theory (SST) extended with selected concepts from actor-network theory (ANT) [16], we will study socio-technical networks (humans and technologies) in the context of 'resistance' to three components of the NPfIT: Summary Care Record (SCR), HealthSpace, and Choose and Book. We reject ANT's notion of 'symmetry' between humans and technologies and insist that the study of human action within the socio-technical network must be informed by a theory of agency. We see human agents, with their complex socio-cultural and technological frames (e.g. their interpretations of the social world and their understanding, perhaps imperfect, of what technologies can and cannot do), as instantiating technology (or not) in social practices. In other words, human choices and actions, based on sometimes-imperfect knowledge of what technologies and other humans can and will do, brings certain technologies into play as part of a wider socio-technical network – or, alternatively, prevents certain technologies from being brought into play.

Human agency is constrained and enabled both by normative influences (what people think they should do in certain circumstances) and also by practical, material and technical factors (what people find they are able to do, or not). External social structures (norms, standards, frames of reference, laws, expected behaviours), and properties inscribed and embedded in technologies, both create possibilities and limit the possible. A SST-informed analysis of resistance to IT programmes considers how 'macro' (institutional) context, 'meso' (organisational) routines and 'micro' (individual) frames operate dynamically and recursively in conjunction with technologies to produce (variously, in different circumstances) adoption, non-adoption, delayed adoption, partial adoption, 'workarounds' and creative new uses.

RESEARCH QUESTIONS

1. How does the recursive relationship between macro (institutional) context, meso (organisational routines and ways of working) and micro (individual understandings and front-line action) explain situations in which humans appear to 'resist' the use of technologies that are linked to big IT programmes?
2. What can we learn from the detailed analysis of small-scale episodes of 'resistance' which will inform the design, delivery and ongoing support of large-scale IT programmes?

RESEARCH METHODS

We will begin with a large qualitative dataset from our evaluation of the SCR and HealthSpace plus an ethnography of the use of local records and networked technologies (SCR, Choose and Book, GP2GP) in GP surgeries. We have 300 in-depth interviews, 3000 pages of ethnographic field notes and 50 multi-media files comprising video and screen capture of clinician-patient consultations.

We will take a purposive sample from this dataset of about 30 small-scale incidents in which professionals and/or patients appear to have 'resisted' the use of a technology, as well as some examples where 'resistance' does not appear to feature. This 'small-scale case study' approach allows us to understand the macro through the meso/micro – i.e. we look at a specific example and 'zoom out' from that to ask wider questions about the organisation, professional body, locality, community, family and so on, and contextualise the decisions and actions of the individual(s) in this wider analysis.

Using the detailed methodology set out in our recent paper (based on Stones' quadripartite refinement of structuration theory – Figures 1 and 2 in our supplementary material) [16], we will [a] study each individual's hermeneutic understanding of the context and the key issues which appear to be foregrounded for him/her in the incident being studied; [b] map the macro, meso and micro contexts in relation to the perspective of differently situated individuals (this will include both the individual's perspective on these contexts and what the researcher views as the constraining and facilitating aspects of these contexts); [c] study the index technology for relevant inscribed structures (e.g. assumptions about roles and behaviours that have been built into the technology as access controls, decision models, pull-down menus etc) and material properties; and [d] explain action and outcomes (intended and unintended) and how these feed back into the system and variously shape, reinforce or challenge the social order. We will generate a preliminary analysis from early cases and select further cases so as to explore emerging themes. The exact number of cases will be determined by when we reach saturation.

RESEARCH OUTPUTS

1. Significant contribution to the theoretical understanding of 'resistance' to technology use by healthcare staff and patients, especially in the context of large-scale networked IT programmes.
2. Practical recommendations for policymakers, professional bodies, healthcare organisations and managers on how to avoid and/or manage 'resistance' of front-line staff to the introduction of new technologies.
3. Recommendations for further research.

5. Contribution of existing research:

Because this is a study to develop theory and method, it would be dishonest to imply that we anticipate a direct and linear relationship between this work and patient impact. We acknowledge and sympathise with the prevailing pressure to produce immediate outputs that have measurable short-term benefits to patients. Most of TG's current

research is oriented to producing such outputs. However, we believe that if research is exclusively directed at short-term outputs to the exclusion of theory development, the long-term future of research is very bleak indeed. RS was approached by TG precisely because of his international reputation as a social theorist (see supplementary material) because she had already identified in a systematic review of the literature [14] that theory-building was a critical gap in the evidence base in this field.

We anticipate indirect impact on the collective research effort with this study. Whilst our preliminary publication applying strong structuration theory to electronic patient record programmes was deliberately written for a sociological audience and published in a theory-focused journal (Social Science and Medicine), a key goal of the proposed study is to develop ways of expressing these complex sociological concepts in language which doctors, other healthcare staff and healthcare policymakers will understand.

In sum, we seek to [a] promote debate within mainstream health services research on the underlying philosophical and theoretical assumptions which underpin research in eHealth, [b] inform research calls and [c] contribute to standard-setting on what counts as quality in this complex field. Indirectly, we also hope to inform policymaking in eHealth.

6. Plan of Investigation:

See 'additional detail' appended.

7. Project Management:

Since this small part-time study involves only two researchers, both of whom are highly experienced, project management will be subsumed within our regular meetings and oriented to producing the deliverables set out above within the 18-month time period.

8. Service users/public involvement:

As a secondary data analysis project service user involvement is not directly being sought here.

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ADDITIONAL DETAIL

Developing theory and method for studying 'resistance' to big IT programmes in healthcare

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Introduction

The two applicants are both experienced professors. From very different backgrounds and research programmes, we discovered a common interest in studying the introduction, adoption and assimilation of new technologies in health care. One of us is a medical doctor looking at innovation and change in healthcare organisations; the other is a sociologist who has refined and extended one of sociology's 'grand theories' (structuration theory) to make it more relevant and applicable to studying the complex, fast-changing and technology-rich world of the 21st-century [1].

TG discovered the work of RS when undertaking a wide-ranging systematic review of the literature on electronic patient records in organisations [2], not because he had published directly in this field but because his theoretical and methodological work in comparable fields appeared uniquely relevant to the study of innovations which impact on interpersonal relationships and collaborative work practices in contemporary health care. In particular, the systematic review highlighted a prevailing tendency in the health informatics literature towards technological determinism (assuming that introducing technology X would produce change Y) in electronic record research, and a parallel tendency for the role of human agency to be under-recognised and under-theorised. Contemporary readings of structuration theory offered one way of productively extending current work in the healthcare field.

We worked together briefly on a preliminary paper (summarised below) which was published in a sociological journal [3]. Working on that paper made us both excited by the possibilities of bringing our different streams of work together more formally, but we quickly realised that the depth and complexity of the intellectual work required meant that [a] this was not a task to be delegated to juniors and [b] it would require considerable time input from both of us.

Description of our dataset

We have datasets from three studies, the empirical work from which is now complete, which we hope to use as the basis for a secondary research study:

1. HERO (Healthcare Electronic Records in Organisations). This was a 2.5-year £435K study funded by the Medical Research Council to undertake ethnographic research on work practices and organisational routines involving electronic patient records in four contrasting GP practices. HERO focused in particular on 'networked' technologies such as Choose and Book (online booking for outpatient appointments), GP2GP (electronic transfer of records between GP surgeries), Map of Medicine (computerised decision support) and the Summary Care Record (a centrally-held extract from the GP-held record, intended for use in emergency and unscheduled care). The study protocol has been published [4] and a number of papers are under review. Relevant sections of the HERO dataset for this secondary analysis study include:
    - 50 videotaped consultations (with doctors and nurses), 20 of which have been transcribed in detail. In addition to high-quality video of the consultation we also have screen capture (20 frames per second) of what is entered on the computer screen.
    - 1000+ pages of ethnographic field notes on work routines in the practice, focusing particularly on 'hidden work' of secretaries, clerks and administrators. These notes include approximately 50 interviews with staff.
    - An extensive email correspondence between all 50 GPs in one locality about the Choose and Book programme, extending over an 18-month period and covering a widespread abandonment of the scheme by most but not all these GPs, along with consent from these GPs to analyse the text for research;
    - Practice documents including training protocols, patient leaflets, guidelines (e.g. on how to do a Choose and Book referral) and minutes of practice meetings.

2. Summary Care Record Independent Evaluation (SCRIE). This 3-year £970K study was funded by the Department of Health as part of the Connecting for Health Evaluation Programme. This study used mainly but not exclusively qualitative case study methods to map the multiple stakeholders and complex story of government's attempt to introduce a centrally stored electronic summary record for every citizen in England. One key finding from was that even when Summary Care Records were available, clinicians working in unscheduled care settings only accessed them in one case in five [5]. Another finding was the depth of resistance and strength of feeling amongst some sectors of both the public and health professionals against the *idea* of centrally held medical records. A number of publications have already appeared [5-10] and several more papers are under review (notably a comparison between the experiences of England, Scotland, Wales and Northern Ireland in introducing nationally shared summary records). Relevant components of the SCRIE dataset for this secondary analysis include:
    - Ethnographic field notes on 235 directly observed unscheduled care consultations in primary and secondary care (in which the Summary Care Record was accessed in 35, hence there is a predominance of 'non-access' – a finding which inspired this study).
    - 2000+ pages of field notes from local and national implementation groups working to implement the Summary Care Record.
    - Transcribed interviews with 130 individuals involved in the programme, including senior clinicians, the IT industry, front-line clinical staff and project managers.
    - Extensive documentation on national policy and business planning within the Department of Health (e.g. Strategic Outline Case, Outline Business Case and Full Business Case for the Summary Care Record Programme).

3. Independent evaluation of HealthSpace, an Internet-accessible personal health organiser introduced alongside the Summary Care Record as part of the National Programme for IT. This national case study was funded by the Department of Health as (initially) part of the SCRIE evaluation, but HealthSpace was subsequently 'uncoupled' from the National Programme for IT and the evaluation's terms of reference became somewhat unclear. The original policy vision was that HealthSpace would empower patients to [a] become actively involved in their own care, especially in relation to long term conditions; [b] access their Summary Care Record and check its accuracy, thus driving up data quality; and [c] increase their health literacy via educational links on the HealthSpace website. The main finding from the HealthSpace evaluation was that only 0.16% of people invited to open an advanced HealthSpace account actually did so, and of those who did, most appeared highly dissatisfied with it and did not use it. In the main findings paper, we commented that 'resistance' to this technology was understandable given its poor match with the practical realities of self-management [11]. Relevant components of the HealthSpace dataset for this secondary analysis include:
    - Ethnographic field notes, interviews and screen capture on 20 people who tried to use HealthSpace with a researcher present.
    - Extended ethnographies (5-15 hours of observation per case) on 20 further people with diabetes as they went about their lives, of whom 3 chose to use HealthSpace and 17 chose not to.
    - Transcribed interviews with 5 senior policymakers and 5 project managers attempting to implement HealthSpace at PCT level.
    - Extensive documentation on national policy and business planning within the Department of Health (e.g. Strategic Outline Case and Full Business Case).

We do not plan a secondary analysis of this entire dataset. Rather, we seek to select from it a purposive sample of 30 cases for in-depth analysis. Details of how we will select and analyse these cases are given on page 14.

A case example

The theory and methods which we plan to use are described later in this document, but because we anticipate that some reviewers / panel members may be unfamiliar with the sociological approaches described below, we introduce them via what we hope will be an accessible case example. What follows is not intended as a definitive scholarly analysis. Rather, it is provided to illustrate the potential of studying 'what actors know' and 'how action is shaped and constrained' as a way of drawing new insights about why people do or do not use information and communication technologies in particular circumstances.

We describe here one of the 235 cases on the series of patient encounters in the SCRIE study (see above). It is the only example in the entire dataset of where we saw a Summary Care Record (SCR) being accessed in a secondary care setting (A&E). As such, it is an 'outlier', and the features which make the case unusual throw light on why A&E patients were almost always seen *without* the clinician seeking to access the patient's SCR. The following is an abbreviated set of field notes made by the principal applicant on this bid:

> *I am observing a different case when the A&E consultant comes to find me. He says he has got a good case for me. I follow him to a computer terminal by the nurses' station where three or four junior doctors are queuing to look up results. The consultant says "OK guys, I need to use this, can you scatter?". The juniors immediately stand aside and let the consultant log on. He inserts his smart card, enters his password and while we are waiting for the system to boot up, he explains that an 86 year old woman has been brought in with a cut following a fall and the bleeding has not stopped. It appears she may be on "tablets for the blood", but she can't remember what these are. The patient's record is found on the Spine (national database of patient records). A pop-up prompt asks the consultant if he has a legitimate relationship with the patient and reminds him that he must obtain her consent to view her SCR. He realises he has forgotten to ask her consent, but selects the emergency over-ride option ("emergency: best interests of patient"). He gains access to her SCR but – disappointingly – the message reads "this record is blank".*

Leaving aside the fact that the SCR did not contain the expected data (an important finding but not directly relevant here), this case illustrates how a number of atypical phenomena came together to generate 'access' rather than 'non-access' of the patient's SCR.

A key feature of this case is the behaviour of the A&E consultant. He identifies potential benefit from information held on the SCR, searches out the researcher, clears the junior doctors from the computer terminal, uses his smart card and password to log on, and over-rides the system security on the grounds of "emergency". To explore these aspects of human agency further, we might fruitfully ask, "what does the consultant *know*?". The term 'know' here refers not merely to factual knowledge but to the sum total of past experiences, attitudes, skills, formal training, tacit understandings, organisational routines and personal values which the consultant brings to bear as he manages the case.

The first thing the consultant 'knows' is that this patient has been in A&E for 3 hours and 37 minutes. He knows this because he has been sitting in his office monitoring the department's activity on a piece of software which orders patients by the time since their arrival. Patients whose stay goes over 3½ hours are flagged red on the software. The consultant does not routinely see A&E admissions, though he is available for advice and intervention if juniors need help. But when he sees a patient flagged in red, he comes out of his office to see what he can to do speed up their transit. He does this because a national quality standard exists that 98% of patients must spend less than 4 hours in A&E before being either admitted or discharged. Thus, the chief reason the consultant has become involved in this case is a macro-level incentive (indeed, threat) which has been translated into a meso-level work pattern (supported by a bespoke technology) of actively pursuing the '4-hour target'.

The consultant also 'knows' that the patient is bleeding and is taking "tablets for the blood". His extensive clinical knowledge and long experience enable him to surmise that a pivotal item of information is whether or not the patient is taking warfarin (or some other anti-clotting medication). If she is, she may need plasma urgently. If she is not, the bleeding is likely to stop with standard management. Less experienced doctors may or may not realise how pivotal the patient's medication is to the clinical decision.

Unlike the junior doctors, the consultant 'knows' that the patient has a SCR. He knows this because he sits on the local implementation group charged with introducing the SCR, and he is friendly with the handful of GPs who are 'early adopters' of the technology. At the time this case was observed, only one in five patients had a SCR because most local GP practices had yet to join the scheme. Contrast the consultant's knowledge here (gained from asking the patient who her GP was) with the knowledge of the typical junior doctor in A&E who knows only that the 'hit rate' when seeking a SCR is one in five.

As a result of his membership of the local implementation group, the consultant also 'knows' the policy vision for a nationally integrated electronic record system. He knows that his department is part of a high-profile national pilot for this system and that because of this, Department of Health officials occasionally visit to confirm that the SCR is 'up and running'. He knows that there will be some loss of face (and income) if the officials return to Whitehall with bad news stories. He knows that the research team are here for a week of intensive field work and that they have watched A&E activity for three days without yet seeing a SCR.

The consultant knows that he is the boss, and he knows how his juniors behave. His observation of the doctors huddled around the terminal indicate routine rather than urgent activity on the computer. The juniors, too, know the subtle, informal signals which indicate urgency in the need for computer-held data ('urgency' being a two-edged construct: clinical need and/or impending breach of the 4-hour target). They readily vacate the terminal.

The consultant knows what data the SCR ought to contain because he sits on the working group which defined the 'minimum dataset'. He knows that he has a 'legitimate relationship' with the patient (since, apart from anything else, he sits on committees where such jargon terms are used). He knows where his smart card is, and he knows his password. He also knows that if his actions using the emergency over-ride are picked up through audit or surveillance, they would be easily justified and the chances of punishment are nil.

All these (and other things which the consultant 'knows') come together to produce the rare (though ultimately unsatisfying) sighting of a patient's SCR. Our dataset contains numerous other examples of doctors and nurses in secondary care whose 'knowledge' was very different – or in whom the same knowledge appeared to lead to inaction rather than action (for example when the 4-hour target was used to justify *not* seeking access to a patient's SCR). The junior doctors spend only around four months on this placement; they have little knowledge of policy or organisational memory and their horizon of action is much more limited. They may not know how to log onto the Spine, what a legitimate relationship means or what the consequences would be if they use the emergency over-ride.

What the patient knows is speculative since (unusually) the researcher did not observe or interview this patient directly. The patient knows that she was being seen by a junior doctor and that a senior doctor has now become involved and has gone off to try to find out what tablets she is on. She is unlikely to know that she has a SCR or what data it should or does contain. If she is typical of patients interviewed for this study, however, she may assume that the A&E doctors have had access to her GP-held record for some years [8]. In all probability given her age, she 'knows' that doctors have high professional integrity and that her records will be accessed with her best interests in mind. She may also know that she has nothing

she wishes to conceal (such as a past termination of pregnancy, mental health problem or other personal health information which she perceives as 'confidential'). The patient may, incidentally, know key information which was not sought from her – for example that she attends a 'clotting clinic' every week and has a booklet at home telling her how many of the tablets to take.

Finally, let us consider what the technology 'knows'. Technologies, of course, do not know things in the same way as people do. But using the term metaphorically, a number of types of 'knowledge' are discernible in the SCR and its supporting technologies. The system has had designed into it some assumptions that people will act in certain ways (for example that doctors will be truthful when they claim a 'legitimate relationship') and a technical structure which makes some things possible (e.g. a staff member to access to an extract from the patient's GP record) and some impossible (e.g. doing so without a working smart card programmed with the appropriate access privileges). In that sense the system 'knows' this consultant – and it does *not* 'know' staff members with a more transient relationship to the organisation who have yet to be issued with a smart card. Certain inputs (e.g. keystrokes, unique identifiers) prompt the technology to 'act' in a qualified way (e.g. pull up the record and display its contents).

We hope that this brief example illustrates that what people know and how they act are closely related, and that macro and meso influences modify micro-level action at least partly by changing what human and technological actors 'know'. The next section expresses these notions in more complex sociological terms and is intended mainly for reviewers with backgrounds in the relevant disciplines.

Our work to date on the structuration theory / ANT hybrid

Philosophical assumptions

This section summarises a previous paper [3]. We began with the question: "How do we begin to theorise what happens at macro, meso and micro levels, when government tries to 'modernise' a health service with the help of big IT?" Both macro (e.g. policymaking, contracting) and micro (e.g. the clinical encounter) feature a complex interplay of influence, authority, the pursuit of goals, and the allocation of resources within a particular set of social norms, meaning-systems, and constraints. Given that the clinician-patient relationship is an intimate and sensitive one, new technology typically involves subtle but potentially far-reaching changes in roles, identities and mutual expectations. Technology sometimes makes possible new or more efficient ways of communicating and interacting for staff and patients. At other times, it is associated with disorder, inefficiency, and the need for stressful workarounds. The same technology may meet the former fate in one setting and the latter in another. Context matters. Macro and micro levels are closely and reciprocally related. Meso-level structures such as NHS organisations, professional bodies or civil liberties groups mediate the relationship between micro and macro.

Research on information systems generally takes one of four broad philosophical positions:

- *Positivist*, which assumes an external and knowable reality that can be objectively measured; an impartial researcher; and the possibility of producing generalisable 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, and that the purpose of research is at least partly to help the oppressed 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.

Healthcare is traditionally a positivist field of enquiry. But the limits of technological determinism – the assumption that technology X will produce impact Y – are increasingly recognised [2]. In recursive traditions, researchers do not study 'technologies' and 'contexts' separately but technologies-in-use. In other words, context is not simply a given external milieu whose properties can be measured from afar and controlled for (positivist), nor is it merely a conceptual frame through which the technology is given meaning (interpretivist). Rather, context is a complex and emergent outcome of the interplay between social actors and their organisational and technological infrastructures, generated and regenerated when human actors use technologies in particular ways for particular purposes.

In this theoretical work, we have sought to develop and align recursive approaches to the study of big IT in healthcare. We begin with the perspective that social structures, human agency and technologies each exist in a recursive relationship with the other two, and that all three co-evolve in complex and often unpredictable ways over time. Below, we describe two recursive approaches, structuration theory and actor-network theory (ANT), and highlight their strengths and limitations. We then introduce strong structuration theory (SST), which potentially overcomes some of these limitations, and suggest how it might be enhanced and combined with selected aspects of ANT to produce a new way of conceptualising, theorising and empirically exploring the co-evolution of technologies and the social order.

Structuration theory and technology structuration

In his theory of structuration, Giddens sought to bring together objectivist social theories (which assume that a hard social reality exists independently of individual actors and is to a large extent deterministic of their actions) and subjectivist ones (which assume that no social reality exists except the one that individuals construct in their interpretations and perceptions) [12]. Social actors are knowledgeable, active agents who may either reproduce social structures faithfully or choose to change them by behaving differently. Structuration theory has been widely applied in information systems research [13].

Giddens viewed social structures as internalised in what actors 'know' (i.e. their interpretive understanding) of the social world, and as instantiated (i.e. brought into being) through their actions. Barley applied structuration theory to technological change in healthcare in his classic study of the introduction of CT scanners in two U.S. hospitals [14]. Using the 'script' (a recurrent and observable pattern of social action) as his unit of analysis, he demonstrated how the introduction of the CT scanner was an 'occasion for structuring' – that is, it provided opportunities for (but importantly, was not deterministic of) changes in the social order of the hospital. Barley's early work informed Orlikowski's technology structuration theory, which considers how organisational actors, working collaboratively around common tasks, engage in a process of adapting the meaning, properties and applications of technologies to a particular context, and a parallel process of adapting the context to the technology [15]. Orlikowski uses the term 'interpretive flexibility' which emphasises the actor's interpretation of their own action in social context [16].

In contrast to Barley's elegant demonstration of new social orders accompanying the introduction of the CT scanner, our systematic review uncovered no examples of this phenomenon occurring unproblematically when electronic record systems were introduced in organisations, though there were many examples of role confusion, disrupted routines and abandoned systems [2]. Big IT in healthcare has thus not been an 'occasion for structuring' in any simple sense – probably because of the sheer complexity of the technologies and their embeddedness in wider programmes within and beyond the organisation.

One criticism of technology structuration theory is that the technical dimension is under-theorised. Technical artefacts 'do' things that cannot be attributed to or reduced to social practice [17]. Both Barley and Orlikowski have latterly acknowledged and begun to address this deficiency [18,19]. But it is interesting to reflect that Barley's seminal study considered organisations 'before' and 'after' the introduction of the CT scanner, but not the CT scanner evolving over time [14]. If *evolution* of technology (e.g. software upgrades) is added to the analysis, the structure-agency duality becomes, in one sense at least, three-dimensional – and also non-linear, since each component evolves at a different pace.

Actor-network theory (ANT)

ANT considers networks made up of both people and technologies [20,21]. The essential, given properties of people and things are not the focus of interest in ANT. What is of interest is what people and things *become* as a result of their position in a network, and the power that emerges from dynamic configurations of human and non-human actors. Actor-networks are often highly dynamic and inherently unstable. They can be stabilised to some extent when people, technologies, roles, routines, training, incentives, and so on are aligned. This is achieved (or at least, attempted) through 'translation', which involves the four stages of problematisation (defining a problem for which a particular technology is a solution), interessement (getting others to accept this problem-solution), enrolment (defining the key roles and practices in the network), and mobilisation (engaging others in fulfilling the roles, undertaking the practices and linking with others in the network) [20].

Because actor-networks are heterogeneous and organically evolving open systems, and the strength of network relations waxes and wanes, a fixed input to the system will not produce a fixed output [22]. Stability of an actor-network is always a truce of some sort, achieved through 'black boxes' – configurations of actors (human and non-human) which have become taken-for-granted as the way things are, and hence are no longer questioned. Elements of the network that are durable (e.g. materials) will lend stability; those that are ephemeral (e.g. opinions) will not. The inbuilt properties of software (for example, pull-down menus) may help to stabilise the network and thus shape and constrain clinical work. "Software", suggested one ANT scholar, "is frozen organisational discourse" [23].

Researchers have used ANT to describe the struggles (sometimes successful, sometimes not) of groups of actors who have sought to define and inscribe particular codes and standards into particular electronic record technologies, and shown how once these have become part of the network, they are hard to reverse (see, for example Ellingsen and Monteiro [24]). Studies in this tradition have also shown that the tension between standardisation (which helps stabilise the network) and contingency (which reflects and responds to local needs and priorities) can never be resolved once and for all; rather, it must be actively and creatively managed – and this gets harder as the network gets bigger [25].

A criticism of ANT is that it has a 'flat ontology'. ANT holds that there are no pre-existing layers (such as 'structure' and 'agency') but only *"a single plane of endlessly entangled translations"* (Harris [26], page 173). ANT's black boxes represent only a set of stable-for-now relations that could change at any time – without any further theorisation. By refusing more conceptually differentiated and refined analyses of institutional sources of power and inequality, ANT has little to say about the systematic exclusion that prevents some social groups from having a voice in the design and use of technologies. A second criticism is ANT's assumption of "symmetry" between humans and things. Reducing humans to comparable status to technologies places human motives, desires and virtues beyond the analytic frame and evades ethical questions [27]. Finally, there is the charge of cultural imperialism: a compelling researcher narrative is offered at the expense of any account which the 'natives' might have given. Despite these limitations, ANT's emphasis on the

dynamic and relational aspects of a problem is a useful lens for studying non-linear change and the unintended outcomes of technology programmes – including the rare but unpredictable events that are known to characterise big IT [22].

The general format of a research question from an ANT perspective – "What is the network, and what phenomena are emerging from it?" – offers broad and flexible scope for mapping the relevant terrain. In relation to Choose and Book, for example, the socio-technical network includes the index technology; other technical systems with which it is interoperable (or not); the individuals (doctors, patients, administrators) who use it in primary, secondary and self care; a particular alignment of policymakers, technical designers and technical components from which its infrastructure and data models were generated; civil servants and clinical negotiators who are busy creating financial incentives to persuade recalcitrant GPs to start using it again; and the media, lobbyists and publishing machinery which perpetuate the long-running story about the programme being 'behind schedule'.

Whilst ANT can help map the network and consider certain aspects of how power flows within it, it is inherently unsuited to micro-causal questions such as *why* – that is, through whose agency and enabled and constrained by which social structures – did the phenomenon in question emerge? For researchers who seek to answer such questions, ANT may provide conceptual tools and inspiration, but not a sophisticated theory of either human agency or the generative causality of social structures. Others have combined structuration theory with selected features of ANT to explain adoption of software by individuals, but did not address the sociology of translation in complex technology programmes [28]. Below, we introduce an adaptation of structuration theory which we believe can be aligned more closely with ANT to achieve this goal.

Strong structuration theory – an introduction

Strong structuration theory (SST) seeks to move beyond the abstract philosophical concepts in which Giddens was particularly interested ('structures' and 'agents') and explore empirical applications (*particular* structures and *particular* agents) [1]. Its focus on empirical case studies in which individuals are situated in webs of networked relations resonates with ANT's approach. In contrast with ANT's 'flat ontology', however, SST holds that the recursive relationship between structure and agency remains a useful concept and, furthermore, that four analytically distinct components of this duality can be studied empirically: (a) external structures (conditions of action); (b) internal structures within the agent (how and what individuals 'know'); (c) active agency (in which agents draw, routinely or strategically, on their internal structures); and (d) outcomes (in which both external and internal structures are either reproduced or changed). Rather than considering the script as its unit of analysis (as Barley did), SST considers the *conjuncture* (defined as a critical combination of events or circumstances – of which 'the clinical encounter' is one example).

SST proposes that external structures are mediated largely through position-practices. A position-practice is a social position and associated identity and practice, together with the network of social relations (and organisational and technical infrastructure) which recognise and support it (known as 'position-practice relations'). Position-practices are not merely structural 'slots' within which agents are largely interchangeable; rather, they are perpetuated (and changed) through their enactment by active human agents within their network of relationships. Agents' internal structures may be divided into:

[i] *General dispositions,* which include such things as socio-cultural schemas, discourses and world-views, moral and practical principles, attitudes, ambitions, technical and other embodied skills, and personal values – roughly what Bourdieu called 'habitus' [29] and overlapping with what Habermas, following the phenomenological tradition, referred to as the lifeworld [30]. Many of these dispositions are not amenable to change; and

[ii] *Particular ('conjuncturally-specific') knowledge* of the strategic terrain and how one is expected to act within it, based on one's hermeneutic understanding of external structures.

Within the conjuncture, the human agent actively and more or less reflectively and creatively draws upon these internal structures to produce action (observable behaviour). To study active agency, SST draws together three theories linked to social psychology. The first is phenomenology: the study of agents' shifting fields and horizons of action arising from the focused activity at hand (e.g. [30]). The second is ethnomethodology, which assumes that social action is an irreducibly situated, contingent and skilful accomplishment in which each utterance, written comment or action occurs in a micro-sequence that takes detailed and tacit account of the utterances, comments or actions preceding it [31]. In the workplace, for example, it is not so much abstract patterns and routines that make meaning but "the moment by moment management of contingent detail through sequential orderings" [32]. The third is symbolic interactionism, which focuses on the subjective meaning of human behaviour and how social actors interpret and respond to the actions of other actors [33].

Thus, whilst each of us brings generic capabilities, dispositions and strategic knowledge to any particular conjuncture, what we *actually do* in that situation will depend on a host of specificities which we cannot predict in advance but which depend crucially on our horizon of action, the contextual particularities of other external structures and happenings, and the constraints of time and space. Our knowledge of 'how we might be expected to act', and of the rewards and sanctions likely to follow from our actions, can be thought of in terms of the widely-cited terminology originally used by Giddens: interpretive schemas (structures of signification), normative expectations (structures of legitimation) and capacity to mobilise authority and resources (structures of domination). SST focuses particularly on the concrete ways in which agents *combine* these and other components when considering the strategic terrain. The agent's knowledge of this terrain may be more or less accurate and more or less adequate. Outcomes may be intended or unintended, and feed back on both external and internal structures – either preserving them faithfully or changing them as they are enacted.

The 'quadripartite' study of structuration thus involves seeking empirical evidence with which to explore and test key concepts and the relations between them for particular case examples. Data sources may be multiple and selected pragmatically (e.g. depending on access and availability) and include combinations of documents, ethnographic field notes, semi-structured and other forms of interviews and surveys, and multi-media data such as video or screen capture.

Strong structuration theory – adding a technology dimension

In seeking to enhance SST with concepts from ANT, we accept a number of ideas from the latter, but for each, we offer a caveat. First, we accept that it is useful to conceptualise technologies and human actors as part of the same network, and to view both as having a position-practice in that network (Figure 1). However, we reject ANT's assumption of 'ontological symmetry' between people and technologies. Humans act, and technologies 'act' – but in different ways, and we prefer to use different vocabulary to describe these phenomena and different theories and methods to explore them.

Secondly, we accept ANT's notion that aspects of the social order can be inscribed in technologies and this may to some extent 'freeze' certain position-practice relations within the technology. By asking where such things as codes and standards in software came from, and whose interests these codes and standards serve, we may be able to illuminate how technology reproduces and perhaps magnifies particular conditions of social action. The social relevance of the codes, procedures, standards and material which are inscribed in the technology-in-focus, whether intended or unintended, will constrain the potential range of

uses it can be put to, and in many (though not all) contexts can play a significant role in orienting (without determining) the actor to use it in a particular way.

Thirdly, we accept that human behaviour is shaped and constrained by complex forces in the socio-technical network and hence may in some senses be an 'effect' rather than a 'cause' of what we are studying. But we reject the idea that human agency can be reduced entirely to network effects. Indeed, we propose that the study of translation (the phases of problematisation, interessement, enrolment, and mobilisation described above) would be enhanced rather than diminished by a more sophisticated theory of structures and agency. We propose that ANT's emphasis on the material properties and socially-relevant inscriptions within technologies (box 2c in Figure 2) be integrated with SST's conception of agency in a more complex notion of the actant.

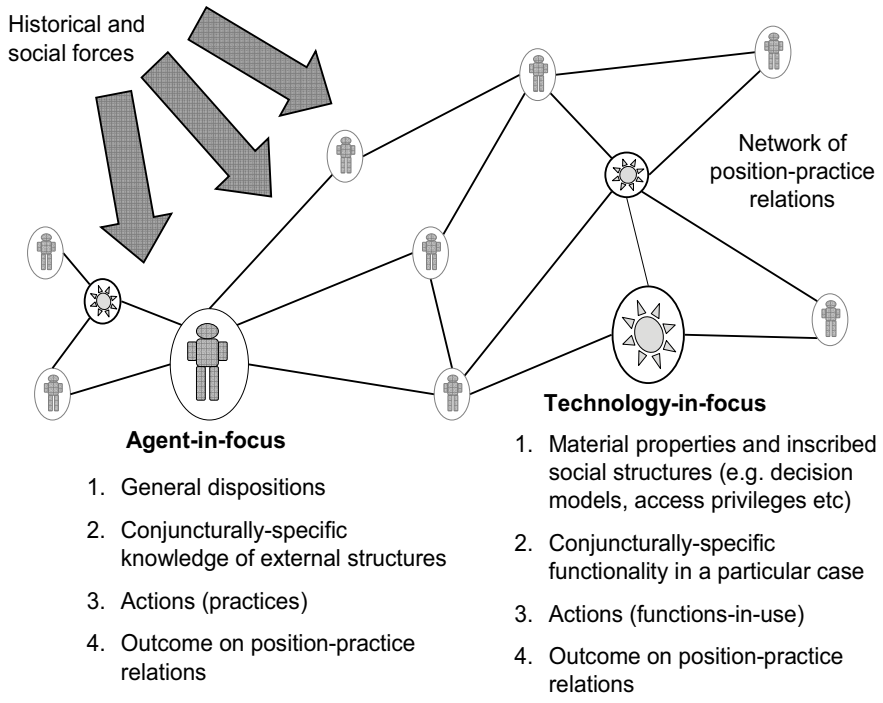

Figure 1: Strong structuration theory: A network of position-practices (people and technologies) influenced by historical and social forces

In relation to this third point, we note Dant's criticism of ANT for its failure to engage closely with the phenomenology of the "lived relationship between human beings and material objects" [34]. A parallel criticism of SST would point to its under-theorisation of the material properties of technology within interaction. To remedy this, we adopt Dant's innovative conceptualisation of the embodied shifting phenomenal, perceptual and manipulatory fields (that is, active agency – box 3 in Figure 2) within which actors draw on technology (box 2d in Figure 2) in 'material interaction' oriented to the task at hand. Dant's corrective dovetails closely with SST's emphasis on the phenomenological and embodied dispositions and capabilities drawn on by active agency (boxes 2a and 2b in Figure 2) whilst providing clear conceptual engagement with the material-technological sphere.

Figure 2 summarises a new conceptual model for considering big IT programmes, comprising a network of position-practices (humans and technologies), which evolves over time and is influenced by macro historical and social forces. These forces – institutional,

political, economic, technological – exist more or less independently of the agents who are in-focus within a particular study, and they contribute to the external conditions of action in any given conjuncture (i.e. small-scale social situation). Social structures are embodied and reproduced by both human agents and technologies. Humans use technologies in particular ways, thereby bringing into being a technology-in-use through which a particular context and social meaning is constituted.

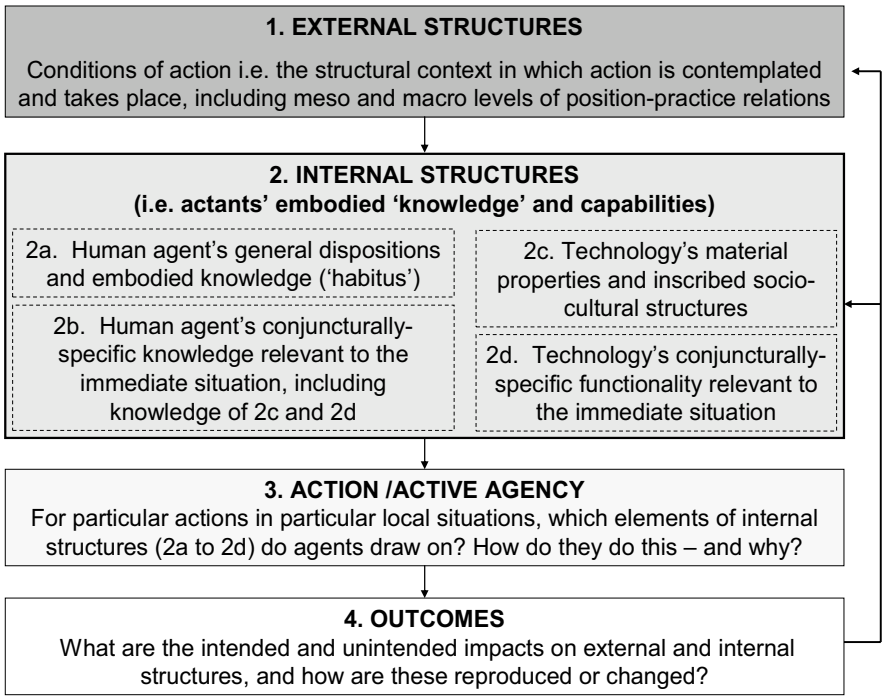

Figure 2: Strong structuration theory incorporating a technology dimension (adapted from [1])

Technologies also play their part in reproducing and changing social structures in two ways. First, social structures may be *built into* the technology, both enabling work practices but also potentially constraining them through inbuilt characteristics that are inflexible and non-negotiable in relation to here-and-now social action. Second, the technological component of social structures may be positively instantiated when people choose, using interpretive flexibility, to use the technology in a particular way both within and outside the intended scripts, and also negatively instantiated when they either actively refuse to use it or, importantly, are unable to use it either at all or in the ways they would like.

Thus, the recursive relationship between structure, agency and technology evolves continuously at the micro-meso level. But this relationship is also played out at a more meso-macro level and on a longer timescale, with many more sets of networked relations in play, where change may well be discontinuous. Below, we propose a provisional and somewhat abbreviated list of questions to guide an approach based on SST to studying the fortunes of a technology project or programme. It is neither prescriptive nor definitive.

MACRO LEVEL QUESTIONS IN RELATION TO AN UNFOLDING PROGRAMME

1. What is the prevailing political, economic, technological and institutional context within which the technology is being introduced locally or nationally?
2. What is the socio-technical network of this project or programme? Which agents and technologies are represented, and what are their position-practices?

3. What are the key relationships in the network and how are they changing over time?
4. To what extent has stability of the network been achieved – and why?

MICRO LEVEL QUESTIONS FOCUSED ON SPECIFIC CONJUNCTURES

1. Which humans and technologies are involved in the part of the network that is 'in focus' for this particular conjuncture?
2. What wider technological, financial and organisational infrastructure is needed to support the conjuncture?
3. In relation to this specific conjuncture, what are the relevant general dispositions (e.g. socio-cultural schemas, values, skills, past experience) of the human agent?
4. In relation to this specific conjuncture, what are the technology's material properties and inscribed socio-cultural structures?
5. In relation to this specific conjuncture, what does the human agent know (perhaps imperfectly) about relevant external structures? In particular, how does this agent think other agents view the world; and what does he/she know about the technology's material properties, inscribed structures and relevant functionality?
6. What does the human agent do – i.e. how does s/he reflexively relate to, and draw on, general dispositions, conjuncturally-specific knowledge, and knowledge of technological properties in an unfolding sequence of action?
7. How do the social structures (e.g. norms, duties, rights, rewards/sanctions) inscribed (deliberately or inadvertently) in the technology enable, influence, or constrain the active agency and strategic orientations of agents?
8. What are the immediate intended and unintended consequences and how do these feed back in the medium and longer term (positively and negatively) on the wider system?
9. What role has the technology played in the production of these positive and negative consequences?
10. How modifiable are the inscribed technological features that have contributed to negative consequences? By whom are they modifiable, over what timescale and at what cost?

The introduction of the technology might be studied diachronically (i.e. in a single site over time), either prospectively (if repeated bouts of extended fieldwork are possible) or through the use of historical documents and accounts. It may also be studied synchronically (i.e. across a sample of cases at a particular time) [14]. Synchronic and diachronic approaches can be combined pragmatically to suit the constraints of fieldwork and funding timeframes [35]. Different field sites will respond to the change in different ways depending on local configurations of socio-cultural dispositions and knowledges and how these articulate with relevant configurations of position-practice relations.

Unanswered questions which we seek to address in this study

The above section was a summary of our thinking to date about the general theoretical concepts and explanatory models of a SST-ANT hybrid. In seeking to apply them to the specific challenge of 'resistance', five key questions are central:

1. How can the above conceptual framework and analytic approach, developed for the general purpose of analysing the fortunes of big IT programmes, be adapted and refined to study the specific question of 'resistance' to such programmes?
2. By applying such a framework to an existing dataset comprising mostly examples of the *non-use* of technologies, can we produce a theoretical model of 'resistance' to big IT and if so, what are its key features?
3. What descriptive and presentational techniques can be used to convey these complex sociological concepts and empirical findings to audiences who are more used to empirical (and especially experimental) studies?
4. What are the implications of the findings for future research calls?
5. What are the implications of the findings for policy?

Details of method

Development of theory and analysis of data will occur concurrently, each feeding into the other. This iterative process will draw particularly on Klein and Myers' seven principles of interpretivist information systems research, especially the notion of the hermeneutic circle (constantly comparing each new item of data or theoretical insight with an emerging picture of the whole) [36]. The study will involve four overlapping main work packages.

Work package 1: Management and governance

Because this work is mainly a piece of thinking by two senior individuals, we feel that a relatively light-touch governance structure is appropriate. A steering group of fellow academics, NHS staff and service users with an independent chair will meet six-monthly (3 times in all) and receive a report on progress. These meetings will be minuted and any concerns documented. Any changes to the protocol set out below will be put to the steering group for formal approval before being implemented. Ethics approval is considered below.

Work package 2: Selection and analysis of case examples

The dataset from which cases will be selected is described on page 2. A maximum variety sample of cases will be drawn so that each illustrates some aspect of 'resistance' to the use of new electronic patient record technologies and is also amenable to analysis using the SST/ANT hybrid described above. Each case will comprise:

- Detailed observational field notes on the micro-level encounter (consultation or other interaction), along with video and/or screen capture data if available;
- Relevant meso-level documentation (e.g. organisational protocols, leaflets, publications or training materials) and field notes (e.g. observation of 'backstage' administrative work linked to the themes illustrated by the case);
- Relevant macro-level sources including documents (e.g. national or local policy), correspondence, press coverage linked to the themes illustrated by the case.

The analysis of each case will depend on its nature and the questions it raises. As a broad outline, and to be modified extensively to fit the particularities of the case, the type of questions to be asked at 'micro' level are shown in outline form in Figure 3.

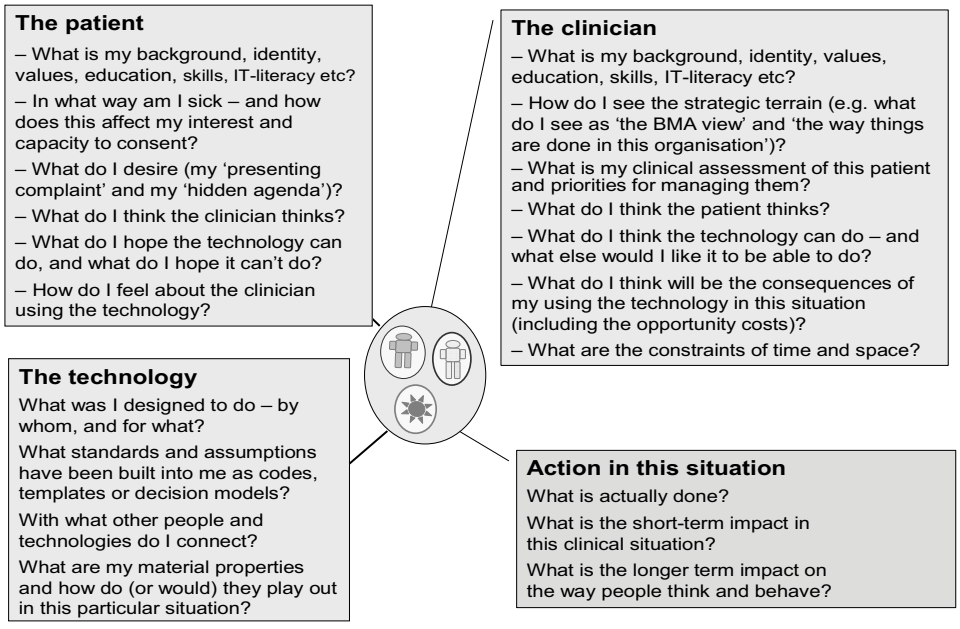

Figure 3: Outline of the types of question to be asked of the 30 cases in the dataset

For each case we will consider micro-, meso- and macro-level influences as well as the dynamic way in which action unfolds on a moment-by-moment basis. The micro-level questions set out in Figure 3 will be supplemented by a study of the meso-level (e.g. organisational) data in which the conjuncture is set. For example, in the example given above, a detailed study of the consultant's identity, talk, actions and non-actions might prompt a meso-level analysis of the work routines oriented to meet the 4-hour target and a macro-level analysis of policy documents on quality and safety in A&E departments.

The relatively small number of cases is deliberate in order that a large amount of data can be pulled together and analysed for each case – in other words, we will trade volume of cases for depth of analysis. Previous experience analysing such cases suggests that there is a wealth of potential meso- and macro-level data which provide context (and hence, analytic material) for the case.

We will not designate all 30 cases at the outset, since it is likely that analysis of early cases will raise themes and issues which require further exploration and cases will then be selected from the wider dataset to pursue such themes and issues.

Work package 3: Development of theory

Theory-building is essentially a process of thinking, and it is of course hard to set out in advance a response to the question "how will you think?". Our previous theoretical work has progressed using three key approaches: [a] working independently on an analysis and then coming together to discuss it; [b] long face to face discussions between the two of us; and [c] presenting our work to a critical audience. We plan to continue to combine these approaches.

Cases will be analysed in sub-samples of about five, paying close attention to the emerging theory. The protected time sought in this funded study will allow the necessary time for in-depth data analysis. Each case will be analysed separately by both researchers before meeting to discuss our respective interpretations. Discrepancies between the researchers will be treated as higher-order data – i.e. we will go on to analyse systematically why we have reached different interpretations of the case and consider how our conclusions about the case and the overall theoretical framework should be modified.

In addition to the formal steering group meetings, we will present our emerging findings, disagreements and concerns regularly to colleagues in academic meetings and invite constructive criticism. This will occur mostly by aligning with the regular seminar series in both sociology and medicine at our respective universities, but will also include organising special seminars and workshops as appropriate. We will seek steering committee advice on when such seminars may be needed and whom to invite.

Work package 4: Dissemination and application

This work is intended to have a strongly academic focus. It is predominantly an upstream, theory-building project which will impact on patient care mainly in an indirect way by informing future research calls. Hence, the balance of activity in the dissemination and application work package must be somewhat different from what might be expected in a study oriented exclusively to generating empirical findings. However, we do anticipate producing *some* empirical findings with immediate implications for practice and policy. With that orientation in mind:

- The empirical findings from the secondary data analysis will be published in a mainstream healthcare journal (e.g. BMJ), and also written up for a non-academic and non-medical audience (e.g. Health Service Journal) and for service users. The focus of these outputs

will be insights into the problem of 'resistance' to information and communication technologies and recommendations for addressing this challenge. It is highly unlikely that we will produce a 'quick fix' for the widespread resistance to big IT that is currently prevailing in the NHS, and one aspect of our dissemination strategy will be managing expectations about this. Our work will include end-of-project seminars and workshops.

(Note that we have a strong track record of delivering on both academic papers and publications for the 'jobbing clinician/manager' and a summary in lay language for service users. For example the SCRIE project was published as an accessible editorial in the Health Service Journal [37] as well as in the BMJ [5,7,8], and extensive work was done with the lay press (including tabloids and breakfast TV as well as broadsheet newspapers) to ensure that the findings were disseminated widely to the lay public.)

- The theoretical findings from this study raise very different dissemination issues. In general, neither front-line NHS staff nor the lay public are especially interested in academic theory, mainly because theory impacts on them indirectly. We certainly plan to publish theoretical papers in sociological journals which use the example of big IT in healthcare to illustrate more general themes in social theory. However, our main aim with the theoretical work is to make it accessible to healthcare researchers by publishing it in mainstream healthcare journals. We anticipate (though we do not consider it a foregone conclusion) that our theoretical findings will support a shift in the focus of research into the implementation and impact of big IT. If that turns out to be the case, we will direct our dissemination efforts at research sponsors such as NHS SDO and MRC.

Summary of intended outputs

This study will produce three main outputs:

1. Significant contribution to the theoretical understanding of 'resistance' to technology use by healthcare staff and patients, especially in the context of large-scale networked IT programmes.
2. Practical recommendations for policymakers, professional bodies, healthcare organisations and managers on how to avoid and/or manage 'resistance' of front-line staff to the introduction of new technologies – and also how to *learn* from resistance.
3. Recommendations for further research in the form of an outline for a future research call.

Ethics approval

All datasets already have ethics committee approval which will cover the analysis proposed in this bid. HERO project: Thames Valley Multi-centre Research Ethics Committee in January 2007 (06/MRE12/81 and subsequent amendments). SCRIE and HealthSpace projects: Thames Valley in January 2007 (06/MRE12/81 and subsequent amendments) and North West 8 in September 2009 (09/H1013/36 and subsequent amendments).

Justification of costs

For staff costs, we seek salary replacement for RS at 20% FTE and backfill for TG (one Clinical SL at 30% FTE) for 18 months. TG will spend 20% of her time on this project but replacing her teaching input will require 30% FTE of a more junior person. We also seek stationery, library and consumables (e.g. printer cartridges) costs (£1500), travel (50 trips London to Essex or Essex to London, 2nd class peak rate, £2000 – this includes steering group travel and subsistence), open-access publications (£1500) and attendance for the two investigators at the annual Academy of Management conference in north America (£2000).

Gantt chart

Task	Month									
	0	2	4	6	8	10	12	14	16	18
ADMINISTRATION										
Set up steering group										
Steering group meetings		x			x			x		
Organising dissemination events										
RESEARCH										
Clarification of brief/focus, selection of sample										
Development of preliminary analytic framework										
Refinement of analytic framework										
Summarising insights / incorporating peer review										
DISSEMINATION										
Draft dissemination strategy / clarification of audience										
Writing up										
Seminars/workshops										
Input to policymaking / design										

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