

Qualitative Research and Information Systems Design – Critical reflections from an eHealth Case study

Jo-Anne Kelder
University of Tasmania
JoAnne.Kelder@utas.edu.au

Associate Professor Paul Turner
University of Tasmania
Paul.Turner@utas.edu.au

Abstract

Academic and business environments increasingly accept the utility of diverse qualitative research approaches for informing the design, implementation and evaluation of information systems. However, there are concerns that inherent techno-centrism within the IS discipline distorts criteria for choosing and adapting approaches and, significantly, works to marginalise the opportunities qualitative insights provide to open up human-centered dialogue on new ways of thinking and designing (Gasson 2003). This paper presents a qualitative research approach designed to facilitate critical reflection and sensitise researchers' to implicit assumptions that technology will be the end-point of their activities and when judgments about criteria for successful designs are technologically and/or economically over-determined. The method endpoint is a conceptual framework constructed for the research domain which is the basis for translating sociological insights into implications for information systems and work practice in a public health service organisation.

Keywords: Qualitative Research, Critical Reflection, e-Health, Case Study.

1. Introduction

The paper presents a qualitative approach which critically reflects on and adapts ethnographic approaches for research in rich, complex social domains (RCSDs). Section 2 introduces the issues of techno-centrism and translation of insights for qualitative IS design approaches and discusses the problems in relation to the general context of e-health initiatives in the Australian health care system. Section 3 describes an accredited public health service organization, BreastScreen Tasmania (BST). BST was chosen for attributes indicating it was a suitable RCSD in which to explore the utility of a research design which incorporates a range of ethnographic techniques and analytic frameworks. The case provides a structural account of the organisation and samples of the data on which the constructs and models describing a theoretical understanding of the organisation was derived. It is not possible to disguise the identity of the organisation so in order to protect participants quotes do not identify their role within the organisation. Section 4 describes the research approach for BST. The research design consisted of three phases, each contingent on the previous phase. Phase one of the method is devoted to sense-making. It is a method for exploring and understanding a social setting at various units of analysis (individual, community/team, organisation level), from multiple perspectives and through various theoretical lenses, using distributed cognition theory (DCog) (Hutchins 1995), Communities of Practice theory (CoP) (Wenger 1998) and Activity theory (AT) (Engeström 1999). Phase two – identifying a key theme – is a method for identifying a theme expressing at a structural level a key problem situation in an

organisation setting in which information systems play significant role. Phase three – theme conceptualising – is a method for researching the chosen theme in order to conceptually model the elements and develop constructs to express the qualities, attributes and relations between the elements with a view to explore and identify implications for IS and work practice. Section 5 comments on the preliminary outcomes of the approach in relation to the issues of techno-centrism and translation for IS design. It provides a brief introduction to how the set of conceptual models can be used for understanding the chosen problem theme for BST, *the nexus between accreditation and practice* and to draw out implications and insights of relevance to IS and work practice design decisions.

2. Qualitative IS research approaches and the health services domain

Literature presenting and commenting on IS research points to the need for a human centred understanding of both the social and technical aspects of human activity and system-level understanding of interactions involving them over time and space (Checkland et al. 1999; Walsham 1993). From within the information systems discipline, qualitative approaches have increasingly been deployed to generate understanding of RCSDs and to inform the design of more human-centred information systems (Nemeth, 2006; Bate, 2002). However, the IS discipline and its use of these qualitative approaches emerges as itself historically situated. While previously dominated by positivism, (Chen et al. 2004; Orlikowski et al. 2002 [1991]), it is only in the last 10-15 years that systems perspectives acknowledging the significance of human actors *and* the need to deploy qualitative approaches to access and describe the perspectives of people using technologies and working together has become accepted (Checkland et al. 1999).

Contemporary human or user-centred approaches have positively influenced IS designs to the benefit of end-users, increasing ease of use, trust and satisfaction (Garrety et al. 2004). However, critical reflection on such approaches and their underlying suppositions identified concerns about the process of translation that occurs between the rich user insights generated by in-depth study of an RCSD to the systems that are finally built (Kelder et al. 2005). This factor in turn poses questions about how the adaptation of these methodologies to sensitise our gaze to *informational* aspects of phenomena being studied artificially prioritises these elements over others within the system. In a very real sense, information systems involving people, places and things (PPT) pre-date contemporary information systems supported by digital information and communication technologies (ICTs). Therefore IS qualitative researchers should also remain aware of the fact that many of the most important aspects of information systems are tacit, intangible and unsuitable for formal representation or codification. As a result, fundamental questions also need to be asked about the consequences of marginalising these aspects in the process of translation to technical designs.

While conducting human-centred computing (HCC) design is clearly complex and difficult, implicit techno-centrism inherent within IS design processes may relegate the rich insights generated to mere adjuncts of conventional usability testing and marginalise opportunities to open up dialogues on new ways of thinking and designing (Gasson 2003). This ‘failure in translation’ is a challenge to the use of sophisticated qualitative techniques to understand and explain the rich socio-cultural complexities of organisational life (Kelder & Turner, 2005).

Put crudely, unless the insights generated by these techniques can be translated more meaningfully than as a means to make techno-centric design decisions more palatable (Kujala, 2003), there is a danger that in the name of technical, financial or other factors these research insights can be used to subvert, marginalise or even obscure the very user issues they raise.

It is possible to explain how this failure in translation can occur by recognizing that most IS design activities are uncritically framed as problems with technological solutions and the different paradigms within IS for representing and communicating insights (process vs. data, procedural vs. declarative, use cases vs. data flow diagrams) are objective and technology focused. More significantly, it is also important to acknowledge that across the range of qualitative methodologies and techniques IS draws on to inform design, few, if any, were originally developed to produce outputs suitable for translation into functional specifications.

The issue of technological framing is especially pressing in RCSDs such as health care organisations which are part of a health system that is officially ‘in crisis.’ As a consequence health reform to address capacity issues due to ageing populations and advances in medical knowledge and technologies (Alvarez 2005; Caro 2005; Oliver et al. 2001) is at the forefront of most political and policy agendas. E-health initiatives have been identified as critical to respond to the crisis (Pagliari et al. 2005) and reform discussions concentrate on the need for ICTs to provide information to 1) support health services practitioners in the conduct of their work; 2) measure health services practice for quality assurance and 3) support health service clients in making decisions related to their physical well-being.

By supporting improved information access, update and evaluation the economic case for ICTs is strong. However, their design and deployment raises numerous socio-technical, clinical and legal issues that have become increasingly evident as many eHealth solutions have met with mixed success or failed to generate forecast benefits. There is a tendency to downplay the levels of complexity and uncertainty that exist in the delivery of health care services and make problematic assumptions about how ICTs will benefit patients, health professionals and the health system as a whole. More recently ‘user centred’ debates on quality of services, quality of care and how they can be achieved have become more visible. Unfortunately, these debates have also tended to be fragmented with a variety of approaches advocated, each based on different measures, using different evidence to support claims of improving quality.

Grol has reviewed many strategies, such as ‘Evidence Based Medicine’, ‘accreditation’ and ‘patient empowerment’, which claim to improve aspects of the healthcare system but, “Although efforts to integrate these approaches can be observed, different parties in health care usually adopt one specific approach without taking into account the achievements of the others” (Grol 2001, p. 2578). It is notable that all strategies view ICTs as potentially critical in achieving their respective objectives. But this, in-turn, raises the question of how ICTs can be designed and deployed to support and link these different strategies and the possible consequences for patients, professionals and the health system.

3. Health Service Organisations as Rich Complex Social Domains – BreastScreen Tasmania

BreastScreen Tasmania (BST) is a State Coordination Unit within the national breast screening program, BreastScreen Australia (BSA). The national Program was a project established in 1991 to bring together fragmented health service professional practices involved in breast cancer health work and provide an integrated quality service that would cost-effectively save women's lives by early detection of cancers.

Member organisations gain the benefits of legitimacy ('accredited' status) and government funding. Membership is conditional on successfully adopting and maintaining compliance with the National Accreditation Standards (NAS) (National Quality Management Review Committee 2002). The policies, procedures and methods for measuring compliance to standards were constructed to overcome the problems of fragmented, unevaluated care of women in the context of deaths by breast cancer. Standards compliance is a condition of Federal Government funding under the Public Health Outcomes Funding Agreement.

The NAS is the formal representation of breast screening practice integrated across multi-domains. The NAS and the Data Dictionary were constructed by representative members from radiology, pathology, surgery, community health education, counselling, and other professional practices such as epidemiology, data management and organisation management. The content of standards and measures, definitions for data and information processing, and formal descriptions of procedures and policies was negotiated in expert committees by representatives from each profession and also included input from representative consumers. This context of bringing together disparate professional practices into an integrated, coherent framework for screening women required artefacts that could objectively establish the legitimacy of the enterprise (value for health dollar: cost effectively saving lives) and the legitimacy of member organisation practice (appropriate quality: meeting standards).

"In terms of cost effectiveness, um, you know screening programs are measured in terms of cost per life year saved, and BreastScreen, because of how it's managed because of how it's done, is actually an extremely cost effective screening program. ... So, the organisational structure, the tight control, um the direct service provision, is actually a very cost-effective service model." Interview, July 2005

"Um, the great advantage of having standards is that you have well, more call it control in breast screen than in, well in any other medical situation that I know. There's over control, far too much of it. Um, but it's like everything else if you have far too much you get just enough." Interview, April 2006

... comment that the NAS had "too many standards" ... but it was because "they had to fight so hard to have screening so they put in standards for everything." Field notes, 5th July 2005

BST is part of Cancer Screening and Control Services, a branch of the Public and Environmental Health Service (PEHS) within the state Department of Health and Human Services (DHHS). Public/population health operates within the positivist scientific paradigm. Its activities of public health policy formulation and recommendations for interventions are

justified and evaluated on the basis of “Gold Standard” evidence consisting of scientific studies evidenced by statistics. Population-level health services manage the tension between affirming individual freedom of action and implementing and/or encouraging public policy which involves constraining individual actions as a responsibility for public health benefits; of taking the focus off individual benefit to the benefit of a statistically defined cohort.

The BreastScreen Program was established in Tasmania in 1993, and has been structured into three business models for delivering the service, each impacting BST’s capability to meet the NAS. The history of BST, compared with the history of its accreditation status, demonstrates that a “full-service” business model, without any outsourcing of the clinical aspects of the enterprise best enabled the Service to meet the NAS. Most Services within the national Program provide some clinical services; a few are structured for simply managing the non-clinical aspects of breast screening (the client record data, client bookings) and monitoring outsourced clinical services to regarding meeting accreditation requirements.

The NAS specifies that member organizations employ (or contract) three “designated” medical professionals (radiologist, pathologist and surgeon). Their role is to take responsibility for the compliance to the NAS of work done by members of their profession. The designated radiologist is also responsible to oversee and advise the Senior Specialist Radiographer who is responsible for radiography aspects of the Service. The designated clinicians are also given the role of educating members of their profession in the value of multi-disciplinary team work; best practice procedures and the levels of competency required if they wish to work within the national screening Program.

The medico-legal framework under which all medical practitioners work means that they must be able to demonstrate any work they do is competent as measured by ‘best practice’ within their profession, however compliance with the NAS is not part of their professional accreditation. Thus the existence of Program employing members of a profession which has clearly defined standards of best practice has a motivating effect in individuals increasing their skills and knowledge to the level considered competent by the accrediting organisation, even if they do not work within the Program. In this sense, NAS standards have been naturalised into the work of individuals who work as ‘designated’ professionals within the population health breast screening Program, and who have responsibility to ensure compliance with those standards by all members of the multi-disciplinary clinical team. Screening specific standards have also migrated into the various clinical professions to varying extent, but more slowly, and as a function of social relations and “collegial” persuasion.

“With the triple assessment which you get in BreastScreen: surgeon, pathologist, radiologist, um, the pathologists and the surgeons had to become part of a team looking after women’s breast disease rather than out in their rooms, accepting referrals. The pathologist had to come out of his ivory tower and muck in and say why he or she called it atypical, find out what sort of human effect that word ‘atypical’ has on the lady whose been given it. ... it’s not an exaggeration to say the NAS aspect of BreastScreen has affected medicine as a whole ... there is the awareness that it is being

done in a highly regulated fashion by BreastScreen and that therefore they have to come up to scratch with it.” Interview participant, April 2006.

Since ‘full-service provision’ was established as the business model (July 1st, 2004), BST’s status has shifted from under threat of losing accreditation status to awarded in 2005 the highest recognition of four year accreditation status. The internal arrangements of the organisation are structured such that work practices are continually negotiated at the level of teams: data staff, clinic reception staff, counsellors, administration, radiographers and medical staff members (radiologists, surgeons and pathologists). However, work practice adaptations are always within the confines of “meeting the NAS”, even if those confines are counterproductive or the accreditation reports are not fully utilised to enable benchmarking for member Service organisations.

In the meeting the strength of the population health paradigm and the quality and accreditation paradigm was very evident. That and politics (funding, FTEs, agency policy) meant that there was no room to restructure or give [name] relief in [role] work. Field notes, March 2006.

The accreditation site visit team prepare a report which is sent to the State Accreditation Committee and then to the NQMRC. I have been told ... that the data collected for Breast Screen Australia is used well at a local level, but not at national level, for example, “They get all this data and they should be sending it back out, re-engineered so that we can use it for benchmarking.” Field notes 5th July 2005

There is a clear division between staff members who are primarily devoted to work that supports BST maintaining its ‘accredited’ status, and those whose work is devoted to the enterprise of screening women for breast cancer. This division is evident in the physical location of staff members in the building, the artefacts they use in conducting their work, and the constant problems for the flow of information which occur because the physical client record (clinical practice artefact) and the client information system (accreditation artefact) must be manually synchronised. This division also creates a fundamental tension between accreditation work and clinical practice, particularly as BST health professionals and data staff are subject to increasing quality assurance processes and accreditation requirements.

[Name] asked a data staff person how she was going. The [person] was upset because they had to do 160 rebookings because of changes in the radiographers’ work shifts, which put them behind and was also very hard to do. “One lady’s appointment had to be changed twice!” Field notes, August 2005.

Within this context, ICTs have an integral role in quality assurance of health services: they enable collecting and managing vast quantities of data onto digital information systems and interrogation of the system to evaluate an organisation’s compliance to the standards (Clarke et al, 2003). BST is a highly regulated health service organization and as a member of BSA must currently comply with 176 standards, comprising the ‘best practice’ according to experts from professions including radiography, radiology, pathology and surgery as well as best practice in data management, management of client psycho-social needs and other

contributing professions. Standards compliance is a condition of Federal Government funding under the Public Health Outcomes Funding Agreement. The Program Manager and Data Managers are responsible for data used to measure compliance to the NAS.

“Unfortunately I think what has not occurred is an understanding of how the database links directly to our accreditation performance and there have been a number of things that just haven’t been captured because that understanding isn’t there. That this isn’t just about something we measure because we want to, but we have to perform against these boundaries and so that’s why there’s these requirements. And we have to report against it and no you can’t get rid of making appointments and reporting against each examination being done with individual machines because that’s a method of measuring the performance of the machine. So, yes, there are a number of issues actually about the grass roots operation that I think have been lost in the overall business case [for a new database].” Interview participant, August 2005.

Breast cancer screening participation is voluntary. Mammograms are perceived by the general public to be very painful which is a deterrent to participation and for BST the critical challenge is to how to balance encouraging participation by maintaining high quality ‘accredited’ care to participants with an accreditation imperative to screen 70% of women biennially in the target population (thereby potentially reducing time for personalised high quality care).

“the objective of the program is to screen as many women as we can. It’s not about having adequate time for chit chat, and social niceties, it is about an appropriate blend of providing an efficient service, so that we can screen as many women as possible so that we can save as many lives as possible. It’s not about looking after one woman’s individual needs; it’s about looking after all women’s mass needs.” Interview participant, August 2005.

4. Research Approach

4.1 Overview: Three Phase Multi-lens approach plus trajectories

At the broadest level the question underpinning this phase was, *“How should researchers explore the Information Systems of a rich, complex and social domain?”* More specifically, the research sought to address, *“What attributes of a research design will generate insights into an organisation and its context which are critical for IS design that is human centered?”* and, *“What techniques can be adopted to improve the translation of sociological insights into technical frameworks with a view to IS design and associated system of work practice (SoWP) design that enables an organisation to meet current and future challenges?”*

In terms of the specific RCSD, BST, the research approach needed analytic power to answer, *“What are the relationships between the situations of the work place, digital information technology/ other artefacts in the domain and the ways people perceive and do their work?”* The preliminary research identified a key relationship associated with a pervasive problem situation for BST. This was *the nexus between accreditation and practice* and this formed the

theme for new research questions: “*What are the consequences of the way this relationship is framed for people and the artefacts they use in their work situation?*” and “*What are the implications of this relationship for Information Systems and work practice systems?*”

The object of the research was to design and explore the utility of a flexible, adaptable research method 1) sharing the attributes of a range of established ethnographic approaches which successfully generate insight into people, place and thing (PPT) interactions and organisation situations; 2) building in techniques for critical reflection and reconceptualising the analysis in the light of data not fitting the constructs based on a particular framework’s assumptions and 3) capacity to generate new constructs that can be used to model the domain. A second research objective was to produce a model of structural relations within research domain, setting out the dimensions of a key problem theme which could be used to generate options for information system designs and guide discussion of implications for changes in the Information Systems (IS) or System of Work Practice (SoWP).

The research design for data collection and analysis deployed ethnographic and sociological analytic techniques over three phases of data collection and analysis. The first two phases of the method can be applied to any complex socio-technical domain for the purposes of sense-making and structuring understanding. The outcome of third phase is specific to the research setting, but the principles of the method can be applied more generally.

There is a variety of theoretical frameworks for investigating RCSDs in the literature that draw on ethnographic values, assumptions, theories and techniques to construct ways of representing PPT in a research setting and the interactions between them. However there is no comprehensive theory or set of constructs available in the literature that deal with the complexity of socio-technical systems (Halverson 2002).

The design of this research began with conceptualising key characteristics of three substantial theoretical approaches which successfully frame a setting in terms of PPT interactions. Distributed Cognition theory (DCog) focuses on the cognitive role of mediating artefacts and people-artefact cognitive interactions developing over time as a cultural phenomenon (Hutchins 1995). Communities of Practice theory (CoP) directs attention to the existence of mechanisms for sharing and distributing knowledge and information (people-brokers, artefacts-boundary objects) (Wenger 1998). Activity theory (AT) engenders thinking about PPT interactions as affected by tools, rules and division of labour for a given activity domain. It facilitates representing multiple perspectives (different subjects with different objectives) and helps identify misalignment between the possible objectives of an activity and elements used in the conduct of the activity (Engeström 1999).

These frameworks draw on ethnographic values, assumptions, theories and techniques to construct ways of representing people, place and things (PPT) in a research setting and the interactions between them. PPT frameworks are characterised by: 1) ethnographic techniques to capture a rich data set; 2) constructs to represent spatio-temporal interactions of people, place and things; 3) analysis for cultural and historical contextualisation of data; 4) techniques for challenging assumptions and generating new insights by redrawing the boundaries of what is under observation or changing the unit of analysis and 5) constructs

and theory for insights into structural relations in a PPT setting with implications for design of technical information systems.

Inspired by Checkland and Holwell (1998) in the quest for reflective IS research practice, the research method was designed to build in a dimension of iteratively ‘re-conceptualising’ the research at the levels of data collection and analysis. This approach was based on the premise that the researcher needs to actively construct or adapt a theory that fits the data best, adopting techniques to challenge their own presuppositions on what data is collected and critically evaluating how it is analysed. Given the agency of technological framing on IS design despite many efforts to address the problems of bias and translation, the research objective was to contribute to the effort to develop a research approach that addressed the issues in terms of theory and method. The research setting was selected for attributes that would support an exploratory research method and provide a rich data set for theory-making: a clear organisation boundary, multiple artefacts, perspectives and domains of interaction.

4.2 Phase One: Familiarisation and sense-making

The first phase drew on ethnographic and sociological techniques to guide collecting data from the setting and constructs from PPT-frameworks to provide initial structure to data collected. In the first phase, the researcher spent several months immersed as a participant observer in the research setting, becoming a familiar person within BST and seeking to make sense of the interactions, issues and activities as well as their emerging interrelationships.

It was anticipated that using established ethnographic and socio-analytic techniques would provide a suitable data set with which to explore a rich, complex social domain (RCSD). The technique of documenting multiple trajectories of interactions was planned to identify multiple perspectives, particularly those customer perspectives rendered invisible by the design of BST’s IS and work practice systems. The decision to apply different PPT analytic frames to the data was expected to facilitate identifying problem themes traversing the research setting and provide constructs for describing the structural elements and relations for modelling a problem situation in relation to a key theme.

In terms of data collection, this was done by adopting ethnographic data collection techniques (field observations and participation, interviews, document collection) and additionally using the trajectories technique to follow sequences PPT interactions beyond the focus of a local set of interactions wherever they led. Immersion involved observing people at work and conducting semi-structured interviews for insights into what was observed. Informal and observation-associated comments and conversations with staff members were recorded as field notes. The researcher also collected and reviewed over 200 organisation documents and scanned the wider health information environment by establishing automatic alerts of electronic content relevant to the health service context. BST community education and cancer policy staff members also made available their information resources.

Trajectory data captures the dynamics of a research domain, new perspectives and natural boundaries. In a suitable research organisation it is possible to follow trajectories of interactions focused on organisations, people, functions, information objects and perspectives

across place (geographical dimension) and time (historical-future dimension). Trajectory data can be used for identifying challenges and opportunities facing the domain. For example, the researcher physically followed 24 clients having a routine mammogram and seven clients on the clinical pathway for attending an assessment clinic through the series of interactions with BST and attended community education and recruitment activities. These were documented to identify *client* perspectives and assumptions about why and how they engage with the health service and to uncover customer perspectives rendered invisible by assumptions based on stereotypical 'client' personas and embedded in organisation system structures.

Client trajectories involving personal interactions with BST were connected to the branching trajectories of artefacts and people connected with those interactions beyond the immediate context. For example, the client record (CR) was transported by trolley between the data management area and the clinic area to ensure data on the physical CR was entered onto the Client Information System (CIS) and CIS generated labels and data collection forms were incorporated into the CR. Each CR-CIS interaction provided occasions for work system breakdowns involving individuals, work teams and the management staff of BST. Trajectory data could be used to trace and analyse the causes and effects of breakdowns beyond the immediate location of symptoms. The trajectories technique also provided data on different boundaries and perspectives operating within the organisation as well as the location of boundary crossing connections and interactions associated with problems in the organisation.

Different conceptualisations of what might be 'the problem situation' for BST were obtained by a multi-domain analysis which began by examining activity domains within BST and extended the analysis along trajectories of PPT interactions leading beyond the organisation boundaries to include other systems of activity which connect up and form its socio-technical context. Data for interactions beyond the borders of BST came from document analysis and interviews. The data was used to create a 'rich picture' of BST (Checkland et al. 1999).

4.3 Phase Two: identifying issues and choosing a problem theme

This phase focused on analysing the data for issues and problem themes. Theme discovery was facilitated by paying attention to aspects of the setting connected to problems for how BST conducted its breast screening enterprise. A theme was selected for further investigation according to its capacity to express a significant problem-situation, affecting at a structural level the information systems and work practice systems design in the research setting.

Potential 'problem themes' were identified from synergies generated by using different PPT frames of analysis for multi-domain data and changing the focus by moving beyond the boundaries of the initial unit of analysis. Focus changing included using the trajectories technique to uncover perspectives and structural relations not identified by specific PPT frameworks. The substantive problem theme which emerged from studying these interactions and was chosen as the research focus was *the nexus between accreditation and practice*. This theme traverses the organisation. The relationship between the conduct of the breast screening enterprise and the requirement to measure and report on the quality of the screening work done formed a constant locus of tension within the organisation which was observed in the field and a theme in ad hoc conversations with participants and in interviews.

Constructs available from the PPT frameworks were applied to describe and illuminate the elements of the *accreditation – practice nexus* and its consequences for the clients, staff members, the organisation (BST) and the national Program for the breast screening enterprise.

The trajectory data within the organisation indicated that there were disjunctive perspectives on the *nexus* which varied depending on the unit of analysis deployed. Disjunctions occurred along the natural boundaries of individual actors, teams within the organisation (function-based), communities of practice (knowledge and skills-based) and the organisation boundary. A disjunction was detected between social and technical factors or systems, such that propositions relating to the relationship between measurement of practice and the practice of work were often found to require choosing between prioritising technical constructions of measurement and of work practice over social constructions of measurement and practice.

Trajectories of PPT interactions in the organisation were followed across the formal boundary of the organisation to include interactions with any identifiable individuals (for example, potential clients), with the accrediting organisation BreastScreen Australia (BSA) and any organisation entities that engaged in interactions with BST. Trajectory data across multiple domains revealed the disjunctions in perspectives associated with the *accreditation – practice nexus* did not resolve with a multi-context of interest.

4.4 Phase Three: researching an emergent theme at the level of structure

Phase three of the research was designed to research the *accreditation – practice nexus* theme. The objective was to develop a set of constructs and a theoretical framework that explained BST's current situation and provided a model from which other possible constructions of the *nexus* suitable for alternative visions of BST and BSA could be considered.

PPT analytic techniques and constructs were re-applied to the data through the lens of the accreditation-practice nexus. Trial models of the complex social and technical interactions between various entities were constructed for various units of analysis: as cognitive systems (Dcog), communities of practice (CoP) and activity systems (AT). Where existing PPT constructs did not fit the data, the literature was examined for additional constructs or new ones developed out of the data.

The *accreditation - practice nexus* within BST was first modelled from a sociological perspective representing how it structured activity within the organisation. The model's constructs were: the *enterprise organisation*, the *accrediting organisation*, *individual health professionals working within BST who belong there as members of a community of practice* (Wenger 1998) and *network of practice* (Seely Brown et al. 2000) to which professionals belong as *members* (see Figure 1). The model included the concept of *boundary work* (Bowker et al. 2000). The analysis distinguished *boundary maintenance*, human activity required to create and maintain connections between multiple communities working together across and within organisational boundaries to achieve agreed objectives; *boundary objects* (Bowker et al. 2000; Wenger 1998) which are objects that serve the information needs of communities connected by mutual use without requiring change of meaning of data categories for each community and *boundary infrastructure*, regimes and networks of

boundary objects which “allow for local variation together with sufficient consistent structure to allow for the full array of bureaucratic tools ... to be applied” (Bowker et al. 2000).

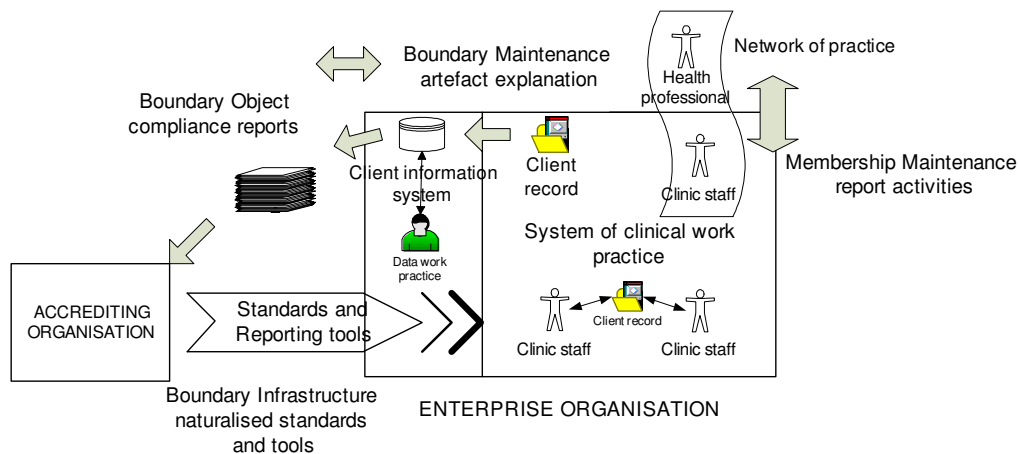


Figure 1: Accreditation – Practice nexus across activity domain boundaries

The structural models from this analysis indicated a different construction of integration for accreditation at the organisation-level to accreditation at the individual practice level. Accreditation of the organisation was constructed as *measurement by an integrating artefact*; accreditation of individuals is socially constructed *by multi-membership* (See Figure 1).

The data was also used to develop a model of BST as an accredited breast screening system. Figure 2 shows the multi-domain information interactions required of BST and staff members of BST. There are many ‘Government Department’ bodies to which BST must report to maintain its funding and accreditation status. ‘Professional Network’ refers to the many networks of practice, one of which professional staff members must report to maintain their accreditation status. This IS technical representation of BST was developed into data flow diagrams (DFDs) and Entity-Relationship (E-R) diagrams. These diagrams showed that from a technical perspective the individual-level accreditation of professionals and the organisation-level (BST) accreditation was fully integrated; the NAS were naturalised.

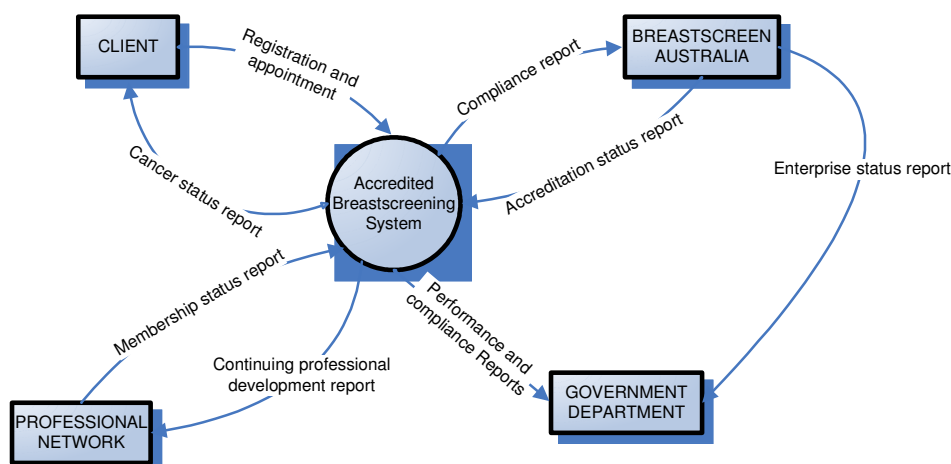


Figure 2: Context diagram – BST as an accredited breast screening system

Thus, one finding of this research, is that the sociologically oriented analysis indicated organisation-level accreditation was partially integrated with accreditation of individual staff members; one was an artefact construction and the other a social construction. Yet the technical IS analysis indicated that the artefacts used in the practice (CIS/CR, policy and procedure manuals) and rules followed for accreditation of the organisation (data dictionary and NAS) were fully integrated conceptually. That is, a qualitatively informed IS technical view of the *accreditation – practice nexus* was not supported by the perspective provided by the models from a multi-lens approach focussing on a problem theme for the RCSD.

5. Research Outcomes

5.1 Reducing techno-centrism

This paper has set out the challenges to human centered approaches within the IS discipline, notably the techno-centrism and translation for design issues that tend to marginalise and/or effectively dismiss rich user insights meant to inform design. The researchers' response was to critically reflect on these issues relating to IS design, and explore the adoption of a multi-lens approach to address them. The approach was described for the case of a health service organization which operates within a nexus of accreditation and practice that has significant impact on the properties and attributes of IS and work practice designs possible for the setting. The depth of data acquired for analysis and synergies of drawing on insights and perspectives from more than one theoretical source was demonstrated. The research approach highlighted the points of connection and interdependence of 'problem stories' traversing the multi-domains investigated which could then be constructed as a theme for exploration. This approach can reduce techno-centrism by producing conceptual models of the domain that highlight disjunctions between its conclusions and the conclusions an IS technical representation of the domain. For example, the insight that a well integrated technical system design for accreditation can create unsustainable work loads for staff and membership disjunctions for individuals regarding their professional identity and organisation identity, is an outcome that pushes against assumptions that a technology will be the endpoint of our activities and highlight the need to avoid evaluating technology focused decisions by solely technological or economic criteria.

5.2 Translation for IS and work practice design

The approach enables the researchers to develop conceptual models setting out the relations between constructs expressing a problem theme for an RCSD, and use them to explore implications and insights into its IS and work practice design.

The finding of a difference between the sociological and technical analyses of the RCSD prompted further analysis of the *accreditation – practice nexus* and the development of a continuum model (not presented here) to represent the social and technical indicators for various degrees of integration of interacting accreditation systems and RCSDs characterised by a requirement for IS that both measures and supports work practices.

Continuing this research, the model will be used to consider implications for the design of IS and work practice systems at the level of the national Program, accredited breast screening organisations, individual staff members and clients. It is expected that the models can be used to translate qualitative descriptions into high level IS design principles in complex social domains.

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Qualitative Research and Information Systems Design – Critical reflections from an eHealth Case study

Jo-Anne Kelder
University of Tasmania
JoAnne.Kelder@utas.edu.au

Associate Professor Paul Turner
University of Tasmania
Paul.Turner@utas.edu.au

Abstract

Academic and business environments increasingly accept the utility of diverse qualitative research approaches for informing the design, implementation and evaluation of information systems. However, there are concerns that inherent techno-centrism within the IS discipline distorts criteria for choosing and adapting approaches and, significantly, works to marginalise the opportunities qualitative insights provide to open up human-centered dialogue on new ways of thinking and designing (Gasson 2003). This paper presents a qualitative research approach designed to facilitate critical reflection and sensitise researchers' to implicit assumptions that technology will be the end-point of their activities and when judgments about criteria for successful designs are technologically and/or economically over-determined. The method endpoint is a conceptual framework constructed for the research domain which is the basis for translating sociological insights into implications for information systems and work practice in a public health service organisation.

Keywords: Qualitative Research, Critical Reflection, e-Health, Case Study.

1. Introduction

The paper presents a qualitative approach which critically reflects on and adapts ethnographic approaches for research in rich, complex social domains (RCSDs). Section 2 introduces the issues of techno-centrism and translation of insights for qualitative IS design approaches and discusses the problems in relation to the general context of e-health initiatives in the Australian health care system. Section 3 describes an accredited public health service organization, BreastScreen Tasmania (BST). BST was chosen for attributes indicating it was a suitable RCSD in which to explore the utility of a research design which incorporates a range of ethnographic techniques and analytic frameworks. The case provides a structural account of the organisation and samples of the data on which the constructs and models describing a theoretical understanding of the organisation was derived. It is not possible to disguise the identity of the organisation so in order to protect participants quotes do not identify their role within the organisation. Section 4 describes the research approach for BST. The research design consisted of three phases, each contingent on the previous phase. Phase one of the method is devoted to sense-making. It is a method for exploring and understanding a social setting at various units of analysis (individual, community/team, organisation level), from multiple perspectives and through various theoretical lenses, using distributed cognition theory (DCog) (Hutchins 1995), Communities of Practice theory (CoP) (Wenger 1998) and Activity theory (AT) (Engeström 1999). Phase two – identifying a key theme – is a method for identifying a theme expressing at a structural level a key problem situation in an

organisation setting in which information systems play significant role. Phase three – theme conceptualising – is a method for researching the chosen theme in order to conceptually model the elements and develop constructs to express the qualities, attributes and relations between the elements with a view to explore and identify implications for IS and work practice. Section 5 comments on the preliminary outcomes of the approach in relation to the issues of techno-centrism and translation for IS design. It provides a brief introduction to how the set of conceptual models can be used for understanding the chosen problem theme for BST, *the nexus between accreditation and practice* and to draw out implications and insights of relevance to IS and work practice design decisions.

2. Qualitative IS research approaches and the health services domain

Literature presenting and commenting on IS research points to the need for a human centred understanding of both the social and technical aspects of human activity and system-level understanding of interactions involving them over time and space (Checkland et al. 1999; Walsham 1993). From within the information systems discipline, qualitative approaches have increasingly been deployed to generate understanding of RCSDs and to inform the design of more human-centred information systems (Nemeth, 2006; Bate, 2002). However, the IS discipline and its use of these qualitative approaches emerges as itself historically situated. While previously dominated by positivism, (Chen et al. 2004; Orlikowski et al. 2002 [1991]), it is only in the last 10-15 years that systems perspectives acknowledging the significance of human actors *and* the need to deploy qualitative approaches to access and describe the perspectives of people using technologies and working together has become accepted (Checkland et al. 1999).

Contemporary human or user-centred approaches have positively influenced IS designs to the benefit of end-users, increasing ease of use, trust and satisfaction (Garrety et al. 2004). However, critical reflection on such approaches and their underlying suppositions identified concerns about the process of translation that occurs between the rich user insights generated by in-depth study of an RCSD to the systems that are finally built (Kelder et al. 2005). This factor in turn poses questions about how the adaptation of these methodologies to sensitise our gaze to *informational* aspects of phenomena being studied artificially prioritises these elements over others within the system. In a very real sense, information systems involving people, places and things (PPT) pre-date contemporary information systems supported by digital information and communication technologies (ICTs). Therefore IS qualitative researchers should also remain aware of the fact that many of the most important aspects of information systems are tacit, intangible and unsuitable for formal representation or codification. As a result, fundamental questions also need to be asked about the consequences of marginalising these aspects in the process of translation to technical designs.

While conducting human-centred computing (HCC) design is clearly complex and difficult, implicit techno-centrism inherent within IS design processes may relegate the rich insights generated to mere adjuncts of conventional usability testing and marginalise opportunities to open up dialogues on new ways of thinking and designing (Gasson 2003). This ‘failure in translation’ is a challenge to the use of sophisticated qualitative techniques to understand and explain the rich socio-cultural complexities of organisational life (Kelder & Turner, 2005).

Put crudely, unless the insights generated by these techniques can be translated more meaningfully than as a means to make techno-centric design decisions more palatable (Kujala, 2003), there is a danger that in the name of technical, financial or other factors these research insights can be used to subvert, marginalise or even obscure the very user issues they raise.

It is possible to explain how this failure in translation can occur by recognizing that most IS design activities are uncritically framed as problems with technological solutions and the different paradigms within IS for representing and communicating insights (process vs. data, procedural vs. declarative, use cases vs. data flow diagrams) are objective and technology focused. More significantly, it is also important to acknowledge that across the range of qualitative methodologies and techniques IS draws on to inform design, few, if any, were originally developed to produce outputs suitable for translation into functional specifications.

The issue of technological framing is especially pressing in RCSDs such as health care organisations which are part of a health system that is officially ‘in crisis.’ As a consequence health reform to address capacity issues due to ageing populations and advances in medical knowledge and technologies (Alvarez 2005; Caro 2005; Oliver et al. 2001) is at the forefront of most political and policy agendas. E-health initiatives have been identified as critical to respond to the crisis (Pagliari et al. 2005) and reform discussions concentrate on the need for ICTs to provide information to 1) support health services practitioners in the conduct of their work; 2) measure health services practice for quality assurance and 3) support health service clients in making decisions related to their physical well-being.

By supporting improved information access, update and evaluation the economic case for ICTs is strong. However, their design and deployment raises numerous socio-technical, clinical and legal issues that have become increasingly evident as many eHealth solutions have met with mixed success or failed to generate forecast benefits. There is a tendency to downplay the levels of complexity and uncertainty that exist in the delivery of health care services and make problematic assumptions about how ICTs will benefit patients, health professionals and the health system as a whole. More recently ‘user centred’ debates on quality of services, quality of care and how they can be achieved have become more visible. Unfortunately, these debates have also tended to be fragmented with a variety of approaches advocated, each based on different measures, using different evidence to support claims of improving quality.

Grol has reviewed many strategies, such as ‘Evidence Based Medicine’, ‘accreditation’ and ‘patient empowerment’, which claim to improve aspects of the healthcare system but, “Although efforts to integrate these approaches can be observed, different parties in health care usually adopt one specific approach without taking into account the achievements of the others” (Grol 2001, p. 2578). It is notable that all strategies view ICTs as potentially critical in achieving their respective objectives. But this, in-turn, raises the question of how ICTs can be designed and deployed to support and link these different strategies and the possible consequences for patients, professionals and the health system.

3. Health Service Organisations as Rich Complex Social Domains – BreastScreen Tasmania

BreastScreen Tasmania (BST) is a State Coordination Unit within the national breast screening program, BreastScreen Australia (BSA). The national Program was a project established in 1991 to bring together fragmented health service professional practices involved in breast cancer health work and provide an integrated quality service that would cost-effectively save women's lives by early detection of cancers.

Member organisations gain the benefits of legitimacy ('accredited' status) and government funding. Membership is conditional on successfully adopting and maintaining compliance with the National Accreditation Standards (NAS) (National Quality Management Review Committee 2002). The policies, procedures and methods for measuring compliance to standards were constructed to overcome the problems of fragmented, unevaluated care of women in the context of deaths by breast cancer. Standards compliance is a condition of Federal Government funding under the Public Health Outcomes Funding Agreement.

The NAS is the formal representation of breast screening practice integrated across multi-domains. The NAS and the Data Dictionary were constructed by representative members from radiology, pathology, surgery, community health education, counselling, and other professional practices such as epidemiology, data management and organisation management. The content of standards and measures, definitions for data and information processing, and formal descriptions of procedures and policies was negotiated in expert committees by representatives from each profession and also included input from representative consumers. This context of bringing together disparate professional practices into an integrated, coherent framework for screening women required artefacts that could objectively establish the legitimacy of the enterprise (value for health dollar: cost effectively saving lives) and the legitimacy of member organisation practice (appropriate quality: meeting standards).

"In terms of cost effectiveness, um, you know screening programs are measured in terms of cost per life year saved, and BreastScreen, because of how it's managed because of how it's done, is actually an extremely cost effective screening program. ... So, the organisational structure, the tight control, um the direct service provision, is actually a very cost-effective service model." Interview, July 2005

"Um, the great advantage of having standards is that you have well, more call it control in breast screen than in, well in any other medical situation that I know. There's over control, far too much of it. Um, but it's like everything else if you have far too much you get just enough." Interview, April 2006

... comment that the NAS had "too many standards" ... but it was because "they had to fight so hard to have screening so they put in standards for everything." Field notes, 5th July 2005

BST is part of Cancer Screening and Control Services, a branch of the Public and Environmental Health Service (PEHS) within the state Department of Health and Human Services (DHHS). Public/population health operates within the positivist scientific paradigm. Its activities of public health policy formulation and recommendations for interventions are

justified and evaluated on the basis of “Gold Standard” evidence consisting of scientific studies evidenced by statistics. Population-level health services manage the tension between affirming individual freedom of action and implementing and/or encouraging public policy which involves constraining individual actions as a responsibility for public health benefits; of taking the focus off individual benefit to the benefit of a statistically defined cohort.

The BreastScreen Program was established in Tasmania in 1993, and has been structured into three business models for delivering the service, each impacting BST’s capability to meet the NAS. The history of BST, compared with the history of its accreditation status, demonstrates that a “full-service” business model, without any outsourcing of the clinical aspects of the enterprise best enabled the Service to meet the NAS. Most Services within the national Program provide some clinical services; a few are structured for simply managing the non-clinical aspects of breast screening (the client record data, client bookings) and monitoring outsourced clinical services to regarding meeting accreditation requirements.

The NAS specifies that member organizations employ (or contract) three “designated” medical professionals (radiologist, pathologist and surgeon). Their role is to take responsibility for the compliance to the NAS of work done by members of their profession. The designated radiologist is also responsible to oversee and advise the Senior Specialist Radiographer who is responsible for radiography aspects of the Service. The designated clinicians are also given the role of educating members of their profession in the value of multi-disciplinary team work; best practice procedures and the levels of competency required if they wish to work within the national screening Program.

The medico-legal framework under which all medical practitioners work means that they must be able to demonstrate any work they do is competent as measured by ‘best practice’ within their profession, however compliance with the NAS is not part of their professional accreditation. Thus the existence of Program employing members of a profession which has clearly defined standards of best practice has a motivating effect in individuals increasing their skills and knowledge to the level considered competent by the accrediting organisation, even if they do not work within the Program. In this sense, NAS standards have been naturalised into the work of individuals who work as ‘designated’ professionals within the population health breast screening Program, and who have responsibility to ensure compliance with those standards by all members of the multi-disciplinary clinical team. Screening specific standards have also migrated into the various clinical professions to varying extent, but more slowly, and as a function of social relations and “collegial” persuasion.

“With the triple assessment which you get in BreastScreen: surgeon, pathologist, radiologist, um, the pathologists and the surgeons had to become part of a team looking after women’s breast disease rather than out in their rooms, accepting referrals. The pathologist had to come out of his ivory tower and muck in and say why he or she called it atypical, find out what sort of human effect that word ‘atypical’ has on the lady whose been given it. ... it’s not an exaggeration to say the NAS aspect of BreastScreen has affected medicine as a whole ... there is the awareness that it is being

done in a highly regulated fashion by BreastScreen and that therefore they have to come up to scratch with it.” Interview participant, April 2006.

Since ‘full-service provision’ was established as the business model (July 1st, 2004), BST’s status has shifted from under threat of losing accreditation status to awarded in 2005 the highest recognition of four year accreditation status. The internal arrangements of the organisation are structured such that work practices are continually negotiated at the level of teams: data staff, clinic reception staff, counsellors, administration, radiographers and medical staff members (radiologists, surgeons and pathologists). However, work practice adaptations are always within the confines of “meeting the NAS”, even if those confines are counterproductive or the accreditation reports are not fully utilised to enable benchmarking for member Service organisations.

In the meeting the strength of the population health paradigm and the quality and accreditation paradigm was very evident. That and politics (funding, FTEs, agency policy) meant that there was no room to restructure or give [name] relief in [role] work. Field notes, March 2006.

The accreditation site visit team prepare a report which is sent to the State Accreditation Committee and then to the NQMRC. I have been told ... that the data collected for Breast Screen Australia is used well at a local level, but not at national level, for example, “They get all this data and they should be sending it back out, re-engineered so that we can use it for benchmarking.” Field notes 5th July 2005

There is a clear division between staff members who are primarily devoted to work that supports BST maintaining its ‘accredited’ status, and those whose work is devoted to the enterprise of screening women for breast cancer. This division is evident in the physical location of staff members in the building, the artefacts they use in conducting their work, and the constant problems for the flow of information which occur because the physical client record (clinical practice artefact) and the client information system (accreditation artefact) must be manually synchronised. This division also creates a fundamental tension between accreditation work and clinical practice, particularly as BST health professionals and data staff are subject to increasing quality assurance processes and accreditation requirements.

[Name] asked a data staff person how she was going. The [person] was upset because they had to do 160 rebookings because of changes in the radiographers’ work shifts, which put them behind and was also very hard to do. “One lady’s appointment had to be changed twice!” Field notes, August 2005.

Within this context, ICTs have an integral role in quality assurance of health services: they enable collecting and managing vast quantities of data onto digital information systems and interrogation of the system to evaluate an organisation’s compliance to the standards (Clarke et al, 2003). BST is a highly regulated health service organization and as a member of BSA must currently comply with 176 standards, comprising the ‘best practice’ according to experts from professions including radiography, radiology, pathology and surgery as well as best practice in data management, management of client psycho-social needs and other

contributing professions. Standards compliance is a condition of Federal Government funding under the Public Health Outcomes Funding Agreement. The Program Manager and Data Managers are responsible for data used to measure compliance to the NAS.

“Unfortunately I think what has not occurred is an understanding of how the database links directly to our accreditation performance and there have been a number of things that just haven’t been captured because that understanding isn’t there. That this isn’t just about something we measure because we want to, but we have to perform against these boundaries and so that’s why there’s these requirements. And we have to report against it and no you can’t get rid of making appointments and reporting against each examination being done with individual machines because that’s a method of measuring the performance of the machine. So, yes, there are a number of issues actually about the grass roots operation that I think have been lost in the overall business case [for a new database].” Interview participant, August 2005.

Breast cancer screening participation is voluntary. Mammograms are perceived by the general public to be very painful which is a deterrent to participation and for BST the critical challenge is to how to balance encouraging participation by maintaining high quality ‘accredited’ care to participants with an accreditation imperative to screen 70% of women biennially in the target population (thereby potentially reducing time for personalised high quality care).

“the objective of the program is to screen as many women as we can. It’s not about having adequate time for chit chat, and social niceties, it is about an appropriate blend of providing an efficient service, so that we can screen as many women as possible so that we can save as many lives as possible. It’s not about looking after one woman’s individual needs; it’s about looking after all women’s mass needs.” Interview participant, August 2005.

4. Research Approach

4.1 Overview: Three Phase Multi-lens approach plus trajectories

At the broadest level the question underpinning this phase was, *“How should researchers explore the Information Systems of a rich, complex and social domain?”* More specifically, the research sought to address, *“What attributes of a research design will generate insights into an organisation and its context which are critical for IS design that is human centered?”* and, *“What techniques can be adopted to improve the translation of sociological insights into technical frameworks with a view to IS design and associated system of work practice (SoWP) design that enables an organisation to meet current and future challenges?”*

In terms of the specific RCSD, BST, the research approach needed analytic power to answer, *“What are the relationships between the situations of the work place, digital information technology/ other artefacts in the domain and the ways people perceive and do their work?”* The preliminary research identified a key relationship associated with a pervasive problem situation for BST. This was *the nexus between accreditation and practice* and this formed the

theme for new research questions: “*What are the consequences of the way this relationship is framed for people and the artefacts they use in their work situation?*” and “*What are the implications of this relationship for Information Systems and work practice systems?*”

The object of the research was to design and explore the utility of a flexible, adaptable research method 1) sharing the attributes of a range of established ethnographic approaches which successfully generate insight into people, place and thing (PPT) interactions and organisation situations; 2) building in techniques for critical reflection and reconceptualising the analysis in the light of data not fitting the constructs based on a particular framework’s assumptions and 3) capacity to generate new constructs that can be used to model the domain. A second research objective was to produce a model of structural relations within research domain, setting out the dimensions of a key problem theme which could be used to generate options for information system designs and guide discussion of implications for changes in the Information Systems (IS) or System of Work Practice (SoWP).

The research design for data collection and analysis deployed ethnographic and sociological analytic techniques over three phases of data collection and analysis. The first two phases of the method can be applied to any complex socio-technical domain for the purposes of sense-making and structuring understanding. The outcome of third phase is specific to the research setting, but the principles of the method can be applied more generally.

There is a variety of theoretical frameworks for investigating RCSDs in the literature that draw on ethnographic values, assumptions, theories and techniques to construct ways of representing PPT in a research setting and the interactions between them. However there is no comprehensive theory or set of constructs available in the literature that deal with the complexity of socio-technical systems (Halverson 2002).

The design of this research began with conceptualising key characteristics of three substantial theoretical approaches which successfully frame a setting in terms of PPT interactions. Distributed Cognition theory (DCog) focuses on the cognitive role of mediating artefacts and people-artefact cognitive interactions developing over time as a cultural phenomenon (Hutchins 1995). Communities of Practice theory (CoP) directs attention to the existence of mechanisms for sharing and distributing knowledge and information (people-brokers, artefacts-boundary objects) (Wenger 1998). Activity theory (AT) engenders thinking about PPT interactions as affected by tools, rules and division of labour for a given activity domain. It facilitates representing multiple perspectives (different subjects with different objectives) and helps identify misalignment between the possible objectives of an activity and elements used in the conduct of the activity (Engeström 1999).

These frameworks draw on ethnographic values, assumptions, theories and techniques to construct ways of representing people, place and things (PPT) in a research setting and the interactions between them. PPT frameworks are characterised by: 1) ethnographic techniques to capture a rich data set; 2) constructs to represent spatio-temporal interactions of people, place and things; 3) analysis for cultural and historical contextualisation of data; 4) techniques for challenging assumptions and generating new insights by redrawing the boundaries of what is under observation or changing the unit of analysis and 5) constructs

and theory for insights into structural relations in a PPT setting with implications for design of technical information systems.

Inspired by Checkland and Holwell (1998) in the quest for reflective IS research practice, the research method was designed to build in a dimension of iteratively ‘re-conceptualising’ the research at the levels of data collection and analysis. This approach was based on the premise that the researcher needs to actively construct or adapt a theory that fits the data best, adopting techniques to challenge their own presuppositions on what data is collected and critically evaluating how it is analysed. Given the agency of technological framing on IS design despite many efforts to address the problems of bias and translation, the research objective was to contribute to the effort to develop a research approach that addressed the issues in terms of theory and method. The research setting was selected for attributes that would support an exploratory research method and provide a rich data set for theory-making: a clear organisation boundary, multiple artefacts, perspectives and domains of interaction.

4.2 Phase One: Familiarisation and sense-making

The first phase drew on ethnographic and sociological techniques to guide collecting data from the setting and constructs from PPT-frameworks to provide initial structure to data collected. In the first phase, the researcher spent several months immersed as a participant observer in the research setting, becoming a familiar person within BST and seeking to make sense of the interactions, issues and activities as well as their emerging interrelationships.

It was anticipated that using established ethnographic and socio-analytic techniques would provide a suitable data set with which to explore a rich, complex social domain (RCSD). The technique of documenting multiple trajectories of interactions was planned to identify multiple perspectives, particularly those customer perspectives rendered invisible by the design of BST’s IS and work practice systems. The decision to apply different PPT analytic frames to the data was expected to facilitate identifying problem themes traversing the research setting and provide constructs for describing the structural elements and relations for modelling a problem situation in relation to a key theme.

In terms of data collection, this was done by adopting ethnographic data collection techniques (field observations and participation, interviews, document collection) and additionally using the trajectories technique to follow sequences PPT interactions beyond the focus of a local set of interactions wherever they led. Immersion involved observing people at work and conducting semi-structured interviews for insights into what was observed. Informal and observation-associated comments and conversations with staff members were recorded as field notes. The researcher also collected and reviewed over 200 organisation documents and scanned the wider health information environment by establishing automatic alerts of electronic content relevant to the health service context. BST community education and cancer policy staff members also made available their information resources.

Trajectory data captures the dynamics of a research domain, new perspectives and natural boundaries. In a suitable research organisation it is possible to follow trajectories of interactions focused on organisations, people, functions, information objects and perspectives

across place (geographical dimension) and time (historical-future dimension). Trajectory data can be used for identifying challenges and opportunities facing the domain. For example, the researcher physically followed 24 clients having a routine mammogram and seven clients on the clinical pathway for attending an assessment clinic through the series of interactions with BST and attended community education and recruitment activities. These were documented to identify *client* perspectives and assumptions about why and how they engage with the health service and to uncover customer perspectives rendered invisible by assumptions based on stereotypical 'client' personas and embedded in organisation system structures.

Client trajectories involving personal interactions with BST were connected to the branching trajectories of artefacts and people connected with those interactions beyond the immediate context. For example, the client record (CR) was transported by trolley between the data management area and the clinic area to ensure data on the physical CR was entered onto the Client Information System (CIS) and CIS generated labels and data collection forms were incorporated into the CR. Each CR-CIS interaction provided occasions for work system breakdowns involving individuals, work teams and the management staff of BST. Trajectory data could be used to trace and analyse the causes and effects of breakdowns beyond the immediate location of symptoms. The trajectories technique also provided data on different boundaries and perspectives operating within the organisation as well as the location of boundary crossing connections and interactions associated with problems in the organisation.

Different conceptualisations of what might be 'the problem situation' for BST were obtained by a multi-domain analysis which began by examining activity domains within BST and extended the analysis along trajectories of PPT interactions leading beyond the organisation boundaries to include other systems of activity which connect up and form its socio-technical context. Data for interactions beyond the borders of BST came from document analysis and interviews. The data was used to create a 'rich picture' of BST (Checkland et al. 1999).

4.3 Phase Two: identifying issues and choosing a problem theme

This phase focused on analysing the data for issues and problem themes. Theme discovery was facilitated by paying attention to aspects of the setting connected to problems for how BST conducted its breast screening enterprise. A theme was selected for further investigation according to its capacity to express a significant problem-situation, affecting at a structural level the information systems and work practice systems design in the research setting.

Potential 'problem themes' were identified from synergies generated by using different PPT frames of analysis for multi-domain data and changing the focus by moving beyond the boundaries of the initial unit of analysis. Focus changing included using the trajectories technique to uncover perspectives and structural relations not identified by specific PPT frameworks. The substantive problem theme which emerged from studying these interactions and was chosen as the research focus was *the nexus between accreditation and practice*. This theme traverses the organisation. The relationship between the conduct of the breast screening enterprise and the requirement to measure and report on the quality of the screening work done formed a constant locus of tension within the organisation which was observed in the field and a theme in ad hoc conversations with participants and in interviews.

Constructs available from the PPT frameworks were applied to describe and illuminate the elements of the *accreditation – practice nexus* and its consequences for the clients, staff members, the organisation (BST) and the national Program for the breast screening enterprise.

The trajectory data within the organisation indicated that there were disjunctive perspectives on the *nexus* which varied depending on the unit of analysis deployed. Disjunctions occurred along the natural boundaries of individual actors, teams within the organisation (function-based), communities of practice (knowledge and skills-based) and the organisation boundary. A disjunction was detected between social and technical factors or systems, such that propositions relating to the relationship between measurement of practice and the practice of work were often found to require choosing between prioritising technical constructions of measurement and of work practice over social constructions of measurement and practice.

Trajectories of PPT interactions in the organisation were followed across the formal boundary of the organisation to include interactions with any identifiable individuals (for example, potential clients), with the accrediting organisation BreastScreen Australia (BSA) and any organisation entities that engaged in interactions with BST. Trajectory data across multiple domains revealed the disjunctions in perspectives associated with the *accreditation – practice nexus* did not resolve with a multi-context of interest.

4.4 Phase Three: researching an emergent theme at the level of structure

Phase three of the research was designed to research the *accreditation – practice nexus* theme. The objective was to develop a set of constructs and a theoretical framework that explained BST's current situation and provided a model from which other possible constructions of the *nexus* suitable for alternative visions of BST and BSA could be considered.

PPT analytic techniques and constructs were re-applied to the data through the lens of the accreditation-practice nexus. Trial models of the complex social and technical interactions between various entities were constructed for various units of analysis: as cognitive systems (Dcog), communities of practice (CoP) and activity systems (AT). Where existing PPT constructs did not fit the data, the literature was examined for additional constructs or new ones developed out of the data.

The *accreditation - practice nexus* within BST was first modelled from a sociological perspective representing how it structured activity within the organisation. The model's constructs were: the *enterprise organisation*, the *accrediting organisation*, *individual health professionals working within BST who belong there as members of a community of practice* (Wenger 1998) and *network of practice* (Seely Brown et al. 2000) to which professionals belong as *members* (see Figure 1). The model included the concept of *boundary work* (Bowker et al. 2000). The analysis distinguished *boundary maintenance*, human activity required to create and maintain connections between multiple communities working together across and within organisational boundaries to achieve agreed objectives; *boundary objects* (Bowker et al. 2000; Wenger 1998) which are objects that serve the information needs of communities connected by mutual use without requiring change of meaning of data categories for each community and *boundary infrastructure*, regimes and networks of

boundary objects which “allow for local variation together with sufficient consistent structure to allow for the full array of bureaucratic tools ... to be applied” (Bowker et al. 2000).

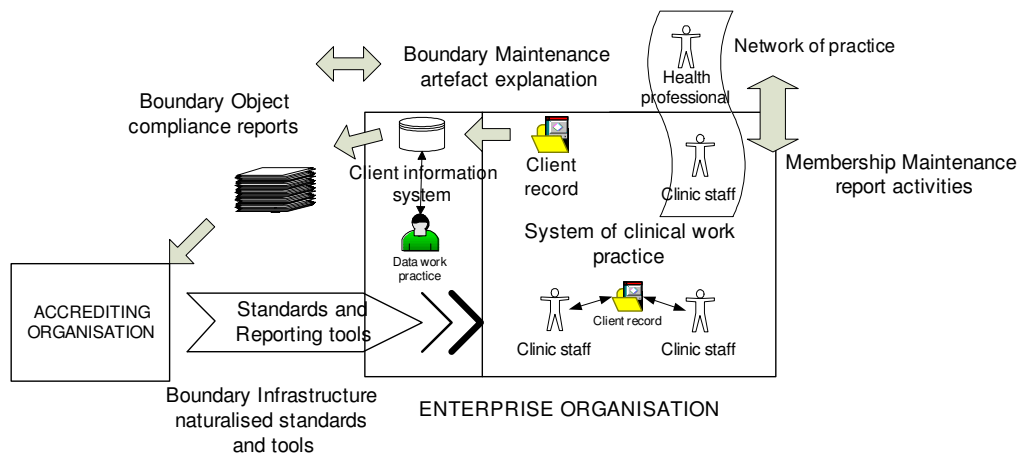


Figure 1: Accreditation – Practice nexus across activity domain boundaries

The structural models from this analysis indicated a different construction of integration for accreditation at the organisation-level to accreditation at the individual practice level. Accreditation of the organisation was constructed as *measurement by an integrating artefact*; accreditation of individuals is socially constructed *by multi-membership* (See Figure 1).

The data was also used to develop a model of BST as an accredited breast screening system. Figure 2 shows the multi-domain information interactions required of BST and staff members of BST. There are many ‘Government Department’ bodies to which BST must report to maintain its funding and accreditation status. ‘Professional Network’ refers to the many networks of practice, one of which professional staff members must report to maintain their accreditation status. This IS technical representation of BST was developed into data flow diagrams (DFDs) and Entity-Relationship (E-R) diagrams. These diagrams showed that from a technical perspective the individual-level accreditation of professionals and the organisation-level (BST) accreditation was fully integrated; the NAS were naturalised.

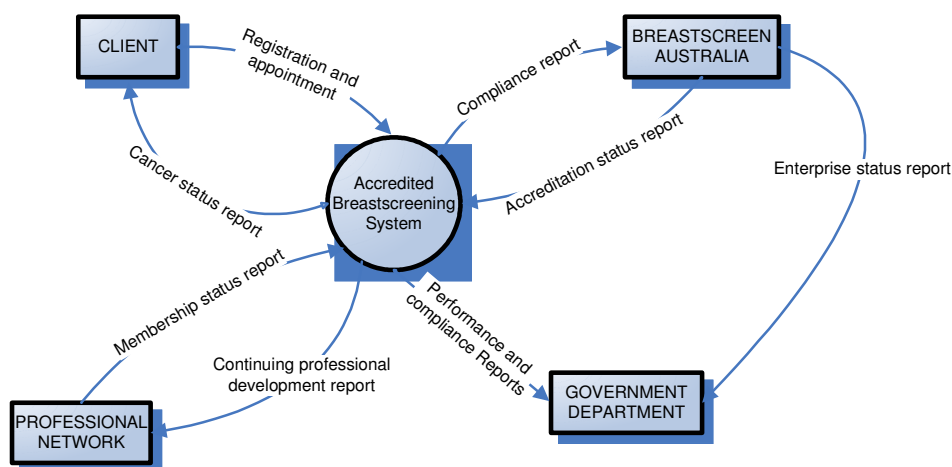


Figure 2: Context diagram – BST as an accredited breast screening system

Thus, one finding of this research, is that the sociologically oriented analysis indicated organisation-level accreditation was partially integrated with accreditation of individual staff members; one was an artefact construction and the other a social construction. Yet the technical IS analysis indicated that the artefacts used in the practice (CIS/CR, policy and procedure manuals) and rules followed for accreditation of the organisation (data dictionary and NAS) were fully integrated conceptually. That is, a qualitatively informed IS technical view of the *accreditation – practice nexus* was not supported by the perspective provided by the models from a multi-lens approach focussing on a problem theme for the RCSD.

5. Research Outcomes

5.1 Reducing techno-centrism

This paper has set out the challenges to human centered approaches within the IS discipline, notably the techno-centrism and translation for design issues that tend to marginalise and/or effectively dismiss rich user insights meant to inform design. The researchers' response was to critically reflect on these issues relating to IS design, and explore the adoption of a multi-lens approach to address them. The approach was described for the case of a health service organization which operates within a nexus of accreditation and practice that has significant impact on the properties and attributes of IS and work practice designs possible for the setting. The depth of data acquired for analysis and synergies of drawing on insights and perspectives from more than one theoretical source was demonstrated. The research approach highlighted the points of connection and interdependence of 'problem stories' traversing the multi-domains investigated which could then be constructed as a theme for exploration. This approach can reduce techno-centrism by producing conceptual models of the domain that highlight disjunctions between its conclusions and the conclusions an IS technical representation of the domain. For example, the insight that a well integrated technical system design for accreditation can create unsustainable work loads for staff and membership disjunctions for individuals regarding their professional identity and organisation identity, is an outcome that pushes against assumptions that a technology will be the endpoint of our activities and highlight the need to avoid evaluating technology focused decisions by solely technological or economic criteria.

5.2 Translation for IS and work practice design

The approach enables the researchers to develop conceptual models setting out the relations between constructs expressing a problem theme for an RCSD, and use them to explore implications and insights into its IS and work practice design.

The finding of a difference between the sociological and technical analyses of the RCSD prompted further analysis of the *accreditation – practice nexus* and the development of a continuum model (not presented here) to represent the social and technical indicators for various degrees of integration of interacting accreditation systems and RCSDs characterised by a requirement for IS that both measures and supports work practices.

Continuing this research, the model will be used to consider implications for the design of IS and work practice systems at the level of the national Program, accredited breast screening organisations, individual staff members and clients. It is expected that the models can be used to translate qualitative descriptions into high level IS design principles in complex social domains.

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