# Sociotechnical Changing in Healthcare

Dimitra PETRAKAKI[1], Tony CORNFORD and Ela KLECUN
*Information Systems and Innovation Group*
*Department of Management*
*London School of Economics and Political Science*

**Abstract.** This paper discusses a conceptual approach to the study of the implementation of ICTs in healthcare organizations. The paper uses some fundamental concepts from sociotechnical studies to address the complex process of change – the changing – that accompanies ICT innovations. The paper argues for the importance of the perspective of changing as a way to account for the dynamics as technology and people, organizations and institutions co-constitutively work-out their future together.

**Keywords.** healthcare, changing, sociotechnical, information systems

## 1. Introduction

Information and Communication Technologies (ICTs) are increasingly important for all types of healthcare organization with the adoption of ICTs almost always expressed through a vision for positive change and specific outcomes, and presented as a means to address identified deficiencies or problems [1- 4]. Policy makers, clinicians, managers and researchers all argue that ICTs can (or even will) lead to achievement of a mix of goals relating to efficiency, cost-effectiveness, better clinical decision making, improved data privacy, team working, speed of delivery or improved quality of healthcare [5-9]. We know that such ambitions are not always directly met. But we also know that ICTs nonetheless almost always condition changes (expected and unexpected) in the context where they are deployed; changes in work practices, professional roles, knowledge and skills deployed, and modes of collaboration [10, 11]. Thus, while ICTs and the visions they embody may not determine outcomes, they do condition complex processes of change, what we identify as the phenomenon of *changing*.

Changing around ICTs innovations is usually complex and on-going but to study it is fundamental to understand what happens when people, organizations, institutions and technology come together. Changing should be a primary interest to those who study health information systems but it cannot be approached in terms of visions linked to technical means and with concern only for defined outcomes. Nor can we rely on ideals of wise (even socio-technical) design and good project management to demystify and guide changing. Similarly changing cannot be understood through simple proxy measures of success or failure [12]. In brief, claims of technological causality are

[1] Dimitra Petrakaki, Information Systems & Innovation Group, Department of Management, London School of Economics & Political Science, Houghton street, London, WC2A 2AE; E-mail: d.petrakaki@lse.ac.uk

seldom credible, (sociotechnical) design is an inexact science, and measures of success or failure are at their core subjective and political abstractions.

Therefore we argue for something different. For studying ICT adoption as inevitably and eternally a process or performance, suspended between what was and what might one day be. Technology, the practice of medicine, the giving of care, the structure of the organizations and the carriers of institutional and professional norms are all in movement, passing from somewhere now lost in the past to somewhere in the uncertain future – an idea expressed by Clegg et al. in the concept of 'becoming'[13]. The healthcare information systems we study are constituted in this dynamic, and the dynamic is what we should study. This is not, as often proposed in a lazy rhetorically kind of way, a question of technology and 'organizational change', but of multiple intricately woven moments of *changing* including *inter alia* combinations of the organizational, technical, social, professional, and therapeutic. In questioning the idea of organisational change, and by analogy also 'organizational changing' we question any priority given to this one dimension (organization). Rather we adopt the phrase '*sociotechnical changing*' to express a focus for studies, and explore below how sociotechnical traditions address changing [14].

The aim of this paper is then to explore a conceptual approach to sociotechnical changing. Section 2 borrows some relevant fundamental concepts of sociotechnical studies. Section 3 investigates how a sociotechnical lens might capture changing. The paper ends with a discussion about the implications of 'sociotechnical changing' for future research in healthcare organisations.

## 2. Refocusing the Sociotechnical Perspective

In a recent paper, Pope and May [15] critically reflect on the 'quality' of qualitative research in healthcare and argue that it has got 'out of hand' due to a lack of depth or sophistication in analysis and insufficient synthesis. They also question the ability of the theoretical frameworks in common use to assist in inductive analysis and theory building. One way to respond is through a restatement of the sociotechnical perspective [1, 2, 16-18], but we go further and suggest more specifically its use as a means to account for *changing*. To this end we unpack and borrow some of the relevant concepts of sociotechnical approaches, in particular Actor Network Theory (ANT) [14, 19] and Social Construction of Technology (SCOT) [20].

Implementation or adoption of technology into healthcare settings, understood as incorporating material artifacts, ways of working and thinking, models, tools, machines, papers and files, cannot be studied separately from the context and the ongoing production of everyday practices. Technology should not be reduced to delivery, implementation and immediate use [21], but understood as both cause and consequence of longer-term processes of change. To understand the changing that technology is a part of, and which it may in part shape, research must shed light on how people and technology come together to perform actions and tasks [19]. For example, a cardiologist's diagnosis is in part an outcome of her deployment of professional knowledge, but this is conditioned by interplay with other healthcare professionals, GPs, nurses, radiologists, and with technologies such as files, computer screens and electrocardiographs. People and technology are co-constitutive [1, 22] - their ability to perform actions (in this case a consultation) and to produce effects (a diagnosis) - their

collective agency - is distributed between the various parts and performed each time things happen [19]. Technological artefacts are of course designed for particular purposes (e.g. to reduce prescribing errors), but also embody certain interests (e.g. of doctors, of technologists, of managers, of patients). They are thus linked to systems of politics and power relations [22] and serve to shape perceptions and actions.

Technology is not a discrete and a-contextual resource deployed in planned processes of change [11, 23]. But nor can it be understood wholly as a local construction where we make of it what we want. Contexts provide multiple possibilities but also constraints for action (e.g. through resources, meanings, rules, norms, cultures, history etc.) and are continuously shaped and reshaped through them [11]. In a health care setting a norm such as an established work practice (e.g. doing three blood tests for all admissions) or an explicit care pathway (e.g. for acute stroke admissions) provides one possible (often normative and prescriptive) way of acting, but does not define practices.

Similarly, configuration of a hospital wide Electronic Patient Record (EPR) software 'translates' the language, practices and purposes embedded in the software so as to be in agreement with existing or future practices of the hospital and the main interests of its 'key' users [24]. This may include adding interface screens to instantiate clinical pathways or informational reminders to assist clinical decision making [4]. But still, individual users and small work groups, in their own changing, will appropriate some of these features and reject or ignore others. Thus practices where technology finds relevance are rendered meaningful in part because they are conditioned by and reflect the context from which they originate (e.g. in design, concepts of best practice, evidence based working, implementation team), and in part from the context of their use (convenience, local needs, patient preferences) [25].

Studying changing (e.g. changing practices) simultaneously implies studying changing contexts. The dynamic nature of contexts and the centrality of what happens there need a special language. Our approach is through the use of verbs rather than nouns [19]; for instance 'ordering' rather than 'order' (so CPOE might become a study of 'Computerising Prescriber Ordering and Entering' – an active ongoing account). Similarly we use 'organising' rather than 'organisation' (ontologically an organization is nothing more than a bundle of related acts of organizing), and in this paper, 'changing' rather than 'change' [13]. Changing and other verb-like accounts offers an analytical lens to help reveal a static situation as a dynamic one. If nouns indicate stability and discrete change, then verbs (present participle) can indicate phenomena that are always held 'in the making' [14]. An understanding of change (as a noun) invites us to make comparisons between 'past and present' or 'before and after' - assuming that change is measured by the difference of a shift from one situation to another. What this cannot do is reveal the actual process of changing (the internal and ongoing 'how') or the complex drivers of changing or not changing (the 'why'). Furthermore, change is seldom a rapid or direct movement from 'the old' to 'the new', rather the new is born within the old and co-exists with it, and the old and the older still remain sedimented within the most new [14]. Changing is then a process surrounded by continuities and discontinuities of ways of acting and thinking demanding a study that requires crossing of temporal boundaries.

## 3. Changing through a Sociotechnical Lens

So how might we orient ourselves to study changing rather than change?

First and foremost we need to engage the actors who are experiencing changing – and who are being changed. Technology is present not as an artefact that can expect to achieve its own ends by acting directly upon these people - technological determinism [20] - but is *enacted* as people try to make sense of new circumstances and use (or not use) technologies [22, 23, 25]. Drawing on ANT's ideas of symmetry we can also see a parallel position – people do not dominate technology – and technology's perceptions, hopes and fears might equally be of interest (or the hopes and fears it carries if that is a touch too anthropomorphic). Thus we need to investigate *what people understand about technology* (perceptions, hopes, fears) and what they do in their daily practices with technology (uses and practice). In doing so, we understand adoption but also rejection, 'non use', 'misuse' and resistance of technology, not as failure or negative consequence but as alternative enactments upon technology [23]. For example, Chiasson and Davidson show how different perceptions of an EPR technology obstructed its implementation [4]. Physicians expected safer storage of data and better access to and presentation of information, but also some disturbance of their interactions with patients. Dieticians expected technology to assist them in calculating patients' diet intake and in creating reports. Administrators were keen to use a system that would look similar to the one that they were using. These perceptions conditioned conflicts of interests and resistance to the new technology and obstructed initial implementation.

Second, we need to capture not only what people say they do versus what they are doing but to reconcile states of being (being a doctor, being a computer, being a patient) and practices of doing (making a diagnosis). This implies understanding how people interact continuously with technologies at hand, shape and are shaped by them infinitely and recursively. Such a concept of enactment is seen in studies that report unpredictable or novel uses of technology, for example different treatment from that specified in a clinical pathway, pathways modified to suit patients' needs, or doctors avoiding standard questions that may cause anxiety to a patient [1, 2, 4].

Third, we need to manifest changing as a process that crosses temporalities by capturing people's perceptions of technology [23] as instances of both *projection* (what is new and becomes possible) and *remembrance* (what is old and hard to forget). Cho et al. [17] explain how the adoption of a health information system in a hospital conditioned redistribution of professional responsibility and (re-)division of labour as people attempted to inscribe their interests into the technology. The adoption of a radiology system meant different things and conditioned different consequences for different people. Physicians were reluctant to commit to the system because they projected extra administrative and computer work which they had previously informally displaced to nurses. Physicians displayed their reluctance by failing to participate in meetings and requesting printed images. Physicians thus were resistant to the changing technology brought continuing to enact their paper-dependent practices. Nurses, in contrast, projected an opportunity for gaining responsibilities for healthcare rather than administrative-related tasks, while technology-enabled electronic monitoring of patients provided to them more control over their work. More subtly, the system made nurses responsible for reminding physicians of their tasks, reproducing responsibilities that were never formally in their remit (manifestation of remembrance).

What we see is complex changing with both reproduction of practices (albeit in different form) and changes in work roles and responsibilities through instances of projection.

## 4. Conclusions and Implications for Research

This paper makes a familiar argument but with a twist; we should study the processes of 'sociotechnical changing' and move away from static pre and post implementation 'impacts' or notions of discrete change that dominate studies in healthcare [26, 27]. In this processes, organisational, technical, social, professional and therapeutic aspects and their relationships need to be sought out and revealed. We propose an approach to *changing* drawing on sociotechnical themes that advocates nominalism (rather than essentialism), crossing of temporalities (rather than before-after dualisms) and practice (rather than strategic or functional) orientation.

Research on ICTs adoption in health might with advantage place emphasis on the above three methodological processes for capturing changing. This implies we need to delve into micro levels, on hospital wards and departments, in patient waiting rooms and doctors' clinics as well as software strategy meetings and ministerial offices. Changing takes us across professional boundaries of IT/Project managers, healthcare professionals, administrators, service providers, and not least to patients. Research has to consider not only what people say they do but also what they are doing, how they translate their beliefs into actions, how they consider their options and how they make use of their powers. The agenda draws on questions of how healthcare technologies and their accompanying policies are enacted 'on the ground', how different professionals and patients engage with technology, make it work for them (or not) and what it asks them to 'do different'. This moves us away from the assumption that (implicitly or explicitly) underpins so many studies; 'the technology' is out there, ready to be adopted, configured, implemented, and evaluated. The vision we live with presents a messier view of the socio-technical confections that try to find a place in healthcare. But these visions can become realised as individuals make sense, project and recall, and thereby make something that works.

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