

An Information Ecology Structured by a Nexus between Accreditation and Practice: Boundary Objects, Brokers and Translation across the Boundaries of Standards Compliance and Practice-oriented Work

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Abstract

BreastScreen Tasmania (BST) is a health service organisation with a complex information ecology dominated by information integration and work practice standardization embodied in the client record. The client record is oriented to provide evidence of organization-level standards compliance. Client record data is also used to support professional practice specific communication, the coordination of multi-disciplinary breast screening practices and client-specific decision-making. The paper illustrates how the client record is a boundary object structured by a nexus between accreditation and practice. This nexus is the impetus for broker roles and boundary object design efforts to manage the different requirements and meanings of information in BST. The findings highlight how despite the full integration of the information systems design to support accreditation and practice, disjunctions occur that require considerable human activity to coordinate, explain, align and prioritize meanings. These meanings have significant ethical and moral implications for the nature of breast screening services.

1. Introduction

Modern health service organizations are increasingly deploying information systems (IS) with aim of supporting integrated data management, standardized work practices and client-oriented service delivery. The aspiration is to deliver efficient access to evidence-based medical information and client-related information to support ‘best practice’ care decisions. However there are significant political, ethical and organizational issues embedded in a drive to bring together data oriented from multiple perspectives for very different decision-making priorities and purposes [1].

Social and technical attempts to integrate differing information orientations can result in disjunctions at the level of data elements, work processes and world-views. Information systems and work practice systems designed to support

interactions within and between socio-technical systems of human activity [2] need to identify the different information orientations being brought together under these integrated systems. They also need to understand the relationships between them and the social and technical structures required to maintain or transition those relationships.

This paper draws on empirical data from an 18 month ethnographic study exploring the substantive, methodological and theoretical implications of the information systems design within a public health service organization: BreastScreen Tasmania (BST). BST is an accredited member organisation of BreastScreen Australia, the accrediting organisation for the national breast screening program. Section 2 of this paper presents the conceptual background and rationale underlying the research questions and approach utilized. Section 3 describes the research method in detail and Section 4 presents empirical data from the BST case. Section 5 presents two models from the data analysis. The first model (Figure 1) represents the three main information orientations designed into the information systems, artifacts and work practices in BST to produce “a high quality service to women attending for screening and assessment” [3]. The second model (Figure 2) represents the outworking of the *accreditation – practice nexus* in which information for individual-level and organisation-level accreditation are technically integrated into the client record in terms of data elements and work processes. This model highlights how the meaning of individual client record information from a *practice-orientation* is not always congruent with its meaning from an *evidence-orientation*. Section 6 discusses the implications of these findings for the client record as *boundary object* and the *institutionalized broker* roles designed to integrate different information orientations required for accreditation and practice.

2. Conceptual Background

There is no one comprehensive theory or set of constructs available that deal with the

complexity of socio-technical systems [4]. Despite qualitative research efforts to address the problems of technology bias and socio- to technical translation [5], the issue of ‘technological framing’ in IS design [6] inspired an objective in this research to contribute to the effort of conceptualizing and conducting IS research in a manner that is human-centered [7].

As a consequence a primary objective in this research was to develop a flexible and adaptable research method for the BST setting. This method aspires to 1) draw on the attributes of a range of established ethnographic approaches that have successfully generated insights respectively into people, places and things and their interactions and organizational settings; 2) to build in techniques for critical reflection and reconceptualization during iterative data analysis when faced with data ‘not fitting in’ to the constructs or assumptions of any particular approach, and 3) to have the capacity to generate new constructs that can be used to model the BSA domain.

A second research objective was to generate a model of structural relations within the BST domain, setting out the dimensions of key themes that could be used to generate problem solving options for IS designs and guide changes in the IS and associated system of work practice.

The primary research question underlying the concern to address issues of technical bias in IS design is *“What are the attributes of a research design that will generate insights into an organisation and its context to enable human-centered design of IS and work practices?”* For BST, this led to an initial questioning of *“What are the relationships between the situations of the work place, digital information technology/ other artifacts in the domain and the ways people perceive and do their work?”* Following preliminary analysis a pervasive problem situation for BST involving the *nexus between accreditation and practice* was identified and this formed the focus for the research questions examined in this paper: *“What are the consequences of the way this relationship is framed for people and the artifacts they use in their work situation?”* and, *“What are the implications of this relationship for information systems and work practice systems in the organisation?”*

In approaching the field-site this research began by conceptualizing the key characteristics of three substantial theoretical approaches that successfully frame settings in terms of interactions between people, place and things [2,

8, 9]. These frameworks (Distributed Cognition, Communities of Practice, Activity Theory) draw on ethnographic values, assumptions, theories and techniques to construct ways of representing people, place and things in context and the interactions between them. The 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 contextualization 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 generating insights into structural relations in context with implications for design of technical IS. These various analytic frames provide different foci and constructs for collecting and analysing data. By following this data along trajectories of interaction it is possible to capture the dynamics, new perspectives and natural boundaries of a research domain and to identify the challenges and opportunities facing the research domain in terms of their implications for IS design [10]. Trajectories of interactions allow for a focus on organisations, people, functions, information objects and perspectives across place (geographical dimension) and time (historical-future dimension) [1].

3. Research Site and Method

3.1. Research Context

BST is one of forty organisations that coordinate and/or deliver breast screening services as part of Australia’s national breast screening program. The program was established in 1991 to bring together fragmented professional health service practices involved in breast cancer work and provide an integrated quality accredited service that would cost-effectively save women’s lives by early detection of cancers. Organization membership is conditional on successfully integrating the accreditation process into an ongoing quality improvement program and maintaining compliance with the National Accreditation Standards (NAS) [3].

3.2. Method

3.2.1. Phase one: familiarization and sense-making. This involved sense-making, exploring

and understanding BST at various units of analysis: individual (client, staff member), team (data management, recruitment, clinic), organisation and (breast screening) enterprise from multiple perspectives and through various theoretical lenses, using distributed cognition theory (DCog) [8], Communities of Practice theory (CoP) [9] and Activity theory (AT) [2]. More specifically, Distributed cognition focuses attention on the cognitive role of mediating artefacts and people-artefact interactions over time as a cultural phenomenon. Communities of Practice focuses attention to the existence of mechanisms for sharing and distributing knowledge and information (people-brokers, artefacts-boundary objects). Activity Theory engenders thinking about interactions as affected by tools, rules and division of labor in context. It enables representation of 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.

The researcher spent 1-2 days/week over several months as a participant observer recording field notes of interactions, issues and activities; noting and reflecting on possible connections and interrelationships. Observations of people at work were followed by 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, including meeting minutes, policy and procedure manuals, accreditation site visit reports, data reports, the 'business case' for the organisation structure and the 'business process analysis' project documents for a replacement database. The wider population health context information environment was scanned via electronic alerts and information resources made available by BST community education and cancer policy staff members.

The researcher attended community education and recruitment activities as well as physically following the trajectories of client interactions with BST of 24 women having a routine mammogram and 7 who attended an assessment clinic. Client trajectories were documented to identify perspectives about why and how clients engage with the BST service and experiences where expectations differed from organisation-level assumptions about client information and health service needs [10].

Client trajectories involving interactions with staff and BST information artifacts were connected to branching trajectories of interactions involving artifacts and people beyond the immediate client-interaction context. 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 BST. The data collection was extended for trajectories of interactions leading beyond the organisation boundaries to include other systems of activity which connect up and form BST's socio-technical context. This extensive data set was used to create a 'rich picture' [7] of BST.

3.2.2 Phase two: identifying a key theme.

The multi-lens structuring of data from phase one provided different conceptualizations of what was observed and reported in interviews and recorded in documents (including 'technological frames' [11]). Field visits in phase two reduced to one day/week and the focus shifted to analysis of data for themes connected to problems for BST in delivering its breast screening services.

Potential 'problem themes' were identified by iteratively using different frames of analysis across the data and by shifting the analytical focus beyond the boundaries of the initial units of analysis. This focus shifting included using the trajectories technique to uncover perspectives and structural relations not identified by any of the specific theoretical frameworks. The substantive problem theme that emerged from this analysis was *the nexus between accreditation and practice*. This theme traverses the organisation and extends beyond its boundaries to include interactions with several government entities responsible for ensuring the quality of BST's screening services. 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 during activities observed in the field and in ad-hoc conversations with participants and in formal interviews.

Constructs available from the chosen theoretical frameworks were applied to describe and illuminate the elements of the *accreditation – practice nexus* and its social and technical consequences.

The trajectory data within the organisation indicated that there were various perspectives on the nature of the *nexus* which varied depending

on the unit of analysis deployed. These differences occurred along the natural boundaries of individual actors, teams within the organisation (function-based), communities of practice (knowledge and skills-based) and at the boundary interaction between BST and the national accrediting organisation.

Breakdowns in work flow or shared understanding were primarily focussed on the client record, and the changing requirements for it along its trajectory of use. A disjunction was detected between social and technical constructions of the client record, such that propositions relating to the relationship between measurement of practice and the practice of work (the *nexus*) often critically required choices being made between prioritizing technical constructions of measurement and of work practice over social meanings and social methods of measurement and work practice.

Trajectories of interactions in the organisation were also followed across the formal boundary of the organisation to include interactions with any identifiable individuals (for example, potential clients), with BreastScreen Australia and any organizational entities that engaged in interactions with BST. Trajectory data across these multiple domains revealed the disjunctions in perspectives associated with the *accreditation – practice nexus* were also not resolved at these levels.

3.2.3 Phase three: theme conceptualizing. Phase three investigated the *accreditation – practice nexus*. The objective was to develop a set of constructs and a theoretical framework that would explain BST's current situation and provide a model for considering possible alternative constructions of the *nexus* and thus IS designs for BST and the national breast screening program.

Analytic 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 foci: as cognitive systems, communities of practice and activity systems. Where existing 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 modeled from a sociological perspective representing how it structured activity within the organisation. The sociological interaction-oriented analysis indicated that organisation-level accreditation was partially integrated with accreditation of individual staff

members: one was an artifact construction and the other a social construction. This analysis was then compared with an IS technical representation of BST, of data flow diagrams and Entity-Relationship diagrams. These diagrams showed that from a technical perspective individual-level accreditation of professionals is fully integrated with the organisation-level accreditation and that the artifacts and standards required by the accrediting organisation are naturalized into BST's system of work practice.

This insight provided the impetus for further research into the theme and model development, not presented here.

4. BST Case

The National Accreditation Standards (NAS) is the formal representation of breast screening practice integrated across multi-domains. The policies, procedures and methods for measuring compliance to those standards were designed to remove the problems of fragmented, unevaluated care of women in the context of deaths by breast cancer. The NAS was constructed by representative members from radiology, pathology, surgery, community health education, counseling, and other professional practices such as epidemiology and organisation and data management.

Data management experts translated clinical information and standards metric requirements into a Data Dictionary with which digital client IS operated by member organisations must comply. BST has a physical client record used by health professionals in the clinics and a digital client record on the client IS, managed by data staff. The client IS operates as the appointment booking and results letters notification system and is used to collect quantitative data for the NAS from the aggregated client records. This data is used by BST to monitor and give feedback on performance of the clinical staff, to check for errors in individual client records and to prepare annual accreditation data reports for BSA.

“NAS data reports involve a hell of a lot more than simply generation of database reports - all the exceptions/oddities are individually examined, files are hand checked, and occasionally results are sent to the multidisciplinary committee for review and action. For instance, if we record a positive core biopsy result but enter that the client did not receive surgery, this comes up in the NAS report query as a false positive due to limitations in the

database and algorithms. An alternate algorithm might show such cases as “incomplete”; however this might still not be correct.”

Interview participant, March 2007.

The “database reports” are generated monthly for the Service Program Manager and the Data Manager to monitor trends in complying with the NAS. An annual data report on a template supplied by BSA detailing performance against the NAS is produced for the State Accreditation Committee overseeing BST, and sent on to the National Quality Management and Review Committee of BSA for decision on BST’s accreditation status. This report is accompanied by a “Response by Service” giving reasons why particular standards have not been met, are unable to be assessed or met with exception; proposed actions by the Service and expected outcomes and timeframes.

These documents form the basis of BSA-level decision on whether accreditation status is maintained in the interim between accreditation site visits on which occasion non-quantitative aspects of the Service are assessed and an independent data audit is conducted before a new period of accreditation is granted.

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 artifacts 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, within the Public and Environmental Health Service within the Tasmanian government Department of Health and Human Services. 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.

In the population health 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 IS to evaluate an organization’s compliance to the standards. BreastScreen Australia is a highly regulated health service program and as a member, BST must comply with 176 standards, comprising the ‘best practice’ defined by from professions including radiography, radiology, pathology and surgery as well as best practice in data management, management of client psychosocial needs and other contributing experts. Standards compliance is a condition of government funding and BST’s 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 theres 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 in the Program. A critical challenge for BST is to give women information about the evidence of benefit of participating and provide a high quality client focused experience dealing with their individual needs and yet maintain ‘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.

The NAS specifies that member organisations 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 naturalized 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.

In 2005 BST was awarded the highest recognition of continuous and successful improvements in quality service: four year accreditation status. The organisation is 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 do not reflect the real constraints affecting capacity to meet standards.

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 in 2005 consumed large swathes of BST’s resources and took the organisation over a year to prepare. Yet the accreditation reports are not fully utilised to enable benchmarking for member Service organisations; information interaction between the forty accredited member organisations is ad hoc and based on personal communication.

“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 [other Services] 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 artifacts they use in conducting their work, and the constant problems for the flow of information which occur because the physical client record (clinical practice artifact) and the client information system (accreditation artifact) must be manually synchronised.

This division also creates a fundamental tension between data work (focused on the client record) and clinical practice (focused on the client). This is significant as BST health professionals and data staff members are subject to increasing quality assurance processes and accreditation requirements in a context of budget and resource constraints (particularly radiographer and radiologist shortages) which limit capacity to meet certain NAS. The empirical data contained many examples of conflicting priorities between role-based teams. BST’s ongoing failure to meet the NAS 70% screening rate standard, coupled with radiographer stress leave in response to pressure to screen clients more quickly, flowed through to affect data staff workers responsible for client bookings.

[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.**

Efforts to determine reasonable productivity levels for different roles were hampered by lack of information at a national level and individual/team desire to protect their ‘professional’ values of client care.

[Name] was given the task of benchmarking the [clinical role]: “that makes me as popular as a maggot in a butcher’s shop”. **Field notes, September 2005.**

This issue links back to the design of the BSA Program as a population-level health intervention which also provides a diagnostic service to individual clients; an evidence-based service which employs health service individuals on the basis of their professional accreditation and also measures some (but not all) aspects of their competence via data from the client record.

5. Models

Two models, derived from the empirical data and drawing on constructs in the literature, are presented in this paper. The first model (Figure 1) combines Mol and Berwick’s insights on information in terms of patient care [12, 13] with the constructs from the data to model three orientations toward information: evidence for evaluation (*E-information*), professional practice (*P-information*) and client (*C-information*).

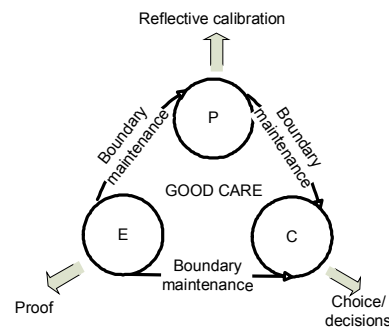


Figure 1 Information Orientations

These orientations reflect both different priorities and different contexts of information use. *Boundary maintenance* is any activity of keeping existing requirements for data collection and interpretation (defining the form, structure or meaning of data) in the context of multi-use of data or information. It includes constructing the work processes or tools required to make use of data for more than one orientation (*boundary object* [1] construction) – to translate or explain data for a different orientation or make judgments of the equivalence of data between orientation contexts. The outcome of boundary maintenance is to keep explicit the different meanings and purposes of data for each specific information orientation.

In BST, the dominant orientation is *E-information*, which is founded on its role as a statistically verifiable population-level health intervention Program. The model for funding is linked to accreditation status: the aggregated client record data from the organization’s digital

client IS providing evidence that the organisation practice complies with the NAS [3].

Organisation interactions with clients prioritize collecting and recording data required for accreditation evidence: *C-information* to calibrate decisions for individual client care may be verbally shared or recorded on the physical Client Record client record used by the screening *community of practice* [9], but is not recorded on the digital client IS used for evaluating the service provided by organisation.

Figure 2 models the outworking of the *accreditation – practice nexus* for BST [14], BreastScreen Australia and *members* of health professional organisations. It shows BST as an accredited breast screening *enterprise*

organisation and the multi-domain information interactions required at organisation-level of BST and from individual staff members of BST.

Membership maintenance activities are information interactions independent of the client record. Individual health professionals working within the *enterprise organisation*, BST, belong there as members of a *network of practice* [15]. Professional staff members must provide evidence of commitment to ongoing professional development to their *network of practice* to maintain their accreditation status and *membership* of a *community of practice* [9] in BST.

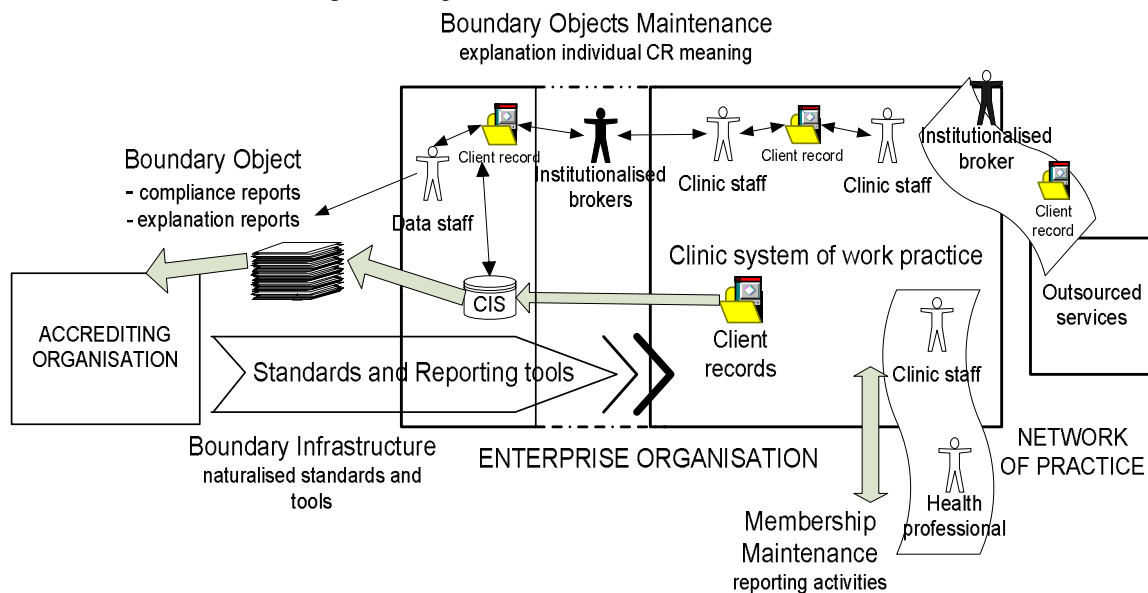


Figure 2 Accreditation – Practice nexus: translations of client data meaning across domain boundaries

Within the clinical *community of practice* which conducts the practice of breast screening, the client record functions as a *boundary object*: it serves the information needs of the communities connected by mutual use without requiring change of meaning of data categories for each community [1, 9]. Not all members of the clinic *community of practice* use the client record in the same time frame and place. The physical client record is transported to different parts of the clinic rooms for use by different *members* and pathologists do their work in a laboratory and send their report to add to the client record by fax. All members of the multi-disciplinary team use the client record for information about the client and add data generated from their own professional activity.

Institutionalised brokers are the Designated Radiologist/ Pathologist/ Surgeon, employed to ensure that the standards required by the *accrediting organisation* are also adopted into the practice of individual staff members and the breast screening *community of practice*.

In the screening context, their work is one of naturalising accreditation objects and maintaining multiple member relations [1], integrating memberships on the *nexus between accreditation and practice*. They also co-ordinate and negotiate conflicts in meaning of professionally oriented data produced by members from the different health disciplines to ensure a data set on the client record that all the *community of practice* members can use in decision making, that will produce good

outcomes for the client and enable meeting the NAS.

The Data Manager and BST Program Manager interact with *institutionalised brokers* in the *boundary object maintenance* activity of maintaining the distinctions between the meaning of individual client record information and its meaning against the metrics in the NAS. The outcome of this is that the *professional practice-oriented information* utilised in the cognitive activity of screening a woman for breast cancer and the *client-oriented information* in caring for an individual client are kept visible and distinct from the meaning of aggregated client record information that is utilised as *evidence* for accreditation (See Figure 1).

At the organisation-level unit of analysis, *boundary maintenance* is the human activity needed to create and maintain connections which cross organisation boundaries to achieve agreed

objectives where the information orientations are not compatible. *Boundary objects* (reports) are constructed to communicate BST standards compliance to the *accrediting organisation* standards and provide explanations and plans for improvement where they are not met.

The *accrediting organisation* requires quantitative evidence of organisation-level compliance with the NAS standards, derived from the aggregated client record data stored on the digital client IS. The artifacts the *accrediting organisation* produces have the form of *boundary infrastructure* [1]. The NAS, Data Dictionary and reporting templates for *enterprise organisations* are translated into Policy and Procedure manuals, client IS and client record design that reflect the naturalization of the standards and tools for measuring performance into each organisation. This is summarized in Table 1.

Table 1. Translations of information and boundary objects

BOUNDARY OBJECT	EVIDENCE ORIENTATION	PROFESSIONAL ORIENTATION	CLIENT DECISION ORIENTATION
Digital client information system	Data for evidence that individual and multi-disciplinary team practice aggregates to measure that organisation practice to standards; feed back	Data on aggregated individual and team performance can be supplied for feed back to inform decisions on how to improve practice; evidence data adds to professional body of knowledge	Aggregated client data provides research evidence of practice outcomes
Individual client Record	Discussion with client of situation in relation to evidence base (informed consent)	Adding data for shared information and understanding within multi-disciplinary team	Discussion with client of situation in relation to clinical diagnosis from data recorded
National Accreditation Standards manual	Sets out standards for breast screening practice and metrics for meeting standards based on evidence of 'best practice'	'Designated' broker uses NAS to educate individuals and his professional network on 'best practice' standards	Information for clients on what can expect of a quality health service (client letters, brochures)
Data Dictionary	Sets out required data elements for collection and algorithms for measuring standards compliance	Requirements for data onto client record: broker ensures members share understanding of meaning of terms	Impact on client information system requirements which do not always match individual client expectations

6. Discussion

The analysis indicated a different construction of integration for accreditation at the organisation-level to accreditation at the individual practice level. The models represent a situation where accreditation of an organisation is constructed as *measurement by an integrating artifact* while accreditation of individuals is socially constructed by *multi-membership*.

In contrast, a technical IS analysis indicated that the artifacts used in the practice (client IS/client record, policy and procedure manuals) and rules for accreditation of the organisation (data dictionary and NAS) were fully integrated.

The research findings indicate that a system of practice that is fully integrated technically such that practice-oriented data on the client record is also used as evidence for organisation accreditation still has disjunctions at the level of meaning and requires human activity to coordinate, explain, align and prioritize meanings.

At this point the cultural and moral implications of using integrated information and standardized work practices to join up various health services emerge which provide a dilemma for organization and enterprise design. The accreditation – practice nexus identified uses standardization and information integration as a

mechanism for producing high quality health services. However, a consequence of evidence-orientation dominance is that information for professional and client use can be distorted or neglected and that boundary maintenance is required to maintain the visibility of all three information orientations.

The first point is that there exists a disconnection in integration between information systems and social systems in the accreditation – practice nexus. This disconnection cannot be eliminated by fully integrated IS and standardized work practices (from a technical perspective) because there is an inescapable difference between the meaning population-level, evidence oriented data, and the meaning of data in the context of a specific client receiving a health service. Such is oriented to supporting the health professionals’ judgments on best decision for the individual client and providing an individual client with information for making good decisions.

That is, the ambition for evidence based clinical practice requires the collection of data that is in a form that enables aggregation of multiple instances of practice stripped of local context and can be used to measure outcomes and identify patterns that can be generalized. The information required for individual health service client care includes the evidence base for best practice – but adapted and shaped by the wisdom, experience and skill to make judgments by an educated clinical professional who additionally is able to include client-specific information and communicate client-specific decisions for assessment.

Thus a critical healthcare system conflict is between the technical and social means of accreditation (*measurement and membership*) and the social and IS implications of the *accreditation-practice* nexus in any particular health care setting. Integrated membership (educating and integrating clinical practice for standardized and multi-disciplinary work) is founded on a mutually accepted basis of scientific evidence for proof of how best to approach health service. However clinical practice is based on socialization into a culture and practice that involves a long process of entering into and demonstrating continued commitment to membership as a competent trustworthy professional. The essence of ‘professionalism’ is the belief that the individual and their professional community has the skills, knowledge and commitment to make good judgments in particular situations based on the

accepted body of knowledge of the profession and individual situation.

7. References

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