Why is it so hard to set up systems for sharing electronic health records? A framework for investigating complex sociotechnical change

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ABSTRACT: Governments and private companies around the world have spent millions of dollars attempting to establish electronic systems for sharing individual health records. Although technologically feasible, they have been very difficult to implement because of political, cultural and legal complexities. In this paper, we develop a theoretical framework for investigating attempts to build and implement electronic health record systems that draws on the work of practice theorist Laurent Thévenot and health policy analyst Jenny Lewis. We use data from a pilot study of two electronic health record projects to illustrate how the framework can be used to analyse complex sociotechnical innovations that span organisational and professional boundaries.

Keywords: Socio-technical change, Technological change, Theories of change, Change practice, Reshaping change, Implementing change

In July 2000, Australian Health Ministers received a 328-page report from one of their advisory bodies, the National Electronic Health Records Taskforce. It recommended ‘building a national health information network to support a system of electronic health records for those who want to share potentially vital information with their various health care providers’ (National Electronic Health Records Taskforce 2000: xiv). The report advised a ‘modest start’ and a ‘staged implementation’ spanning five years (xxxiii). The cost until 2010 was estimated to be $430 million (179). However, the Taskforce claimed that this would easily be recouped, as estimated savings – in fewer hospital stays, less duplication of tests and other efficiencies – would be about $1 billion per year (169).

The 2000 Taskforce report was the culmination of almost a decade of interest in using information and communication technology (ICT) to improve the quality and efficiency of health care. Since the early 1990s, hundreds of health ICT projects have been conducted around Australia (Boston Consulting Group 2004). Coordinating these regional efforts into a national system for storing and sharing individual electronic health records (EHR) has proved to be a formidable task which, to date, is yet to be accomplished. The national effort that followed the 2000 Taskforce report, called HealthConnect, disaggregated into a series of regional trials which, according to critics, were poorly managed and evaluated (Limprecht 2006; Productivity Commission 2005). HealthConnect has been disbanded and another body – the National E-Health Transition Authority (NEHTA) – is now in charge of establishing a national system for sharing EHR. It too, is encountering difficulties (Booz & Company 2008; Boston Consulting Group 2005; Dearne 2008).

The Australian health care system is fragmented and highly politicised. There are frequent battles over policies and resources, as competing groups argue over waste, inefficiencies and
distributions of responsibility (Lewis 2005). Although constant attempts are made to rationalise the system, elements of it frequently elude control, generating the familiar stream of ‘crises’ that appear in the news. Attempts to manage health care expose the limits of what Bruner (1986) calls the ‘logico-scientific’ mode of thinking. This mode assumes that order, efficiency and progress can be achieved by identifying, measuring and controlling decontextualised variables, such as key performance indicators. Health planning is assumed to be rational, with effects following causes in a linear and predictable fashion (Lewis 2005: 42-55). This type of thinking is evident in the official literature advocating a national EHR system. Putative generic ‘needs’ for EHR are presented, financial costs and benefits weighed, standards proposed, plans for education and implementation devised, and timelines constructed. It is clear by now, however, that plans and presentations of benefits are not enough to persuade health providers to change the well entrenched routines through which they habitually handle and exchange information. More nuanced approaches, that explore diverse interpretations, contradictions and unintended consequences are called for. As Tsoukas (2005: 4) observes, ‘complex social systems require complex forms of knowing; namely forms of understanding that are sensitive to context, time, change, events, beliefs and desires, power, feedback loops and circularity’.

In this paper, we present a conceptual framework for investigating attempts to implement EHR that takes complexity into account. We are in the early stages of a large research project in which we propose to compare different attempts to establish EHR systems in Australia and the UK. The ultimate aim is to understand the dynamics involved in complex sociotechnical innovations that cut across organisational and professional boundaries, and whose forms and implications challenge long-established assumptions and routines. EHR disrupt existing notions of patient privacy, ownership of information, medical practice and professional autonomy. To explore the dynamics of these systems, we need a conceptual framework that takes account of interactions among many diverse elements and phenomena, from the micro (doctors’ work habits and attitudes) through the meso (communications among health care providers) to the formal, structural and macro (software standards, privacy legislation, State and Federal health policy mechanisms and funding arrangements).

One way of making room for complexity, and avoiding the decontextualised abstractions and deterministic assumptions of logico-scientific thinking, is to focus on the situated practices through
which organisational actors struggle to bring about innovation (Gherardi 2006; Schatzki, Knorr-Cetina, and Savigny 2001). Many approaches come under the rubric of practice theory, but they all begin by focussing on what people in situations of interest actually do – their routines and modes of engaging with each other, and with concepts and objects in their environments. Practice perspectives have been applied to the analysis of sociotechnical and technological change (Peddle 2007; Schultze & Orlikowski 2004). However, as Thévenot (2001: 56) has argued, the generality and flexibility of ‘practice’ as a focus for theorists has its down side. A one-size-fits-all conception of practice is problematic because it ‘hinders the detailed clarification of differences between types of agency’ which, Thévenot argues ‘is important because these differences are a major feature of our contemporary societies’. The differences Thévenot identifies (discussed below) are useful for untangling the politics and practices involved in complex social situations, such as large scale attempts to reorganise systems for storing and exchanging health information. To underline their relevance, we have combined Thévenot’s forms of agency with a framework developed more specifically for the analysis of policy and politics in health care (Lewis 2005). The combined framework is depicted in Figure 1. We explain it below, and illustrate its usefulness with selected extracts from our analysis of two Australian EHR projects – a regional initiative titled GP Gateway and the national HealthConnect project mentioned above. We conclude with some observations and directions for further research.

A CONCEPTUAL FRAMEWORK FOR EXPLORING THE DEVELOPMENT AND IMPLEMENTATION OF ELECTRONIC HEALTH RECORD SYSTEMS

According to Thévenot, practice theory has been inhibited by a tendency to use a single notion of practice to account for ‘the most personal and intimate kind’ of agency well as ‘agency that is collective, public, or institutional’ (2001: 56). For him, the fact that different forms of agency co-exist and intertwine, and that people move continuously and unreflectively between them, are distinctive and interesting features of our complex society. Thevenot identifies three forms of agency, each enacted in a different ‘pragmatic regime’. Several criteria distinguish the regimes, including the normative ‘goods’ towards which agency is directed, and the type of information that is processed and produced. The first is a ‘regime of familiarity’ which is personal and idiosyncratic. This is where we locate individual interpretations, preferences and habits. The ‘good’ towards which these practices are
oriented is convenience. For example, medical practitioners develop their own ways of interacting with (or avoiding) ICT. Within constraints imposed by relevant legislation and codes\(^1\) doctors develop their own ways of creating and storing patient records. Thévenot describes the agency invoked here as that of ‘a personality attached to his or her entourage’ (67), the ‘entourage’ being an assembly of personal objects (office and desk arrangements for example) and associated habits.

The next regime, that of ‘regular planned action’, takes us out of the private and idiosyncratic into a zone of mutually comprehensible and (more or less) coordinated social interaction. Here ‘ordinary semantics and action’ (67) are oriented towards the accomplishment of local but collective goals – the management of an illness or a GP clinic, for example. The notions of ‘good’ against which actions are evaluated in this regime are shaped by culture. Successful practices are those that are deemed comprehensible, appropriate and worthwhile within the prevailing norms and conventions of the participating community. The agency invoked here is that of ‘the planner’.

Interwoven with these two regimes is a third, more macrosocial one, the ‘public regime of justification’. Agency in this regime is focussed on debating, establishing and legitimating the collective good in ways that transcend local peculiarities. This is where laws, regulations, codes of practice and polices are negotiated, formulated and enforced. The agency enacted here is that of ‘qualified’ persons – the consultants, committee members, professionals, experts and politicians who construct and legislate what is ‘rational’, ‘fair’, and ‘good’ for the relevant collective. Instead of being couched in ‘ordinary semantics and action’ (as in the regime of planned action), information in this regime is typically formalised, generic and/or codified, so that it can shape, constrain and legitimate actions and practices across time and space.

Logico-scientific modes of analysis and management are most compatible with the regime of public justification. The idiosyncratic and localised practices that characterise the other regimes tend to be ignored or treated as problems to be fixed. Much activity directed towards a national EHR system has been carried out in this public regime, with a series of taskforces and committees producing reports that outline generic and overarching plans and justifications. However, while these

\(^1\) e.g. the *NSW Medical Practice Regulation 2008*, Part 2 and the Royal Australian College of General Practice *Handbook for the Management of Health Information in Private Medical Practice*.\[^1\]
documents and plans are important, they only tell part of the story. The other regimes, which focus on habits, personal convenience and local cultures, need to be taken into account, as do particular features of the health policy and politics terrain.

The framework that Lewis (2005) uses to analyse health policy and politics in Australia provides a useful adjunct to Thévenot’s pragmatic regimes. For Lewis, the health arena is a complex system characterised by dynamic interactions among many diverse elements. Nevertheless, she identifies five ‘crucial areas of interest’ (15) that, like Thévenot’s regimes, are interrelated and span the spectrum of micro to macro-social/structural. These areas are: 1. institutions and health systems, 2. governance, 3. power and influence, 4. professions and 5. ideas. To emphasise the dynamic and circular nature of health politics and practice, we have placed the more formalised of these areas (institutions, health systems, governance and professions) in a table beside (but not necessarily corresponding to) Thévenot’s regimes and inserted arrows and a set of concepts that are useful for understanding the political processes through which health politics are enacted. As well as two of Lewis’s areas – ideas, and power and influence – we have included resources and boundary objects, as these also help facilitate change and innovation (Star & Griesemer 1989).

We follow Lewis (2005: 16, 94-111) in placing ideas at the centre of our framework, as these drive struggles to improve health care, and generate the debates that characterise health politics. Lewis’ focus on the centrality of ideas resonates sympathetically with Thévenot’s insistence that agency is oriented towards conceptions of the good. Lewis distinguishes between deep and surface level ideas (96-111). The former are entrenched assumptions, almost beyond question and usually not seriously debated. An example from the field of EHR would be the idea that ‘Doctors should have all of the information about all of their patients all of the time’ (George Halvorson, chairman and CEO of Kaiser Foundation Health Plan and Hospitals, quoted in Rauber 2008). Those who question or challenge deep ideas are often marginalised in policy debates. As Lewis (96) notes ‘deep structure ideation circumscribes the terms within which policy proposals are discussed, allocates influence, and shapes the success or failure of new policy proposals in a particular policy sector’. Surface level ideas are those concerned with policy options, such as different ways of managing patient consent, or different systems of medical nomenclature. Because ideas on their own don’t make things happen, we
also include power, influence, resources and boundary objects in a central set of concepts linked to process. Below we illustrate how the framework outlined in Figure 1 helps to conceptualise the processes through which various individuals and groups in Australia have attempted to develop and implement EHR, and how and why these attempts run into problems.

**SOURCES OF DATA AND METHOD**

The analysis is based mainly on documents, supplemented with interviews. To date, we have interviewed five people involved in the regional GP Gateway project. Attempts to set up EHR involve multiple actors, who attend meetings, write reports and newsletters, and conduct and publish evaluations. Much of the unfolding action can be traced through the many documents that participants and commentators produce (Latour 2005). Due to space constraints, we concentrate on selected aspects of two EHR projects. The first, GP Gateway, facilitated electronic exchange of patient information among hospitals and GPs in the Illawarra between 2000 and 2005. Information about this project is mainly derived from reports, supplemented with interviews with people involved. The second project is HealthConnect, an attempt to create a national system for electronically sharing individual health records that also spanned the years 2000 to 2005. For both projects, documents, events, ideas and actions have been chronologically organised and conceptualised according the scheme outlined in Figure 1. In many cases – for example, the identification of institutions, funds (resources), professions, and governance (privacy and consent issues) – categorisation is relatively straightforward. The allocation of data into Thévenot’s regimes requires some inference, however. We consider debates, processes and objects (reports, plans etc) that are designed to have macro effects on professional practices across states and the nation as a whole to be manifestations of agency in the regime of justification. References to situated work practices, such as the routines through which GPs carry out their daily tasks, are allocated to regimes of familiarity or regular planned action. In the accounts that follow, we focus on selected aspects of the framework depicted in figure 1, namely, interactions between activities in regimes of justification (the construction of policies, plans and programs) and the regimes of familiarity in which doctors work; the circulation (and stalling) of power, influence and resources; and subtle differences in the conceptualisations of EHR that fuel the action.
USING THE FRAMEWORK: SOME ILLUSTRATIONS

GP Gateway – A regional EHR initiative

The origins of GP Gateway can be traced to a national project that was not explicitly directed towards the use of ICT in health care, but towards the development of more ‘rational’ and cost-effective care for chronically ill patients. In 1995, the Commonwealth Department of Human Services and Health decided to fund a series of Coordinated Care trials (Silagy 2000). The Illawarra Area Health Service (IAHS), the Illawarra Division of General Practice (IDGP) and NSW Home Care prepared a joint submission for funding that was successful. Although the focus of the trials was not explicitly on ICT, the IDGP saw the fact that coordinated care would require effective inter-organisational communication as an opportunity for enhancing information systems in the local area. It made the provision of PCs and software for GPs and the development of a trial intranet conditions of its participation. The joint proposal was thus centred around the capabilities of ICT and included the idea that each patient in the trial would have an electronic medical record that could be updated by, and be accessible to, multiple health providers. Such a system was ambitious at the time and expensive. The trial manager obtained an additional $800,000 from NSW Health to supplement the $250,000 provided by the Commonwealth (Cromwell 2000).

The trial did not achieve all its aims (Cromwell 2000; Eagar 2000). However, it provided 98 GPs in the Illawarra with new computers, software, access to an intranet, training and IT support. This represented 46% of GPs in the region at that time (Illawarra Division of General Practice 2001: 1). Computer uptake by GPs in the region was therefore high, compared to others. The IDGP continued to pursue ICT projects, making use of Commonwealth money that was then available through a National Innovations Funding Pool administered by the Australian Divisions of General Practice. Again, these funds were not specifically allocated for ICT, but for ‘innovative projects which aim to improve general practice [and] aspects of primary care’ (innovations.adgp.com.au). The IDGP in partnership with the IAHS received two grants under this scheme. In the first (1999-2000), a software system called Docmail was developed to extract and send data about patients’ hospital admissions, diagnoses, transfers and discharges via email or fax to nominated GPs. The second project, which commenced in July 2000, was GP Gateway.
GP Gateway built on Docmail. The aim was to expand its capabilities so that a range of hospital based patient data and test results were electronically available to GPs. One of the first steps in the project was to assemble a working party of nine GPs who were interested in ICT and EHR. This group produced a wish list of information they would like to have access to, and helped design the web-based interface. They tested prototypes and provided feedback. Close personal connections and effective working relationships between key personnel at the IDGP and IAHS facilitated the liaison work necessary for system development. The system that was built during the 12 month funding period was constrained by the characteristics of the software systems then in use, and their capacity to interface with the central Patient Administration System, through which data were relayed to GPs. Nevertheless, by the time the project ended in August 2001, the system could deliver about 30% of the information the GPs initially desired, including microbiology, haematology, biochemistry, serology, radiology and nuclear medicine results, and information about surgical interventions.

The GP Gateway system remained operational for several years after it went live in May 2001, undergoing modifications and additions as the local health information systems evolved. Its construction and continued operation depended on good relationships between the IDGP and the IAHS. However, around 2005 the situation changed. As part of a restructure of NSW Health, the IAHS was merged with the South East Sydney Area Health Service. Without consultation or explanation, the information link between Illawarra hospitals and GPs was disconnected.

There are many details of GP Gateway, such as those pertaining to patient consent and the accurate identification of patients and GPs, that have not been included in this short description. However, the account illustrates how the project was facilitated and realised by skilful cycling around the components depicted in figure 1. The local GP group took advantage of health reform measures at a national level (the Coordinated Care trials) to equip its members with the latest ICT. Power was exercised as the IDGP made the computerisation of its members and the provision of an intranet conditions of its participation in the Illawarra trial. Through training in email and IT support, the Coordinated Care trial began reshaping the regimes of familiarity and regular planned action in which GPs carried out their daily work. This set the stage for Docmail and GP Gateway. The tangible human and technological elements of the project – the hospital data systems, software developers, patients
and GPs – were all close and hand and ready to engage, or be engaged, in regular planned action. The GP working party met five times in 12 months of the project, which helped produce a system that was (within technical constraints) convenient and usable in their regimes of familiarity. Although the boundary objects that facilitate electronic exchange of patient data – the software systems, consent mechanisms and dialup connections – were relatively undeveloped at the time, GP Gateway was able to transmit health records electronically and was one of the first systems of its type in Australia. As long as relationships between institutions and professional groups remained cooperative, and resources were available, the system continued to evolve. The cycle was broken when one of the institutions – the area health service – changed. In a formidable act of power – which project participants labelled ‘odious’ and ‘heartbreaking’ – the electronic link between hospitals and GPs was severed.

**HealthConnect – a national EHR initiative**

Like GP Gateway, HealthConnect spanned many issues, such as consent, user identification and interoperability. To enhance comparability with our account of the regional initiative, we will focus on similar aspects of the framework, namely relationships between the institutions that formulate policy and control resources on a macro scale, and the conditions under which GPs conduct their daily work. In the regional case, the latter were privileged, as resources and relationships were harnessed in the construction of a system designed to suit GPs’ information needs and desires. In HealthConnect, the focus was quite different.

Health Ministers and ICT companies, rather than clinicians, took the lead in early attempts to establish a national EHR system in Australia (Clarke 1992; Davies 1996). Some medical groups initially opposed the idea (Davies 1996), but as interest in using ICT in health care increased, doctors sought to expand their influence over policy. In 1997, the General Practice Computing Group (GPCP) was established to represent GPs’ interests in the health ICT arena, and to provide a forum and support for doctors interested in information technology (www.gpcg.org).

On the national stage of public justification, there are few opportunities for the type of informal negotiations and tinkering that are possible when regional groups work together to build ICT. When interorganisational negotiations do occur, it is often through more formal means, such as calls for submissions and hearings. By following the trail of documents produced by EHR policymakers
and stakeholders, we can trace the efforts of medical practitioners to have their working conditions taken into account, and the intermittent attention paid to them by policymakers on the national level. A few examples follow.

In March 2000, in the lead up to the July report that set the stage for HealthConnect, the National Electronic Health Records Taskforce released a 26 page *Issues Paper* and invited comment. It is important to note that the system proposed by the Taskforce – the idea of an EHR that drove the action - was somewhat different to that pursued in GP Gateway. The latter was designed to facilitate flows of information to GPs about patients of theirs in hospital. Continuity of care provided a context and relevance for the information. The EHR proposed for HealthConnect was more ambitious and less directly connected to on-going patterns of GP work. Its definition of an EHR (National Electronic Health Records Taskforce 2000: xvi) was:

> An electronic longitudinal collection of personal health information, usually based on the individual, entered or accepted by health care providers, which can be distributed over a number of sites or aggregated at a particular source. The information is organised primarily to support continuing, efficient and quality health care. The record is under the control of the consumer and is stored and transmitted securely.

To assemble such a record, GPs and other health care providers would need to enter data, regardless of its immediate relevance to any particular problem. The compilation of a longitudinal record, in itself, was supposed to provide the purpose and motivation for data entry.

In the wake of *Issues Paper*, hearings were held and 94 written submissions were received. One of ‘key issues’ identified in the feedback was the observation that ‘the work involved will be enormous’ (National Electronic Health Records Taskforce 2000: 111). The GPCG argued that ‘Cost savings that are identified may not accrue directly to those burdened with the cost of implementing new systems’ (Quinlan 2000: 3), and GPs would need incentives, education and training to participate. The Taskforce took some notice of these concerns. The so-called ‘building blocks’ that underpinned its policies were changed. Those listed in the *Issues Paper* were all concerned with technical components such as data protection and authentication. The July report contained a new building block: ‘encouraging uptake and use of information technology’ (148-150). In identifying this block, the Taskforce acknowledged the pragmatic regimes in which people use (or avoid) ICT in their daily work. However, as the project unfolded, this acknowledgement was not fully developed.
HealthConnect developed a two-pronged approach to the development of EHR. In the first, trial projects were set up in Hobart and the Northern Territory. At the same time, policymakers worked on business architectures and implementation plans for the national system. In 2003 a series of interim reports was published (http://www.health.gov.au/internet/hconnect/publishing.nsf/Content/reports). A summary of findings from the trials (Department of Health and Ageing 2003a: 81-2) took note of doctors’ working conditions:

*For HealthConnect to be taken up more widely, the system must operate in the normal process of care with minimal impact on the three-way relationship between clinician, consumer and computer. The process of using HealthConnect must at least save the clinician time, and preferably money, for its use to be sustained.* …

Despite this, people working on the more generic, codified aspects of the system were again losing sight of regimes of familiarity. For example, the 2003 interim report on the building blocks (Department of Health and Ageing 2003b) was almost exclusively devoted to technical issues. ‘Change management’ (rather than ‘encouraging uptake and use of IT’) was listed as a building block on the first page of the report, but was not mentioned again.

In November 2004, the third iteration of the HealthConnect Business Architecture was published, and responses invited (Department of Health and Ageing 2004). The 185-page document described the components that would comprise the EHR system, and the processes through which it would be created and maintained. Consumers would register and record their preferences. Health providers would create and check ‘initial health profiles’, and supply and check ‘event summaries’ for each episode of care. Despite the preparatory rounds of consultation, responses to the Architecture were not favourable. The GPCG estimated that participation in HealthConnect would add an extra 90 minutes of work to the average GP’s day (General Practice Computing Group 2005). The Consumers Health Forum also raised concerns (Consumers' Health Forum 2005). Despite the trials and the extensive work done in the regime of justification, HealthConnect policymakers had not managed to cycle smoothly around the elements depicted in our research framework. Others, including Health Minister Tony Abbott and the Productivity Commission, joined the GPCG and CHF in criticising HealthConnect (Bajkowski 2005; Productivity Commission 2005). In 2005, the National E-Health Transition Authority took over the responsibility for developing a national EHR system.
CONCLUSIONS

There are many reasons for the demise of HealthConnect, and the difficulties of establishing regional and national systems for sharing electronic health data should not be underestimated. Our purpose in this paper has been to present a conceptual framework for making sense of the complex non-linear processes and diverse elements through which individuals and organisations attempt to develop and implement EHR, and to explore how and why they sometimes succeed, but often run into obstacles.

In GP Gateway, interested actors were able to exercise power and influence, making use of national policies to channel resources into the regimes of familiarity and regular planned action in which medical practitioners, administrative and IT staff work. Geographical proximity, interpersonal trust and the presence of tangible databases (as boundary objects) to work with facilitated the process. The system was not sustainable, however, as a change in the health system broke the cycle.

In HealthConnect, the action was initiated in the regime of justification, on a macrosocial scale, by actors who were somewhat distant from the regimes of familiarity in which medical practitioners work. Policymakers and system designers invited feedback from these regimes, and doctors expressed concerns over the system’s costs in extra workload in relation to its benefits. These concerns were not really addressed, at least to the satisfaction of the peak GP group in the EHR arena, the GPCG. Instead, HealthConnect policymakers translated them into issues of ‘user encouragement’ and ‘change management’, which were only intermittently acknowledged. Attempts by medical practitioners to exert influence upwards into the regime of justification were thus unsuccessful. However, HealthConnect could not work without the support of the GPs, and the initiative stalled. In this case, it was not a change in the health system that broke the cycle, but an inability to move and negotiate productively around the macro and micro levels of Figure 1.

There are several promising directions for future research. One is to focus on how the push for EHR is changing the nature of medical records, from private aide-memoire to documents that are supposed to be comprehensible to a range of stakeholders, including patients. The capacity of EHR to retain meanings across regimes and social worlds is yet to be tested. We propose to study how different conceptualisations of EHR and motivations influence how and why the records are created, shared and used (if they are), how they are interpreted and how they influence medical practice.
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**Figure 1: Framework for investigating attempts to develop and implement shared electronic health record systems**

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<th>Pragmatic regimes</th>
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Adapted from Thevenot (2001) and Lewis (2005)