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## Implementing an HIS project: everyday features and practicalities of NHS project work

*Dave Martin, John Mariani and Mark Rouncefield*

**This article considers some of the everyday practicalities of delivering an electronic health record project within an NHS hospital trust. Using ethnographic, observational data we document how and in what ways the orderly character of project work is achieved against a background of battles and negotiations to deliver the project within and despite various organizational contingencies and constraints.**

### Keywords

ethnography, hospital information system (HIS), project work

### Introduction: delivering information integration

Satisfying the growing demand for improved coordination and cooperation between healthcare providers presents a major challenge for healthcare planners. The NHS programme Information for Health attempts to meet this challenge through the adoption of a comprehensive strategy for healthcare information integration. The patchy success record of past information integration projects makes it clear that the problems of realizing information integration are numerous and often complex. Progress has fallen short of expectations, and studies cast doubt on whether information integration can actually deliver the anticipated improvement in information collation, distribution and use, and promote service integration [1, 2].

This article presents some findings from an observational research project that has been investigating some of the everyday practicalities of delivering a hospital information system (HIS) project within a hospital trust. The emphasis is on the HIS as a project that needs to be managed in order to be successful. It recognizes that many healthcare IT

projects like the HIS are carried out within an organizational and political environment that threatens to overwhelm the project. Our focus is on the everyday work of the project, on the mundane and routine concern with addressing organizational contingencies and constraints. Using ethnographic, observational techniques we document how and in what ways the orderly character of such project work is achieved and delivered. Of interest are the ways in which HIS design is related to ongoing health service workflow management and re-engineering and how stakeholder participation and socio-technical design are scoped and managed.

The setting for this research is an NHS hospital trust that is currently in phase 1 of a three-phase comprehensive £8 million HIS project, delivered as a public/private partnership (PPP). The HIS system was procured from a US supplier. Phase 1 was due to 'go live' in February 2004 and involves the core administrative system and connected reporting system, A&E, theatres, order communications, and pathology systems. The core administrative/reporting system incorporates various clinical applications and is designed to be integrated with existing legacy systems, most notably a series of pathology applications. Phase 2 involves the EPR and GP access, and phase 3 is concerned with clinical pathways and electronic drug prescription.

Our research uses ethnographic methods, with their emphasis on workplace studies and the 'real-world, real-time' everyday character of work. The central characteristic of enquiry is the researcher's detailed observation of how the work – in this case the project work associated with designing and implementing an HIS system – actually 'gets done'. Its focus is upon the circumstances, practices and activities that constitute the real-world, situated character of work. The defining feature of this kind of study is the immersion of the researcher in the work environment where a non-presumptive record is made of all aspects of the day-to-day work over an extended period. This involved 'shadowing' the internal project team leader as they went about their everyday work as well as observing internal implementation analyst meetings, joint US/UK analyst meetings, project leader meetings, IT communications strategy meetings, and meetings with medical staff in their departments. In this way, a 'thick description' [3] is built up of the situated working practices associated with the HIS project. The project manager has responsibility for information provision and distribution, and for coordinating activities amongst internal teams and with the system provider. Implementation team meetings are the arena in which practical project activities are reported, discussed, negotiated and planned, and decisions are made. They are attended by the project manager, analysts from all implementation teams, programme support representatives, trainers and US analysts via a teleconferencing system. These meetings tend to be fairly technical in nature and involve reporting on progress, issues and concerns. These team meetings provide an opportunity for people to orient to the project as a totality and provide some correspondence between what project members should be, and are doing. At the same time the project manager uses team meetings to keep people informed, thereby keeping any progress or problems visible. This is evident in discussions about 'roll-out' time:

News has come from X Co that the dates they've given us for rolling out the . . . database and the interface are months behind . . . it doesn't look like they can give us lot the interface when we need it . . . there's no guarantee that we're going to have a microbiology interface up and running for the beginning of phase 1.

## The 'contract'

Central to these meetings, and much of the work surrounding the development and implementation of the HIS, is the 'contract'. The 'contract' – the formal, legal stipulation of work and responsibilities – gets dragged into everyday work and used in a number of ways. For example, the contract is referred to in everyday talk because of its importance in specifying responsibility – who is formally responsible for what – as illustrated in the following exchanges:

You can bet that he went back and checked on the contract right away and he was the one who actually pointed out to me that it was in the contract so . . . he was going to speed this through.

Why are they talking to us about cost? . . . contractually its on [X Co's] head.

Attention to the detail of the contract ensures that the organization, through the project team, effectively 'covers its bases' – or fulfils its obligations – ensuring that any (inevitably costly) breakdowns cannot be attributed to the project team or the organization it represents:

We have to be very proactive and keep emailing your analyst and say what do you want me to work on? What d'you want me to do? . . . I'm getting nervous for a variety of reasons . . . I'm just not sure what they're going to throw back at me . . . just want to make sure we're . . . covering our bases as well.

Of course the contract, like any plan, does not, cannot, lay out in endless detail exactly what it takes to fulfil the contract. Contractual ambiguities arise over the definition of actions:

This goes back to the issue of . . . whose responsibility is it to do certain things with setting up and configuration . . . the expectation has always been that, well, we would participate in configuration . . . it was on the understanding that they would be directing that configuration.

The contract therefore offers the project leader and project team possibilities for finding flexibility within contractual limits (what Bittner [4] might term 'organizational acumen') – for finding within the formal contract the means to ensure they get what they want:

It's important that we are getting the things that we require within the contractual limitations and y'know I understand that we have to work within that but if also within that we need to make sure we are getting what we require.

## Getting a project to work

Our observations of the implementation of an HIS project indicate a number of ways by which the contingencies and uncertainties of organizational and project life can be handled. Most obviously, planning is a way of managing contingency – but, of course, plans do not implement themselves but have to be made to work in 'real world, real time'. As Button and Sharrock [5] note, organizing a project into 'phases', for example, is intended to ensure that tasks are worked on until complete, to achieve for the work

a paced sequential progression and provide for the recognition of incomplete steps. All phases are planned in advance in terms of what they consist of and when they will take place. Identifiable major phases in this project include: procurement, award and signing of contract, 'data collection', 'database build and configuration', 'application testing', 'integration testing', and finally 'go-live and transition management'. Phasing exhibits some sensitivity to timelines of practical decision making – by specifying considerations relevant to a decision prior to any deliberation on that decision. Phases may be (almost certainly will be) delayed, tasks reallocated, items of the contract and hence the phasing renegotiated and redefined. Nevertheless, phasing remains a key resource for the ongoing practical management of the project – enabling the distribution and coordination of work, allocating responsibilities, keeping track of activities, measuring work progress.

Phasing also relates to another aspect of practical project management, the methodic handling of tasks (or at least maintaining the semblance of method) and some way of measuring progression – how they are doing, how much has been done, where they are, what remains to be done. This involves maintaining the agenda of tasks, ordering, sequencing, allocating, managing and keeping track of progress and problems. In this fashion the project manager can determine where they are relative to the project schedule, and whether the work, going at the present pace, will be done by the scheduled date. The following field note from a project meeting, part of which we have already seen, illustrates just such an attempt to keep a project 'up to speed':

And if I can just ask everyone to keep doing that. I think we have to be very proactive and keep emailing your analyst and say what do you want me to work on? What d'you want me to do?

Of course, 'slippage' from the plan is a 'normal, natural trouble' and its importance or magnitude is measured against the schedule:

There were 53 days where we were looking at database configuration and I've said that now there's, not to scare anyone, 28 days left . . . 28 business days left before . . . it's in the plan, it's identified that we're going to start testing, we've not done any configuration.

Where 'slippage' does occur, contingency plans are made by reference to possible implications:

It may be that we'll have to go with the idea that they don't interface in phase 1 . . . but we'll carry on in discussing it, um, further just to sort of look at all of the implications around it and I'm hoping that it's not as . . . It's more annoying than anything right now if the truth be told, but in terms of the scope of the overall project I think there's ways we can get around it without making it, um, too specific, too much of an impact on the end user.

Such solutions often involve considering various workarounds:

We need to start thinking about . . . how we would deal with that if we can't get [system] linked, we just need to start thinking what are our options whether people continue ordering micro on . . . paper or whether we have . . . ordering . . . I think we just have to look at all the different options . . . of how to deal with it without, sort

of, causing sort of too much, damage, to the microbiology staff but also without too much impact on the end user.

## Keeping track of issues

Getting a project to work requires that the project leader keeps track of issues and problems as they arise and ensures they are prioritized and dealt with. Issues are conventionally managed through formal and informal conversations allied with the use of various forms of documentation (schedules, logs, and meeting minutes):

I think we just raise it so that it's minuted that we've raised it . . . see what their response is.

Nevertheless items can fall off the agenda, causing problems: 'I'm worried that this one has fallen through the cracks.' Sometimes 'others' – usually the suppliers – have let the project down in some sense by not conforming to agreed deadlines:

A: It was identified that this should be in place by June so we thought we were merrily, things were progressing the way they should but now the last information that we received, contradicted that so . . . so I'm going to start, ah, doing some phoning today . . . and see what we can do . . .

A: I went back to the minutes from the initial Z Co meetings, and P had said very clearly . . .

B: Yeah he was quite confident it would be ready by June.

A: And we would be the first ones installed and so from the initial reports that's why I've never got too concerned and again that was a . . .

C: mmm . . .

A: fatal mistake.

As the above extract shows, deadlines are no guarantee that work will be done. As the following shows, problems may also return:

No I think that's a real concern and as I've said I have raised it earlier and have actually added it to the issues log earlier and we have got some movement then but we're still, we're, we had some creep back.

## Escalating problems

Orienting to the project as a totality also includes an attention to escalating things in the correct fashion, with sensitivity to the correct routes by which this should be accomplished. How can a problem be raised as an issue in such a way as to ensure that it is addressed whilst maintaining otherwise cordial professional relationships? Within the HIS project there is a managed, ordered process for escalating problems:

In some of the escalation process stuff . . . I try and do everything as a staged process . . . and I do try and keep things away as much as possible so that you're not having to get involved in the, in the fight part so to speak.

There are ordered 'issues' and 'risks' logs. Issues become risks when they are deemed to be a threat to the planned delivery of the system:

It's already on the risk log we, um, probably up the risk number at this stage cos it's obviously increased in possibility or likelihood.

When problems cannot be readily solved between analysts they are removed from the discussions:

I'm trying to as much as possible keep the grappling over this with X Co at the level of me because I don't want to impair your working relationships with your analysts.

The logs (particularly the risk log) are used as a means of escalating the problem to be dealt with at a higher organizational level – in this fashion attempting to ensure that harmonious working relationships can be maintained at a lower level:

Just to reassure you, tomorrow's IM&T steering group, you can bet that this issue is going to come up at that because I already know and Y knows the issues around the code of connections . . . once I've got the IM&T steering group fully aware of all of these issues . . . they'll take a stand, in a sense an official stand from the hospital perspective, which will make it a little easier for me to put more pressure on X Co but I do want to keep you aware of sort of how things are going, and again I do try and . . . keep . . . that argument side of it away from this group.

## **Keeping users in mind**

Throughout the project there is a need (and desire) for 'user' involvement – though this may be submerged in the myriad demands of keeping a project on track. In these circumstances a focus on practice as well as process (a socio-technical perspective) and an understanding that a 'domestication' process [6] that fully involves the various stakeholders is required. Of course, 'users' come in various forms, and on occasion it may be that the interests (requirements or convenience) of one set of users, say administrative staff, may clash with those of another, say clinical staff or patients. Tensions (professional and design related) exist between different user groups. Even within the clinical user group there are many different subgroups: consultants, doctors, nurses, physiotherapists, occupational therapists, radiologists, lab staff, etc. Each has different work oriented perspectives on the same patient and this can have implications for the design of the HIS. Nevertheless the HIS, as an infrastructural backbone to the organization, requires a close match with organizational structure, process and practice. The system is inextricably linked to all work activities, so it is of crucial importance to understand and take users' everyday activities into account. One problem that arises therefore is in considering the relationship of the HIS to other organizational changes, where there may be a lack of understanding of just what the implications of the HIS are on everyday organizational workings. In these circumstances the problem emerges of human factors effectively being downgraded, being dumped (perhaps by necessity in this type of project) down the schedule, or treated as 'other' types of problem and perhaps not adequately addressed.

In this project there is a desire to gain an understanding of current procedures – as

part of an attempt, in some cases, to transform them. In this case, user involvement comes in the form of 'expert' or 'super-users' who are involved in specifying current configuration and procedure. The main involvement of these super-users comes during testing which, it is envisaged, will highlight various human factors problems. However, identifying what the problem is and how to solve it can be difficult with piecemeal documentation of current practice. The influence of these super-users is variable and partially reliant on their relationship with their UK analyst and their experiences of the healthcare system. So, for example, the pathology analyst has worked to develop systems with users over a long period and is good at championing their cause:

If there's no way to get the information from the microbiology system into [system] then people will still have to go to multiple places to get the information they want and that defeats the object [of the project].

If we have a single sign-on procedure, to get both onto the network and onto [system], we may run into problems in the laboratory with our connections to all our other analysers.

One example of the way in which human factors enter into the project and are given serious discussion came with a debate concerning 'logging-on' procedures – taking in issues of security that particularly arise in the chaotic work environment of A&E:

A: Because if they've got to log out people will not log out of it, they don't now.

B: But maybe they won't have a chance because the log-in time out will . . .

A: Well I understand that . . . but if it doesn't time out before someone gets their hands on the keyboard . . . hh that next action is taking place under someone else's signature.

B: Mm hm.

A: And that's a problem.

C: Mm hm it is a problem.

A: And in A&E, in that chaotic, you know, environment, they will not log out.

C: Well and again that is something I mean, again this is one of the reasons why we've asked for the IT trainers here as well so that this is . . . yesterday I met with the IT trainers and we started talking about some of the issues that we need to make sure that everyone is aware of . . . this is one of the key ones, making sure that people log out and understanding the implications because in a fact it's an electronic signature, and that's going to give a print of where you've been on the system, and if you don't log out you're allowing someone else to use that signature.

A: But it's not a training issue.

C: Mm.

A: The fact is that the log-out procedure will not be looked upon as important as treating a patient.

C: Sure.

A: And in that environment they're not going to turn round and log out every time they walk away from a PC, I can guarantee that.

C: Yeah so . . . we need to, to look at it . . . I agree it's not completely a training issue, I do think it is partially a training issue.

As healthcare organizations seek to deploy the HIS as an infrastructural technology, i.e.

as a backbone for organizational activities, the need for a close match with the organization increases [2, 7]. A growing body of research has reported the difficulties involved in designing systems that match the complex and particular needs of organizational users. To work and be useful, systems have to be adapted in the course of implementation to match them to users' technical and organizational contexts [2, 8]. To be successful, such processes of configuration, 'design in use' or *domestication* [9] require contributions from a wide range of organizational members as well as technical specialists.

For example, underlying technical and organizational issues, such as problems with 'legacy' systems, hinder the development and deployment of the HIS. This is not just about linking software from different systems, but also about understanding how the organization works. An appreciation of legacy needs to move away from a purely technological stance to admit the importance of a subtle appreciation of factors that may appear distant from the technology, including details of everyday working practice. Any attempt to resolve legacy issues will depend for its success on understanding that organizational change will necessarily have to confront the legacy of current practices. This involves understanding how technologies become embedded within, and are oriented to, everyday working practice.

The configuration challenges for the HIS are numerous and significant. There are a large number of issues concerning the detailed design of user interaction with the system. Perhaps more importantly, many implications of information integration, i.e. more rapid information flows, novel information representation and record-keeping practices, will only become understood through experience gained in use. Integration may change existing – or create new – work dependencies between e.g. clinical and administrative departments in unexpected ways. This is seen, for example, in the debates around security policy:

Yeah um can I ask a quick question . . . what's gonna be the policy with regard to time out, functionality of the software? . . . if we have a single sign-on procedure . . . we may run into problems in the laboratory with our connections to all our other analysers, if somebody initiates a data transfer . . . for reviewing and authorizing results as they come up on analyser and the network connection is cut because the time out's kicked in . . . you could end up locking a lot of results that take a long time to actually retrieve.

It is vital that system implementers be aware of such changes, evaluate their significance and match them to system configuration options. For this to happen, there must be effective mechanisms for feeding back experience of use to implementers, and appropriate policies in place for negotiating how this is acted upon.

## Discussion: project work and organizational issues

This section attempts to link the everyday concerns of managing a major IT project with other important organizational considerations. The project is characterized by ongoing negotiations about tasks and responsibilities and substantial ongoing effort to coordinate work across diverse interorganizational teams across sites and time zones. This is managed through both formal (contracts, schedules, meetings, visits) and informal means (email, telephone calls, etc.) Working with and working out these relationships between organizations is crucial:

In a sense our thing is with Q the [Y Co's] manager and theirs is [with] X Co.

It involves learning how the organizations are structured:

I've got the numbers to start phoning myself and trying to pursue it, we're a bit in a situation where we're at the mercy of different organizations because . . . it's W . . . and so we're trying to liaise through various layers of people to try and get this to move on, so . . .

And (of course!) with interorganizational working others' failings can suddenly become your problems:

It is our issue but it's . . . not us holding it up on this one . . . but it will not be seen that way in the trust, they'll see it as the EPR not meeting a target.

System design in a large NHS trust (and the associated processes of analysis, configuration, testing, integration, evolution, etc.) is a complex, messy business. This HIS project within the trust is proceeding in tandem with the implementation of a new network infrastructure. In these circumstances, issues such as hardware provision, data point placement, database configuration and population, interface design and training are inextricably linked to other projects and organizational working associated with modernization and investment in IT. At the same time the NHS environment can be said to be characterized by upheaval and changing circumstances, policies, even governments. Furthermore, given national, governmental targets and priorities there is a sense in which this is a project that cannot afford to fail. Unlike the software projects documented by Button and Sharrock [5], and despite the long history of IT failures within the NHS, there is a strong sense that this is a project that must succeed, that abandonment to work on another project is not an available or thinkable option. And, of course, resources remain a problem within the NHS environment. Variations in resource coverage are due to histories of systems use, problems in attracting technical staff, differing systems expertise, different mechanisms for clinical input, varied relationships with clinical staff, etc., all of which bear on the success of the project and its associated work. Similarly, reliance on many providers adds even greater complexity to working relationships. The core system, legacy applications (e.g. pathology) and middleware are all provided (or have been provided) by different companies, and the advent of PPP has changed relationships between providers such that the trust only has an indirect relationship with legacy providers.

Some impediments to information integration simply reflect the scale of the organizations and services involved. For large organizations with complex information systems, achieving even modest levels of integration can be difficult in practice [10]. Here the issue of funding and ensuring accurate statistics brought this concern to the fore:

I did meet with R yesterday to discuss some of the issues . . . because the reports we hand in to the NHS are crucial to our funding as a trust, and obviously we have to get the reporting right and there's a huge risk to the trust because we're going live six weeks before the end of year, and . . . all of our end of year reports we have to make sure are right between that six week period . . . I needed to speak . . . and make sure he understood very clearly, what these risks were . . . it is an issue that we need to really look at because we do need to make sure our reports are correct that we're handing in and X Co has to build the system to NHS requirements so we do have to sort of match up all these things.

The government and public desire for transparency, league tables, etc. places a strong reporting focus on information integration. This accentuates the need for business focused organizational acumen to understand how to produce figures that paint the trust in the best light within the 'rules' of production for those figures (Bittner's 'gambit of compliance' [4]).

The evolving nature of the services being provided leads to difficulties in providing technical support that can evolve to match organizational change. Large organizations exhibit further complexities related to scale, numbers of distinct roles and processes, and the richness and interrelatedness of information in the organization. Information exchange practices and systems are rooted in local work processes as well as wider patterns of coordination and communication. Attempts to change practices and redefine roles and relationships may lead to resistance, if those involved have different commitments and understandings of organizational processes and service provision. Current health and social care policy initiatives in the UK make significant claims about the desirability of integrated services for better health and social care, i.e. more patient-centred healthcare delivery, improved resource utilization and management of information. Plans for implementing these initiatives appear to be largely predicated on information integration being a precondition for service integration. The HIS is an element of this strategy, yet as our research too readily documents, its implementation presents formidable challenges.

## Conclusions

We wish to be cautious about suggesting how the problems and particulars of the HIS project reported here translate to other NHS settings and projects. However, it may be useful for others if we make some tentative remarks on this topic. First, in some fashion the work reported here is like that systems design projects elsewhere. Project work is complicated and messy; managing a project like this involves a lot of 'work to get the project to work' (cf. Bowers [11]). Work must constantly be done to move things along, keep track of what is going on, inform the 'correct' people of developments, and discuss, argue and renegotiate tasks, roles and responsibilities. The work will not go to plan, and certain aspects will be designed a lot more satisfactorily than others: in other words, project work is necessarily a 'satisficing' activity (i.e. finding workable and acceptable compromises).

In terms of specifics for the NHS, it can be seen that a big challenge for any trust implementing an HIS is that of achieving a global view of their information flows and processes. The HIS project can serve to expose a current lack of consistency, coherence and integration of terminology, information and processes that must be overcome and reconciled to enable project success. The HIS cannot realize its potential without organizational change. A final point to end on, which builds on the previous two, is that it is important to acknowledge that the business of system configuration is the major design task. Configuration involves 'working out how the trust works', how activities are structured and so forth, and modelling them such that they are consistent and logical, then building this into a database that may well place further constraints on the models, thus forcing further redesign and satisficing. All aspects of this work are difficult and time-consuming, as painfully realized by the trust discussed here. One might consider that the constraints imposed by reconfiguring a US application for UK healthcare create particular problems

that may be avoided by other service providers. However, the biggest problem of configuration has been working out how the hospital works and modelling this in a satisfactory manner (both for the disparate workers and for the purposes of database build), suggesting that this may well be the same for others and thus is a key concern for the achievement of information integration.

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