Towards a better understanding of delivering e-health systems: a systematic review using the meta-narrative method and two case studies

Executive Summary

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Declaration of competing interests

HP, PB and JN are all based in CHIME, which receives funding from the Whittington Hospital NHS Trust for software used by the North Central London Anticoagulation and Stroke Prevention Service (NCLASPS) described in case study 1. DP and AS are senior staff within NCLASPS. CM designed and has rights in the Laindon Model software (case study 3); he is also based part-time in CHIME.

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Background

The introduction of 'e-Health' has profound consequences for healthcare. There is good evidence that e-Health technologies lead to changes in the organisation and delivery of health services. Changes are occurring in both in specific clinical settings and in the ways in which patient care is managed across organisational boundaries.

However, past research has found that the nature and magnitude of benefits from e-Health are not consistent across studies, nor have there been clear findings on how benefits might be maximised or what their opportunity cost might be. On the one hand, electronic patient records (EPRs) and related technologies are often depicted as the cornerstone of a modernised health service. According to many, they will make healthcare better, safer, cheaper and more integrated. Lost records, duplication of effort, mistaken identity, drug administration errors, idiosyncratic clinical decisions and inefficient billing will be a thing of the past. There has been consequent large-scale funding of these technologies, notably in the National Health Service's National Programme for IT. Yet there is also evidence that new services can be introduced without discernible benefits and some authors criticise visions of a technological utopia. They argue that failed programmes are common and even successful initiatives are plagued by delays, escalation of costs, scope creep, and technical problems.

While there is unanimity on many points – like the need for a strong leadership, adequate resources, good project management, effective communication and attention to human resource – tensions exist on other issues, including the relative merits of homegrown systems compared to off-the-shelf ones. There is widespread recognition that e-Health systems are complex interventions. They entail a combination of technology and organisation. Health information technologies are socially and organisationally embedded, used by people in particular contexts for particular social acts. They are socio-technical systems.

Aims

Much existing research concentrates on studies of implementations of e-Health, be they successful or not. We sought to look at e-Health systems that are currently in use, and have been in use for some

time. We sought to learn from how real health services have used technology and adapted to the use of technology.

About this study

We used a case study approach to produce an in-depth look at two healthcare systems using information systems. (Data collection had to be abandoned in a third setting.) We performed a systematic review using the meta-narrative approach. We then used mixed methods including ethnographic data collection, observations, interviews, document analysis and formal risk management approaches (task analyses, prospective and retrospective hazards analyses).

Key findings

There is a diverse evidence base relevant to e-Health in the context of organisations and service delivery that is frequently overlooked. We identified the following distinct 'meta-narratives':

- Health information systems

- Change management studies

- Information systems (positivist)

- Information systems (interpretivist)

- Information systems (technology-in-practice)

- Computer supported cooperative work

- Critical sociology

- Actor-network analyses

- Systems approaches to risk management and integration, and other recent work

Focusing on the EPR, a number of key themes are evident across this heterogeneous literature. These themes contain tensions, different ways of framing the problem: (1) the EPR ('container' or 'itinerary'); (2) the EPR user ('information-processer' or 'member of socio-technical network'); (3) organisational context ('the setting within which the EPR is implemented' or 'the EPR-in-use'); (4) clinical work ('decision-making' or 'situated practice'); (5) the process of change ('the logic of determinism' or 'the logic of opposition'); (6) implementation success ('objectively defined' or 'socially

negotiated'); and (7) complexity and scale ('the bigger the better' or 'small is beautiful').

Our case studies and this literature review agree on much. The development of e-Health systems can reflect past and ongoing contingencies. There are unavoidable pressures for the localisation and fragmentation of services. There is always a co-evolution of the service and the technology, including the use of workarounds. Individuals working within systems can be unaware of how others use shared technology. Definitions of success reflect stakeholders' different perspectives and may evolve over time.

Communication is a key need for integrated services, but communication between healthcare professionals is often more than just an exchange of unambiguous information. There is an important human role in re-contextualising knowledge for different uses. We would encourage a greater focus on communicative features in healthcare systems, but communication requires the right organisational context too.

e-Health is often promoted for its contributions to patient safety and improved quality of care, but the evidence base for improvements is weak. We saw that risk management methodologies (task analysis; prospective hazards analysis like healthcare failure modes and effects analysis; and retrospective hazards analysis like root cause analysis) can be illuminative for studying e-Health technologies and the services using them. We received good feedback on these processes from clinical staff. Even in a context where the clinical and software team were believed to work together closely, these methods proved valuable in promoting communication between the two groups. However, these methods were not individually reliable and may work better in conjunction. The routinisation of workarounds was identified as an area of possible risk and we conclude the importance of proactive methods to question routine behaviours. NHS managers and clinician-managers need to move beyond assumptions that implementing e-Health systems will necessarily and uncomplicatedly improve patient safety; and beyond a focus on implementation as a one-time process. Instead, there is a need for the ongoing management and governance of e-Health systems to realise their potential benefits and to overcome failures of interessement. There needs, instead, to be a focus on on praxis. The unexpected effects of management decisions a long way from an e-Health system should be considered.

Generally, healthcare staff were flexible in dealing with these systems, developing workarounds as necessary, but these increased localisation. We recognise the importance of 'hidden work', including by administrators, to keep services running smoothly. The unavoidable tension between standardisation and the contingency of

local needs requires active management. Systems developed 'bottom-up' may have an advantage here, but we also found that even bottom-up systems still have to work within a broader context. Getting that broader context right, particularly the funding models, is important. Whether dealing with a novel service using bespoke software and a bottom-up approach, or an off-the-shelf system supporting existing services, organisational boundaries remain problem areas and threaten the provision of high quality care. Organisational boundaries are a particular issue when 'interessement' (the process of recruiting other stakeholders to a solution) has failed, and finance structures can be a particular barrier. The medico-legal context is largely untested, with the division of responsibilities across settings suggesting a need for greater clarification of the relative roles of involved parties.

GPs have a central role in integrated services. GPs are also generally among the most advanced in using computer systems in the NHS, so their role in e-Health systems seeking to achieve integration is even greater. The North Central London Anticoagulant and Stroke Prevention Service recognises the key role of GPs, but has an ongoing struggle to involve them. In the SystmOne context, it is notable how, in one case, a hospital doctor accessed results from other hospital departments via the GP record. Yet both case studies found only partial implementation or incomplete interessement among GPs.

Conclusions

The evidence suggests that future research on e-Health systems should not presume a simple, causalist approach (that is, technology X will reliably produce outcome Y). The knowledge base continues to develop, but we also suggest that parts of it have been systematically overlooked. Our work also suggests that there should be a greater focus on communicative functions in e-Health.

Our case studies and the literature depict in-use e-Health systems as being flexible and contingent. They rely on the ongoing work of healthcare staff to bridge the gap between social requirements and technical feasibility, including the common use of workarounds and the frequent re-contextualisation of knowledge. We suggest a dynamic tension between standardisation and localisation is unavoidable. Evidence from the first case study suggests that an integrated governance board can have a useful role bringing stakeholders together to navigate these co-evolutions of technology and service. The evidence highlights organisational barriers, including funding models, to successful integrated electronic services.

The evidence suggests that there is scope for the greater use of risk management methods in health informatics, but also that these are not individually reliable.

While e-Health systems are complex, and we have discussed several challenges they face, our results support the finding that they can be successful. We recommend future research focuses on systems in use from a socio-technical perspective.

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Addendum

This document is an output from a research project that was commissioned by the Service Delivery and Organisation (SDO) programme whilst it was managed by the National Coordinating Centre for the Service Delivery and Organisation (NCCSDO) at the London School of Hygiene & Tropical Medicine. The NIHR SDO programme is now managed by the National Institute for Health Research Evaluations, Trials and Studies Coordinating Centre (NETSCC) based at the University of Southampton.

Although NETSCC, SDO has managed the project and conducted the editorial review of this document, we had no involvement in the commissioning, and therefore may not be able to comment on the background of this document. Should you have any queries please contact sdo@southampton.ac.uk.