Why is it difficult to implement e-health initiatives? A qualitative study

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Abstract

Background

The use of information and communication technologies in healthcare is seen as essential for high quality and cost-effective healthcare. However, implementation of e-health initiatives has often been problematic, with many failing to demonstrate predicted benefits. This study aimed to explore and understand the experiences of implementers -- the senior managers and other staff charged with implementing e-health initiatives and their assessment of factors which promote or inhibit the successful implementation, embedding, and integration of e-health initiatives.

Methods

We used a case study methodology, using semi-structured interviews with implementers for data collection. Case studies were selected to provide a range of healthcare contexts (primary, secondary, community care), e-health initiatives, and degrees of normalization. The initiatives studied were Picture Archiving and Communication System (PACS) in secondary care, a Community Nurse Information System (CNIS) in community care, and Choose and Book (C&B) across the primary-secondary care interface. Implementers were selected to provide a range of seniority, including chief executive officers, middle managers, and staff with 'on the ground' experience. Interview data were analyzed using a framework derived from Normalization Process Theory (NPT).

Results

Twenty-three interviews were completed across the three case studies. There were wide differences in experiences of implementation and embedding across these case studies; these differences were well explained by collective action components of NPT. New technology was most likely to 'normalize' where implementers perceived that it had a positive impact on interactions between professionals and patients and between different professional groups, and fit well with the organisational goals and skill sets of existing staff. However, where implementers perceived problems in one or more of these areas, they also perceived a lower level of normalization.

Conclusions

Implementers had rich understandings of barriers and facilitators to successful implementation of e-health initiatives, and their views should continue to be sought in future research. NPT can be used to explain observed variations in implementation processes, and may be useful in drawing planners' attention to potential problems with a view to addressing them during implementation planning.

Keywords

- Chief Executive Officer
- Relational Integration
- Primary Care Trust
- Normalization Process Theory
- District Nurse

Background

The challenges facing healthcare systems in the twenty-first century have been well described: an aging population; increasing prevalence of long-term conditions; improving health technologies leading to better survival; and rising expectations of healthcare all combine to put ever increasing pressure on available healthcare resources [1]. Although each country is pursuing individual solutions to these challenges, some common approaches are clearly apparent, including the use of information and communication technology (ICT) [2]. The use of ICT is expected to lead to improvements in healthcare quality (e.g., through better communication) and efficiency (e.g., through reduced duplication of investigations) [3]. Australia, New Zealand, and the UK have been at the forefront of attempts to embed ICT into routine healthcare [4], with the UK investing £12.4 billion over 10 years [5]. However, despite political commitment and substantial investment, there has been significant variability in the success of different e-health implementations across the British National Health Service (NHS) [6]. Many projects have been subject to considerable delay, increasing budget deficits, and in some cases, severely negative impacts on the quality and effectiveness of care [7, 8].

Difficulties in e-health implementation are an international phenomenon, with similar problems being widely reported [9–12]. This work has taken many forms and, importantly, it has raised questions about what 'successful' implementation actually
Most likely to influence the success or failure of an implementation were the clinical context (primary, secondary, tertiary) and the setting in which the innovation was introduced. Our theoretical framework, as well as previous research conducted by members of the team, is informed by the analysis of collective action, a core construct of Normalization Process Theory (NPT), which we used to provide a general framework for this study. In particular, we focused on those of its components that support the analysis of enacting implementation and other social processes. NPT focuses on the work that individuals and groups have to do for a new technology or practice to become embedded and sustained in routine practice.

We were interested in exploring the application of four of NPT’s concepts: interoperability (IW); relational integration (RI); skill set workability (SSW); and contextual integration (CI) (Figure 1). IW refers to the impact that a new technology or practice has on interactions, particularly the interactions between health professionals and patients (consultations). RI refers to the impact of the new technology or practice on relations between different groups of professionals, and the degree to which it promotes trust, accountability, and responsibility in inter-professional relationships. SSW refers to the fit between the new technology and existing skill sets. An example of poor SSW would be a technology that required clinicians to do clerical work, or conversely, required administrative staff to take clinical decisions. CI, which refers to the fit between the new technology and overall organisational context, including organisational goals, morale, leadership, and distribution of resources.

Figure 1

Constructs of the collective action component of normalization process theory.

The assumption that informed our analysis was that technologies that are understood by their users to have a positive impact on consultations (IW), inter-professional relationships (RI), and which fit well with existing skill sets (SSW) and organisational context (CI) are more likely to normalize than those with a negative impact or poor fit.

This study had two aims: first, to determine implementers’ views of factors which promote or inhibit successful normalization (implementation, embedding, and integration) of e-health innovations; and secondly, to explore whether the collective action components of Normalization Process Theory (NPT) provided an adequate explanation for different perceived degrees of normalization. Although NPT was derived from a large body of empirical work, at the time this study was designed (2006), there were relatively few studies which had attempted to test NPT’s power as an explanatory model across a range of technologies. We adopted a case study methodology as the most effective way of addressing these two aims because case study methods are appropriate for studying complex systems which are in a state of flux and for exploring why and how particular outcomes occurred, rather than simply describing what happened. Case study methods are distinguished by their in-depth focus on a relatively small number of units or ‘cases’, and benefit from prior development of theoretical propositions to guide data collection and analysis.

Methods

Design

We report case studies of three e-health innovations. Data were collected using semi-structured interviews with implementers and analyzed using the Normalization Process Model.

Setting

Our theoretical framework, as well as previous research conducted by members of the team, led us to postulate that the characteristics most likely to influence the success or failure of an implementation were the clinical context (primary, secondary, tertiary), and the setting in which the innovation was introduced.
or community care) and the nature of the e-health technology [29]. In addition, we wished to ensure that the implementation was recent enough to remain alive in respondent's memories, while sufficiently established to allow for assessment of the extent to which the initiative had become embedded and integrated into routine practice (normalized). These criteria led to the selection of three cases (Table 1). In each case, the implementation had occurred between 2004 to 2006, with data collection undertaken 2007 to 2008.

Table 1

Summary of Case Study characteristics

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Choose and Book</th>
<th>Picture Archiving and Communication System</th>
<th>Community Nurse Information System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health care setting</td>
<td>Primary/Secondary care interface</td>
<td>Secondary care</td>
<td>Community care</td>
</tr>
<tr>
<td>Aim of technology</td>
<td>Allow patients to book first outpatient appointment at hospital of choice</td>
<td>Digitise x-rays and other images so they can be stored and viewed electronically</td>
<td>Electronic record system that also allows patient registration, clinic and visit scheduling and access to clinical algorithms.</td>
</tr>
<tr>
<td>Professionals affected by technology</td>
<td>Primary care: GPs, administrative staff.</td>
<td>Doctors, radiologists, radiography administrative staff.</td>
<td>Community nurses</td>
</tr>
<tr>
<td></td>
<td>Secondary care: Consultants, outpatient administrative staff</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Case study one (CS1) was the implementation of the Choose and Book (C&B) system in a hospital trust serving an inner city population in a large metropolitan area in England and the lead Primary Care Trust providing referrals to that hospital. C&B was a national electronic service that provided patients with the opportunity to choose which hospital their general practitioner (GP) referred them to for a particular problem, and to book the time and date of their first appointment. C&B was a flagship project for the multi-billion pound programme for improving use of information technology in the English NHS, known as Connecting for Health [40]. Implementation involved three main stakeholders: the hospital receiving referrals, the Primary Care Trust (PCT) commissioning out-patient appointments, and the GPs making referrals.

Case Study two (CS2) was the implementation of the Picture Archive and Communication System (PACS) in one acute hospital trust, which included several hospitals at different sites, located in a largely rural area of England. PACS was a system for digitizing images, such as X-rays, scans, or photographs. The digitized images could be stored online, and accessed simultaneously from different locations.

Case Study three (CS3) was the implementation of a Community Nursing Information System (CNIS) for district nurses in an urban area in Scotland. The CNIS consisted of hand-held wireless enabled Personal Digital Assistant devices (iPAQs). District Nurses could use them to record clinical assessment information while out in the community, and download the information to the central server once back at base. The system also included some decision support in the form of standardized assessment tools with associated care algorithms. The system had originally been intended to form a single shared assessment that could be shared between district nurses and social services; however, social services had been unable to pursue their side of the implementation and so this function had not become available by the time of data collection.

Participants

Participants were staff with responsibility for planning and/or executing an e-health initiative ('implementers' as defined in Figure 2). We purposively recruited a maximum variety sample, aiming to include senior Department of Health or Connecting for Health staff with responsibility for a number of e-health projects across multiple organizations, senior staff from within the Trust or Health Board with lead responsibility for implementing a number of e-health systems within their organization (such as chief executive officers), and middle management with day-to-day responsibility for the implementation under study. Recruitment within each case study continued until we reached saturation, i.e., until no new data were emerging from subsequent interviews. Based on previous experience, we estimated that up to ten interviews per case study would be needed [38].

Figure 2

Definition of implementers.
Data collection

Semi-structured interviews were used to determine not only ‘what happened’ but also participants’ explanations of ‘why it happened’ in that way. Interviewees were asked for a description of the e-health implementation process from their perspective, their views about factors which had promoted or impeded implementation and their assessment of how normalized (embedded into routine care) the e-health initiative had become. Interviews were tape-recorded and transcribed verbatim, with the interviewer keeping additional field notes.

Data analysis

Data were analyzed using the framework method proposed by Ritchie and Spencer [41] according to four components of the collective action construct of NPT (May 2006): IW, RI, SSW, and CI (Figure 1). Data were coded to the four constructs and overall degree of normalization.

Initial interviews were coded by the interviewer (JB) and chief investigator (EM) in order to develop a coding framework. This framework was then tested and refined at a two-day multidisciplinary data analysis clinic involving all authors. The revised coding frame was reapplied to the previously coded interviews and all subsequent interviews by three authors independently (JB, EM, CM). There were no significant disagreements in applying the coding framework.

Data are presented in the text with each quotation followed by case study number and role of interviewee. Where quotes include remarks by the interviewer, the interviewer is denoted by ‘I’ and the participant by ‘P.’

Results

Twenty-three interviews were undertaken: ten for CS1, five for CS2, and eight for CS3. Our intended sampling frame was achieved, with interviewees including regional leads for the cluster (CS2) or local service provider (CS1), Chief executives for the trust or health board for all three case studies, and clinical or IT leads and a range of middle management with ‘on the ground’ responsibilities (Table 2). Data saturation was achieved quickly in the two case studies (CS2 and 3), which were located in a single context, but took longer in C&B, where there were very different perspectives emerging from the three different groups of stakeholders in the hospital, the primary care trust, and individual general practices.

Table 2

Roles of Interviewees

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Choose and Book (CS 1)</th>
<th>PACS (CS 2)</th>
<th>CNIS (CS 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional Level</td>
<td>Lead for Local Service Provider</td>
<td>Regional Implementation Director for Cluster</td>
<td>Managing Director of provider company; General Manager of Health Board</td>
</tr>
<tr>
<td>Chief Executive</td>
<td>CEO of Trust</td>
<td>CEO of Trust</td>
<td></td>
</tr>
<tr>
<td>Senior Management</td>
<td>Clinical Lead for Hospital Trust</td>
<td>Clinical Lead for Hospital Trust</td>
<td>IT Manager Health Board; Clinical Services Manager</td>
</tr>
<tr>
<td>Middle Management or “on the ground”</td>
<td>GP and clinical lead in PCT; Consultant; Practice Manager; Project Manager for Hospital Trust; Outpatient Manager; Primary Care Director for Hospital Trust</td>
<td>Radiology Manager; IT Manager</td>
<td>Lead Project Nurse; IT training manager Health Board; Senior Nurses x 2</td>
</tr>
</tbody>
</table>
Assessments of normalization

For each case study, we explored interviewee perspectives of the degree to which the e-health innovation had become normalized. Data were triangulated across the different interviewee perspectives. The three case studies demonstrated a wide range of normalization (Table 3). For example, CS2 (PACS) had completely normalized and was totally embedded into routine practice:

Table 3
Summary of factors affecting normalization of study technologies

<table>
<thead>
<tr>
<th>Case Study</th>
<th>C &amp; B (hospital)</th>
<th>C &amp; B (primary care)</th>
<th>PACS</th>
<th>CNIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of normalization</td>
<td>✓ ✓ ✓</td>
<td>X/✓</td>
<td>✓ ✓ ✓</td>
<td></td>
</tr>
<tr>
<td>Interactional Workability (impact on consultations)</td>
<td>X</td>
<td>X X X</td>
<td>✓ ✓ ✓</td>
<td></td>
</tr>
<tr>
<td>Relational Integration (impact on inter-professional relationships)</td>
<td>X</td>
<td>X</td>
<td>✓ X/✓</td>
<td></td>
</tr>
<tr>
<td>Skill Set Workability (fit with existing skill sets)</td>
<td>✓</td>
<td>X X</td>
<td>✓ X X</td>
<td></td>
</tr>
<tr>
<td>Contextual Integration (fit with organizational context)</td>
<td>✓ ✓ ✓</td>
<td>X/✓</td>
<td>✓ ✓ ✓</td>
<td></td>
</tr>
</tbody>
</table>

'It's just taken for granted that you come in and you use PACS and that's how your images are that's it... Just normal practice now.' --CS2 IT training manager

In contrast, CS3 (CNIS) had at best, only partially normalized, and provided a good example of the difference between adoption and normalization. Although some 80% of the district nurses were using it, many teams were still running dual systems (old paper-based and new electronic), and it was evident that not all nurses felt comfortable using it, with the hand-held devices still seen as new or strange:

'It think it's fair to say it's not integrated into normal routines very much at all in my area, but the previous area that they were in before, they, I mean, I understand that they have been started last May, and they're only 80% on the system.' --CS3 senior nurse

'It's a new gadget to show off amongst their friends and stuff like that.' --CS3 IT trainer

The picture in CS1 (C&B) was more complex. It appeared that there had been a high degree of normalization in the hospital, with references to it as 'a way of life here' (CS1 hospital chief executive officer) or 'completely embedded in standard operational workings' (CS1: project manager for C&B in the hospital). In primary care, there was variable (and often low) normalization with certain practices contributing the bulk of the electronic referrals:

'Yeah, well most GPs don't use it!' --CS1 hospital chief executive officer

Even in those practices that were high users of C&B, it was considered problematic, and had not become part of routine practice:

'Right you are saying within my 10-minute slot and you have said Choose and Book will take a couple of minutes -- it doesn't -- what, even two and a half years on it takes at least four and is not even working properly today. So it took me 10 minutes to do one this morning.' --CS1 GP early adopter

This variability in perceived normalization was further analyzed using NPT as an explanatory framework (Table 3). Where implementers perceived good levels of CI, IW, RI, and SSW, high levels of normalization had occurred. However, where implementers perceived problems in one or more of these areas, the level of normalization was lower.

Interactional workability

Data were considered to refer to IW if they reported the impact of the new technology on health professional -- patient interactions or consultations. PACS was perceived as having a very positive impact on doctor-patient relationships on two grounds. The first was that images were always available when needed, allowing clinicians to make decisions in a timely manner:

'The biggest advantage is in having images available all the time to everyone. So as soon as I take a picture of you, somebody can see it. In fact, everybody can see it. So where, if you were come into A and E and you've broken an arm and you have to be
Second, doctors liked being able to show patients their images, and found this easier to do with PACS than with film:

'you did get good doctors saying 'it's so nice being able to point things, and rotate things, and show things more easily,' because you can magnify and things like that I suppose, so you can do that sort of thing, and share that with the patient.' --CS2 IT training manager

The data suggested that the CNIS had a positive impact on IW. The iPAQ devices were cheap, robust and portable, allowing nurses to feel comfortable carrying them around as they visited patients, and hence providing access to the patient record during home visits:

'You've seen how streamlined they are quite you know petite. You can put them in your pocket.' --CS3 IT trainer

'[Before the CNIS] if you needed information about someone whose condition had deteriorated, perhaps on a Friday afternoon, you then had to write a different set of documentation and drive it to the place that the patient needed to be seen, otherwise there was no way of getting the information to them.' --CS 3; Clinical Services Manager

In contrast, C&B had a negative effect on IW in general practice, with interviewees commenting adversely on the time required to make a C&B referral and the negative impact this had on patient consultations. C&B had little impact on IW in hospital, except where the system allowed patients to be booked into the wrong clinic, which led to unsatisfactory consultations.

**Relational integration**

Data were coded to RI if they referred to the impact of the new technology on relationships between groups of professionals.

PACS was reported as promoting communication and trust between different professional groups because it enabled multiple users to view the same image from different locations. This was felt to have improved working relations between for example, orthopaedic surgeons and radiologists, or within multidisciplinary team meetings for planning complex cancer care for individual patients:

'Yes and I think its aiding clinicians to have a better conversation if you put it in the cancer or renal unit ...the multidisciplinary team meeting.... I can remember, my senior pathologist has just retired and she said sitting in some of these meetings now and you've got the pathology there and you've got the images there and she said the quality of the clinical conversation that's going on around what's best for an individual patient and their circumstances has moved on and is a higher quality clinical discussion which I would then argue must lead to better treatment planning and clinical decision making and therefore must lead onto better outcomes for patients.' --CS2 chief executive officer

'And I think, particularly with the interaction between say one of the clinicians and one of the radiologists, that's improved because the consultant outside knows that the consultant radiologist inside has access to those images -- and has probably already seen them, probably already done a report -- so what they are doing is they are starting off from another point. In the old days, if a CT scan was done and it went to the ward, the consultant on the ward would have to pick it up and bring it down to the radiologist and that would be the first time the radiologist was seeing it. Because it had never come down from the ward before. Whereas now, he rings him up and say -- 'you've seen so-and-so, and said so-and-so -- what about this little bit over there?' And then he looks up and ... Or they still come down to the department to talk because they like the interaction, but it is not the first time the radiologist is seeing that scan.' CS2 radiology manager

The CNIS had been intended to have a positive impact on inter-professional relationships because it was originally intended to form the basis for a joint record held by both social services and community nurses. However, problems within social services led to extensive delay, and at the time of data collection, social services were not using the system, preventing any positive impact of the system on RI.

The impact of C&B on relations between professional groups was most marked for the relations between hospital consultants and GPs, with both groups regretting the loss of personal contact between referring doctor and specialist (negative impact on RI):

'I think of the points about Choose and Book was to basically - is part of a systematic disenfranchisement of clinicians basically - so that we now refer to a generic gastroenterologist or a generic chest physician.' --CS1 GP early adopter

'I think it is all a bit more distant. Because it used to be the GPs referred to their main buddies. And they can't really do so much anymore. What we hope is we substituted for that the confidence that they patients will be seen the first time by someone who can deal with the problem.' --CS1 consultant and clinical lead for C&B in hospital

**Skill set workability**

Data were coded to SSW if they referred to the fit between the new technology and existing skill sets, or efforts made to teach the requisite skills to users.
In many ways PACS fit well with existing skill sets. It was seen as relatively intuitive to use, and intensive efforts were put into training clinical staff before implementation:

‘... and basically there were a number of sessions set up by our training department with five or six web browsing terminals, and they just went in and they [clinical staff] were shown how to get into their patient; they were shown how to pick an image, and how to adjust and image and read a report. I think we probably got about 60% of the clinical staff in the trust trained before go-live.

I: Before go-live. Oh fantastic.

P: Which was bad. And the other 40% very quickly learnt afterwards.’ --CS2 radiology manager

Some clinicians were used to nurses displaying images for them, and were initially reluctant to have to take on that task themselves. However, the advantages of PACS swiftly won them over:

‘And the orthopaedic surgeon said ‘What happens when I go on the ward and the nurse can't get the image up on the screen?’ 'The nurse can't get the image up on the screen -- you're going to!' And off he went, mumbling that he didn't want PACS introduced until he retired. He's now on that DVD that was done as a champion of it.' --CS2 radiology manager

Ease of use was seen as essential for the CNIS, where the nurses started from a low level of IT literacy. Many were alarmed that poor IT skills could jeopardize their future employment:

'It's basically nurses who don't even have a computer in their own homes and they haven't actually come across this sort of technology and they're having to face it at work and sometimes you get that sort of nervous reaction that they maybe might feel a bit inadequate in the sense that that oh this is really daunting. I've never used a computer system before. Will this mean I'll be out of a job?' --CS3 IT trainer

Trainers had to spend a great deal of time on one-to-one training and emotional reassurance:

'I must say, to be honest, they we do hold their hand quite a lot and we've probably spoilt them in a sense that we tend to go out to the health centres and actually do the training rather than tell them to come out to an unfamiliar environment.' --CS3 IT trainer

C&B fit well with the skill sets in hospital, where administrative and IT staff tended to deal with it. In general practice, C&B had a poor level of SSW because GPs were expected to make the C&B referral within a consultation. They perceived this as a clerical function that was a poor use of their clinical skill:

'I think the doctors would say that they are doing a bit more with Choose and Book administration than they used to. They are not happy about that. Really. And that is why that brings out the worst headlines in the comics - 'I am not a travel agent' sort of thing...' --CS1 GP early adopter

**Contextual integration**

Data were coded as pertaining to CI if they reported on the fit between the technology and the overall organizational context, including organizational goals, the quality of leadership within the organization, resources allocated to the implementation, and overall morale.

PACS was perceived as a way of meeting several organizational goals, including national targets for shorter waiting times for investigations, increased efficiency within the hospital, and the chief executive officer's personal goal of encouraging clinical engagement with IT. PACS helped the organization achieve their goals by eliminating the problem of x-ray films that had been 'lost' or were unavailable at the time and place they were needed:

'they were never in the right place at the right time. Well, never is too strong a word, but I think there were times when we were running up to about 20% lost films. And what I mean by 'lost films' is just not being in the right place at the right time.' --CS2 radiology manager

This had considerable knock-on costs in terms of repeat X-rays, delays to consultations or treatments, and staff time in looking for films. PACS eliminated this inefficiency: ‘through PACS we become more efficient, more productive' --CS2 consultant radiologist

The chief executive officer was very committed to introducing PACS and provided strong leadership for the implementation process, ensuring that sufficient resources, including time, senior staff and funds were available for the implementation to go well and complete on time:

'Well I drove it, I chaired the project board...It's about change and the way we do things, changing the culture. So I chaired the project board and brought the relevant people, so the lead radiologist who was my key clinical champion was there. My head of IT was there. There were other people involved and in a sense we do everything here by project management methodology. That's the way we make sure we deliver things.' --CS2 chief executive officer

The data from CS3 (CNIS) demonstrated both positive and negative features about CI. On the positive side, the system was seen as a way of achieving the policy goal of sharing assessment information between community nursing and social services.
Strengths of this study include the use of case study methodology with case studies selected to include a range of healthcare
relationships between staff groups, existing skill sets, and organisational context -- provided a good explanation for the
promoted or inhibited perceived normalization of these technologies from their perspective of being involved in service
Senior staff with responsibility for implementing new e-health technologies in the NHS had clear views about factors that
Discussion
we initially thought.’ --CS1 practice manager
hospital and from the whole starting point here through to when the patient was actually seen at the other end. That was what
‘because we felt there would be real advantages to it and it would hopefully streamline the process of referring patients to
during the study period, however, C&B bore little relationship to the goals of the Primary Care Trust or the general practices,
including highly regarded teaching hospitals. The overall number of referrals from primary to secondary care was decreasing,
and the study hospital could only survive financially if it could attract an increasing proportion of a decreasing pool of referrals. C
and B became a central part of this hospital's business plan to maintain inward referrals and hence overall financial viability:
‘So I wanted to make it so easy to book an appointment in this hospital that people would start to use this hospital for booking.’ -
CS1 hospital chief executive officer
Awareness of this overwhelming importance of C&B to the organization's survival plan had permeated every level of
management, leading to considerable investment of energy and resource into the implementation:
‘we had very strong executive leadership so it was always top of the priority. We had quite a strict project methodology in terms
of the meeting structures that we had. And we had a project board that met consistently and was chaired by chief execs.’ --CS1
project manager for C&B in the hospital
During the study period, however, C&B bore little relationship to the goals of the Primary Care Trust or the general practices,
partly from an awareness of the government promotion of policies aimed at improving patient choice. Some individual general
practices saw the electronic booking component of C&B as a way of cutting down on administrative time spent chasing
appointments in secondary care for their patients, but this advantage was often offset by the amount of administrative time
taken sorting out problems caused by C&B:
‘because we felt there would be real advantages to it and it would hopefully streamline the process of referring patients to
hospital and from the whole starting point here through to when the patient was actually seen at the other end. That was what
we initially thought.’ --CS1 practice manager

Discussion
Senior staff with responsibility for implementing new e-health technologies in the NHS had clear views about factors that
promoted or inhibited perceived normalization of these technologies from their perspective of being involved in service
implementations. NPT -- with its emphasis on the degree to which a new technology fits with professional-patient interactions,
relationships between staff groups, existing skill sets, and organisational context -- provided a good explanation for the
observed variability in normalization of three contrasting technologies in different contexts.
Strengths of this study include the use of case study methodology with case studies selected to include a range of healthcare
Authors' contributions

CRM led on developing NPT, and all authors have made important contributions to its development.

Competing interests

CRM led on developing NPT, and all authors have made important contributions to its development.

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However, implementation of e-health initiatives has often been problematic, with many failing to demonstrate predicted benefits. This study aimed to explore and understand the experiences of implementers -- the senior managers and other staff charged with implementing e-health initiatives and their assessment of factors which promote or inhibit the successful implementation, embedding, and integration of e-health initiatives. We used a case study methodology, using semi-structured interviews with implementers for data collection. Case studies were selected to provide a range of healthcare contexts (primary, secondary, community care), e-health initiatives, and degrees of normalization. eHealth (also written e-health) is a relatively recent healthcare practice supported by electronic processes and communication, dating back to at least 1999. Usage of the term varies. A study in 2005 found 51 unique definitions. Some argue that it is interchangeable with health informatics with a broad definition covering electronic/digital processes in health while others use it in the narrower sense of healthcare practice using the Internet. It can also include health applications and links on